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**WAVETEK**

OPERATOR'S MANUAL

Model FG3B

Sweep/Function Generator

## One Year Limited Warranty

The Model FG3B Sweep/Function Generator is warranted in entirety against any defects of material or workmanship which develop for any reason whatsoever, except abuse, within a period of one (1) year following the date of purchase of the sweep/function generator by the original buyer. This warranty is extended by Wavetek Corporation to the original buyer or original user of the function generator only, who must present proof of purchase at time of warranty service.

In the United States any sweep/function generator claimed to be defective during the warranty period should be returned with proof of purchase to Wavetek Corporation's Factory Service Center. Repair is typically made within two working days after receipt of the defective unit. Follow the shipping instructions as detailed in the service section at the back of the manual. For warranty repair outside the United States, contact your local Wavetek Corporation dealer or distributor where your sweep/function generator was purchased, or return to Wavetek Corporation's Factory Service Center.

ANY IMPLIED WARRANTIES arising out of the sale of a sweep/function generator including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above stated one (1) year period. Wavetek Corporation shall not be liable for loss of use of the sweep/function generator or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses, or economic loss.

Some states do not allow limitations on how long implied warranties last or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have rights which vary from state to state.

WAVETEK CORPORATION  
San Diego, California

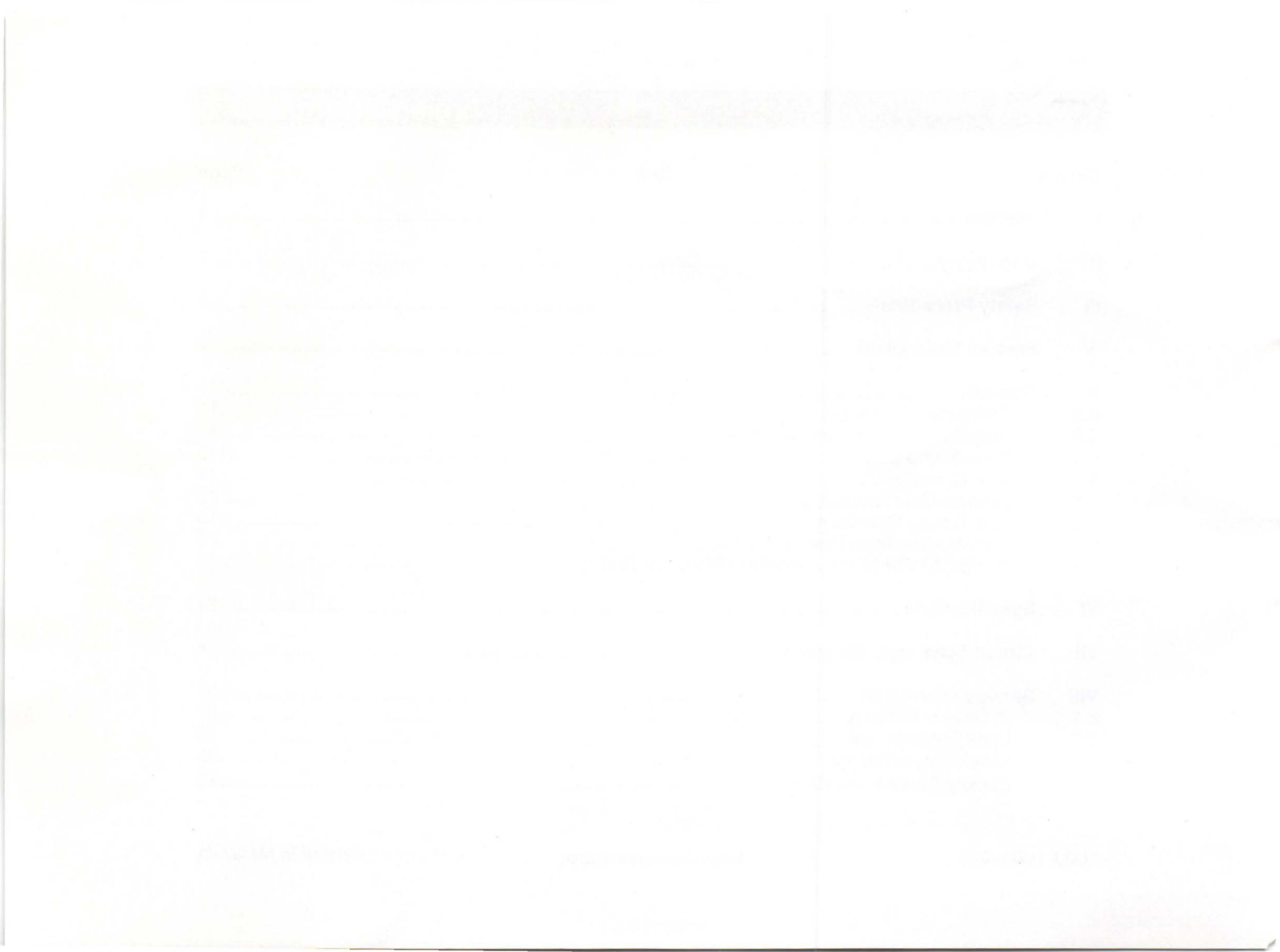
**Model FG3B**  
**Sweep/Function Generator**

Operator's Manual



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The Model FG3B Sweep/Function Generator is a stable, low distortion instrument, capable of generating signals in the 0.2Hz to 2.0MHz frequency range. It is suitable for vibration testing, servo system evaluation, general-purpose audio response testing, ultrasound applications and much more.

Features that make this instrument unique include linear or logarithmic sweep capabilities and a built-in frequency counter. The sweep capability simplifies the often tedious task of finding resonant points in speakers, filters, and structures. You may connect an oscilloscope to the equipment and observe a display of responses automatically. The counter makes it easy to set the frequency control knob to the precise value desired. In addition, the counter may be switched to measure and display external signals up to 100MHz.

Other features include:

1. Low-distortion sine wave, triangle wave, square wave and ramp signals.
2. Signal outputs in seven decade increments from 0.2Hz to 2.0MHz.
3. Adjustable sweep time, sweep width, and linear/log sweep mode controls.
4. AM or FM capability with internal or external modulation control.
5. Duty cycle control with inversion feature.
6. External VCF (Voltage Controlled Frequency).
7. Main signal 50 ohm output with DC offset adjustment and 20dB attenuation capability.
8. Second output for TTL or adjustable CMOS pulses.
9. Self-extinguishing plastic case, two BNC test cables, and AC power cord.





Use care when unpacking the Model FG3B Sweep/Function Generator to avoid damaging the packing materials and the instrument. It is recommended that the packing be retained for protection should future transport of the instrument be required.

The carton should contain the following items:

1. Model FG3B Sweep/Function Generator.
2. A plastic bag containing:
  - Coaxial test leads (2 each)
  - Spare fuses (2 each) \*
  - Operator's manual
  - Warranty card
3. AC power cord \*

\* **NOTE:** Type and rating determined by USA, U.K., or European designation.



For maximum operator safety and long instrument life observe the following precautions:

**DANGER!** Before connecting AC power, make certain the instrument is compatible with the local AC power source. Refer to the back label for voltage requirements.

Do not operate the instrument with the case opened.

Do not operate the instrument ungrounded with the ground pin of the power cord removed, or with a 3-pin adapter.

Never permit water to enter the interior of the instrument.

**WARNING!** Do not apply voltages to the output connectors.

Strictly observe the voltage input limits of the External Counter input and VCF/Modulation input connectors.

Do not place the instrument on top of other high temperature equipment.

**CAUTION!** For normal operating performance, operate the instrument within a 0°C to 50°C range.



For features described in this section, refer to Figure 4.1. We **HIGHLY RECOMMEND** that you become familiar with the controls and indicators described below before operating the instrument.

This manual assumes the user is reasonably familiar with function generators, frequency counters, and sweep generators.

1. GATE  
Indicator flashes when power is on, showing when frequency counter is making a measurement.
2. OVER  
Indicator lights to show over-range condition, or when a signal applied to the External Counter input exceeds the counter's measurement range.
3. COUNTER DISPLAY  
5 digit LED display shows frequency value.
4. kHz  
Indicator lights to show Counter Display reading is in kilohertz units.
5. MHz  
Indicator lights to show Counter Display reading is in megahertz units.
6. PWR  
This switch controls AC power to the instrument.
7. FREQUENCY RANGE Selector and GATE TIME Selector  
Pushing one button at a time selects the desired frequency from the function generator, in decades, AND selects the counter gate time value, from 10 sec to 0.01 sec intervals.

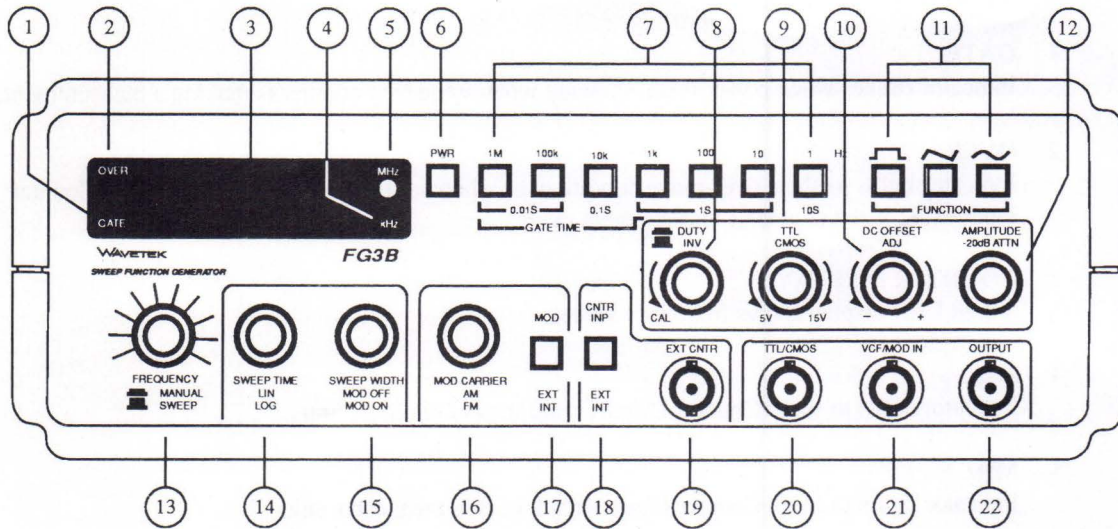


Figure 4.1

8. DUTY (push)/INV (pull)  
Varies duty cycle of signal from 50% (1:1) in Cal. position to about 10% (10:1). Pull knob to invert duty cycle. Affects both signal outputs at TTL/CMOS connector 20 and Output connector 22.
9. TTL (push)/CMOS (pull)  
Adjusts output level on TTL/CMOS connector 20. Push in for fixed TTL level pulse. Pull out for adjustable 5-15V CMOS level pulse.
10. DC OFFSET ADJUST  
Applies an adjustable positive or negative DC offset voltage to the signal on Output connector 22. Pull to adjust offset.
11. FUNCTION Selector  
Selects square, triangle, or sine wave output at connector 22. TTL/CMOS output connector 20 not affected.
12. AMPLITUDE (push)/-20dB ATTN (pull)  
Adjusts output amplitude on Output connector 22. Pull for -20 dB (10% of original output) attenuation.
13. FREQUENCY (push)/SWEEP (pull)  
Sets desired frequency of signal between 0.2 and 2 times the Frequency Range value selected. Pull for sweep mode.
14. SWEEP TIME LINEAR (push)/LOG (pull)  
Adjusts repetition rate of sweep in a linear mode (i.e. number of sweeps/second). Pull for log-type sweep.



15. SWEEP WIDTH  
Varies width of sweep, from 0 (no sweep) to 1000:1 (max. sweep width).  
Pull for AM/FM modulation capability.
16. MODULATION CARRIER  
Varies AM/FM modulation level, either from internal 400Hz source or VCF/MOD IN connector 21. Pull for FM modulation capability.
17. MOD  
Selects internal 400Hz sine wave modulation, or external signal applied to VCF/MOD IN connector 21.
18. COUNTER INPUT  
Selects internal waveform (function generator output) or external signal on External Counter connector 19 for measurement and display.
19. EXT COUNTER  
Accepts external signals in the 5Hz-to-100MHz range for measurement.
20. TTL/CMOS  
Square wave output for driving digital logic. Can be varied in pulse width with DUTY control.
21. VCF/MOD IN  
DC voltage input to control function generator frequency (VCF), or external modulation signal input when modulation capability is used.
22. OUTPUT  
50 ohm square, triangle, or sine wave output.

This section describes the basic steps required to operate the instrument. It is recommended that the following information be carefully read.

### **5.1 Preliminary checkout**

- A. Observe the line voltage rating on the rear panel nameplate and make certain it conforms with your AC line voltage.
- B. Push the female line cord connector firmly into the socket of the instrument and connect the other end to your AC outlet.
- C. Push the PWR switch. The GATE indicator will flash and the Counter Display will read the frequency of the signal.
- D. Preset the controls:
  - All controls pushed in.
  - All non-power buttons released.
  - AMPL and OFFSET set to midposition.
  - DUTY control at CAL position
  - FREQUENCY control fully counterclockwise.

### **5.2 Square, Triangle, or Sine wave output**

- A. Push the desired FUNCTION button for square, triangle, or sine wave output.
- B. Push the desired Range button (1M, 100k, 10k, 1k, 100, 10, 1) for the desired frequency.
- C. Rotate the FREQUENCY knob until the desired frequency appears in the Frequency Display window.

D. Adjust the AMPL knob for the desired amplitude at the OUTPUT connector.

**NOTE:** For low level applications, pull the AMPL knob for -20 dB (10-to-1 reduction) attenuation of the output signal.

E. Pull and adjust the OFFSET knob for a DC offset in the output signal at the OUTPUT connector. The signal duty cycle may be varied by rotating the DUTY knob. Pull it to invert the duty cycle.

F. There is a simultaneous output at the TTL/CMOS connector. This output will drive logic circuitry. TTL output level is fixed at  $>3$  V. For CMOS circuitry operating from a 5-to-15 volt power supply, pull the TTL/CMOS knob and adjust the level to the desired value.

Figure 5.1 shows the phase relationships between the TTL/CMOS and OUTPUT signals.

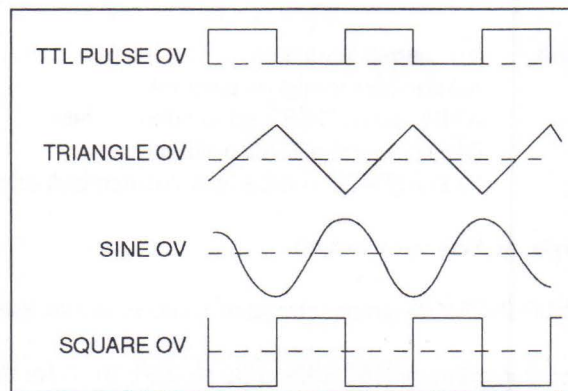


Figure 5.1

### 5.3 Pulse/Ramp Output

- A. Push the desired FUNCTION button for square wave to generate a pulse output or for triangle wave for a ramp output.
- B. Push the desired Range button (1M, 100k, 10k, 1k, 100, 10, 1) for the desired frequency.
- C. Rotate FREQUENCY knob until the desired frequency appears in the Frequency Display window.
- D. Adjust the AMPL knob for the desired amplitude at the OUTPUT jack.

**NOTE:** For low level applications, pull the AMPL knob for -20 dB (10-to-1 reduction) attenuation of the output signal.

- E. If required, pull and adjust the OFFSET knob for a DC offset in the output signal at the OUTPUT jack.
- F. The pulse or ramp signal is generated by rotating the DUTY knob. Pull it to invert the duty cycle. This adjustment affects the waveforms at both TTL/CMOS Output and Output connectors

**NOTE:** Output frequency is decreased when using variable duty cycle.

## 5.4 VCF Operation

The VCF (Voltage Controlled Frequency) mode permits the user to adjust the function generator frequency with an external DC control voltage.

- A. Push the desired FUNCTION button for square, triangle, or sine wave output.
- B. Push the desired Range button (1M, 100k, 10k, 1k, 100, 10, 1) for the desired frequency.
- C. Rotate the FREQUENCY knob until the desired frequency appears in the Frequency Display window.
- D. Make certain the SWEEP WIDTH knob is pushed in, enabling the VCF mode.
- E. Connect the control voltage to the VCF/MOD IN connector.

**NOTE:** The VCF input controls the output frequency over a range of 3 decades; the same control range the FREQUENCY knob provides for a given frequency multiplier range (i.e., when the X10k frequency multiplier button is pressed, the range is 20Hz to 20kHz). The VCF input modifies the initial frequency setting—within the original 3 decade control range. With a frequency setting of 20kHz, applying +10V to the VCF input will **reduce** the frequency, by approximately 1000:1, to 20Hz. An application of -10V to a setting of 20Hz will **increase** the frequency to approximately 20kHz. If the setting is within the range limits, a VCF input will change the output frequency up to the range limits. A positive voltage input causes a decrease in output frequency while a negative input causes an increase in output frequency.

- F. Adjust the AMPL control for the desired voltage level on the Output connector, or pull the TTL/CMOS knob and adjust the desired output level on the TTL/CMOS output connector.
- G. If necessary, adjust the DUTY and OFFSET knobs to change the duty cycle or to add a DC offset voltage to the waveform.



## 5.5 External Counter Operation

The built-in frequency counter can measure external signals in the 5Hz to 100MHz range.

- A. Push the CNTR INP switch in.
- B. Switch the back panel switch to 10MHz or 100MHz, depending upon the frequency to be measured or the resolution required.
- C. Connect the signal to be measured to the EXT CNTR connector.
- D. Press the appropriate gate time button (the frequency appears in the Frequency Display window, but the OVER indicator is not lit). For unknown signals, push the 1 sec button first.

**NOTE:** For better accuracy, wait 60 seconds for a stable reading when the 10 sec button is pressed.

## 5.6 Auto Sweep Operation

- A. Push the desired FUNCTION button for square, triangle, or sine wave output.
- B. Push the desired Range button (1M, 100k, 10k, 1k, 100, 10, 1) for the desired frequency.
- C. Turn the FREQUENCY knob until the MAXIMUM desired frequency shows in the Frequency Display window.
- D. Adjust the AMPL control for the desired level on the Output jack, or pull the TTL/CMOS knob and adjust the desired output level on the TTL/CMOS output jack.

- E. If needed, adjust the DUTY and OFFSET knobs to change the duty cycle or add a DC offset voltage to the waveform.
- F. For a log-type sweep, pull the SWEEP TIME control. Leave it pushed in for linear mode sweep cycles.
- G. Pull the FREQUENCY knob for the sweep mode of operation.
- H. Turn the SWEEP TIME control fully counterclockwise for the slowest sweep rate.
- I. Adjust the SWEEP WIDTH control so that the instrument sweeps through the desired frequencies.

**NOTE:** The sweep cannot be stopped; SWEEP WIDTH must be adjusted during the sweep.

- J. Then adjust the SWEEP TIME control for the desired sweep rate.

### **5.7 AM/FM Modulation Operation**

- A. Push the desired FUNCTION button for square, triangle, or sine wave output.
- B. Push the desired Range button (1M, 100k, 10k, 1k, 100, 10, 1) for the desired frequency.
- C. Rotate the FREQUENCY knob until the desired frequency appears in the Frequency Display window.
- D. Adjust the AMPL knob for the desired amplitude at the OUTPUT jack.



**NOTE:** For low level applications, pull the AMPL knob for -20 dB (10-to-1 reduction) attenuation of the output signal.

- E. If required, pull and adjust the OFFSET knob for a DC offset in the output signal at the OUTPUT jack.
- F. Pull the SWEEP WIDTH knob out to turn on the modulation.
- G. Pull the MODULATION CARRIER knob out for FM modulation, otherwise leave it pushed in for AM modulation.
- H. For external modulation of the carrier, push the MOD button in, or leave it released to use the internal 400Hz modulation signal.
- I. Adjust the MODULATION CARRIER knob for the desired modulation level.

### **5.8 Application Note: Amplifier Response Testing**

A typical use for the Model FG3B Sweep/Function Generator is evaluating the performance of audio power amplifiers. Sweep testing an amplifier permits the user to see at a glance the overall quality of the unit. Problems such as limited bandwidth or instability due to component failure become apparent by variations in the output level.

If the amplifier has tone controls, sweep testing will readily show their operation. The boost-and-cut effects of treble and bass controls will appear as peaks and dips in the output, respectively, during the sweep. Otherwise set the tone controls to the flat position during testing to avoid confusion.

Refer to Figure 5.2 for connection details. Note that the Model FG3B Sweep/Function Generator connects to both the amplifier input and the Channel 1 input of the oscilloscope. The amplifier output is terminated with a load resistor (typically an 8 ohm, 100 watt non-inductive unit for audio power amplifiers) and the output drives the Channel 2 oscilloscope input.

Note that the power amplifier input is terminated with a  $50\Omega$  resistor to prevent high frequency effects caused by the connecting cable from affecting the test results. High frequency capacitive loading of the cable appears as ringing and other distortions in the signal.

In operation, the Model FG3B Sweep/Function Generator is set for a 20Hz to 20kHz linear-type sweep. The sine wave output is selected, and the output level is set for half the rated amplifier's power output. This method is safe for the amplifier and gives optimum results. Or if desired, future sweep testing may be done at one-fourth rated power, or full power. Use caution when testing at full power to avoid overheating and damaging the amplifier.

The oscilloscope is set up to properly display both signals. The Channel 1 and 2 Volts/Div controls are set for about 3 divisions peak-to-peak of the input and the output signals. Use the vertical centering controls to position the input signal on the top half of the display, and the output signal on the bottom half of the display. Then, observe the variations in the output signal during the sweep cycle. The input signal may be repositioned over the output signal for a better comparison, if desired.

If the oscilloscope has an ADD mode and INVERT switch, signal comparison becomes easier. Only the difference between the input and output levels may be displayed. Simply press ADD and INVERT, then adjust the vertical centering controls to center the trace on the display.

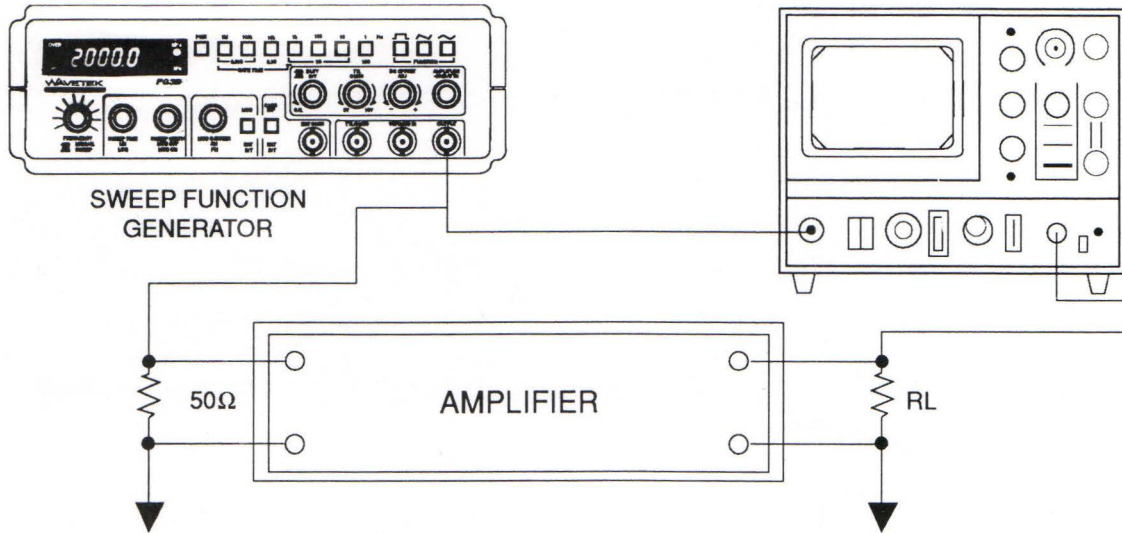


Figure 5.2



## 6.1 General

Output Waveforms	Sine, triangle, square wave from OUTPUT connector Square wave from TTL/CMOS connector
Amplitude	OUTPUT connector: >20V P-P open circuit >10V P-P into 50 $\Omega$ load  TTL/CMOS connector: TTL: >3V open circuit CMOS: 4 to 14.5V, adjustable
Impedance	50 $\Omega$ $\pm$ 6% (OUTPUT connector only)
Attenuator	-20dB $\pm$ 1dB at 1kHz (OUTPUT connector only)
DC Offset	<-10V to >+10V for no load <-5V to >+5V for 50 $\Omega$ load (OUTPUT connector only)
Duty Cycle	1:1 to 10:1 minimum, variable
Display	5 digit LED display of frequency 4 LED indicators for Gate, Over, kHz, MHz
Frequency Range	0.2Hz to 2.0MHz in 7 ranges

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*The electrical specifications in Section VI are guaranteed when operated at 23°C  $\pm$  5°C, and when powered by the rated line voltage.*

## 6.2 Sine Wave Output

Distortion	<1%, 0.2Hz to 200kHz
Flatness	<0.2dB, 0.2Hz to 100kHz <1dB, 100kHz to 2MHz

## 6.3 Triangle Wave Output

Linearity	>98%, 0.2Hz to 100kHz >95%, 100kHz to 2MHz
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## 6.4 Square Wave Output

Symmetry	<2%, 0.2Hz to 100kHz
Rise/Fall Time	<120ns

## 6.5 CMOS Output

Level	4V P-P ( $\pm 1V$ P-P) to 14.5V P-P ( $\pm 0.5V$ P-P), adjustable
Rise/Fall Time	<120ns

## 6.6 TTL Output

Level	>3V P-P
Rise/Fall Time	<25ns

## 6.7 VCF Input

Input Voltage	0 to 10V ( $\pm 1$ V) for 1000:1 frequency ratio
Input Impedance	$\geq 10\text{k}\Omega$

## 6.8 Frequency Counter

Input	Internal/External, front panel switch selected
Frequency Ranges	Internal input: 0.2Hz to 2MHz External input: 5Hz to 10MHz 5MHz to 100MHz, back panel switch selected
Accuracy	10 PPM $\pm$ 1 count at 23°C
Timebase	Oscillator frequency: 10MHz Stability: $\pm 10$ PPM at 23°C
Resolution	Internal and external 10MHz: 0.1Hz, 1.0Hz, 10Hz, 100Hz
Input Sensitivity	10MHz: $\leq 25\text{mV RMS}$
External	100MHz: $\leq 35\text{mV RMS}$
Display	Five digit LED display for frequency Four LEDs for gate, overflow, kHz, MHz

## 6.9 Sweep

Sweep/Manual Mode	Switch selected
Sweep Width	1000:1 frequency ratio max., adjustable



Sweep Time	0.5 sec. to 30 sec., adjustable
Sweep Type	Linear or Logarithmic, switch selectable

#### **6.10 Amplitude Modulation**

Depth	0-100% modulation, adjustable
Modulation Freq.	400Hz internal, DC-1MHz external
Carrier BW	100Hz to 2MHz (-3dB)
Ext. Sensitivity	<10V P-P for 100% modulation

#### **6.11 Frequency Modulation**

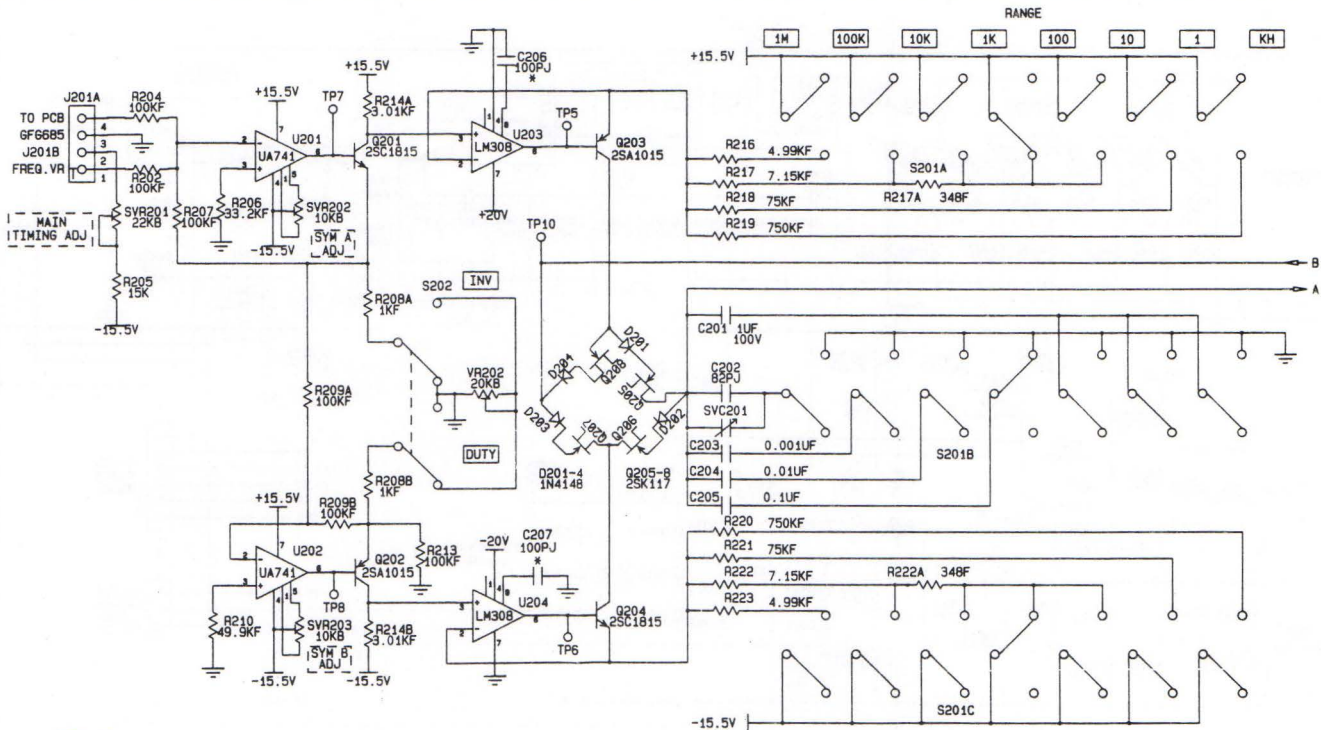
Deviation	0 to $\pm 5\%$
Modulation Freq.	400Hz internal, DC-20kHz external
Ext. Sensitivity	<10V P-P for $\pm 5\%$ deviation

#### **6.12 General**

Power Source	North American version: 117V, 60Hz Europe, UK versions: 234V, 50Hz
Dimensions	22.8(W) x 8(H) x 32.9(D) in centimeters 9(W) x 3.13(H) x 13(D) in inches exclusive of handle
Weight	2.0 kilograms typical 4.5 pounds typical

# Section VII

# Schematics

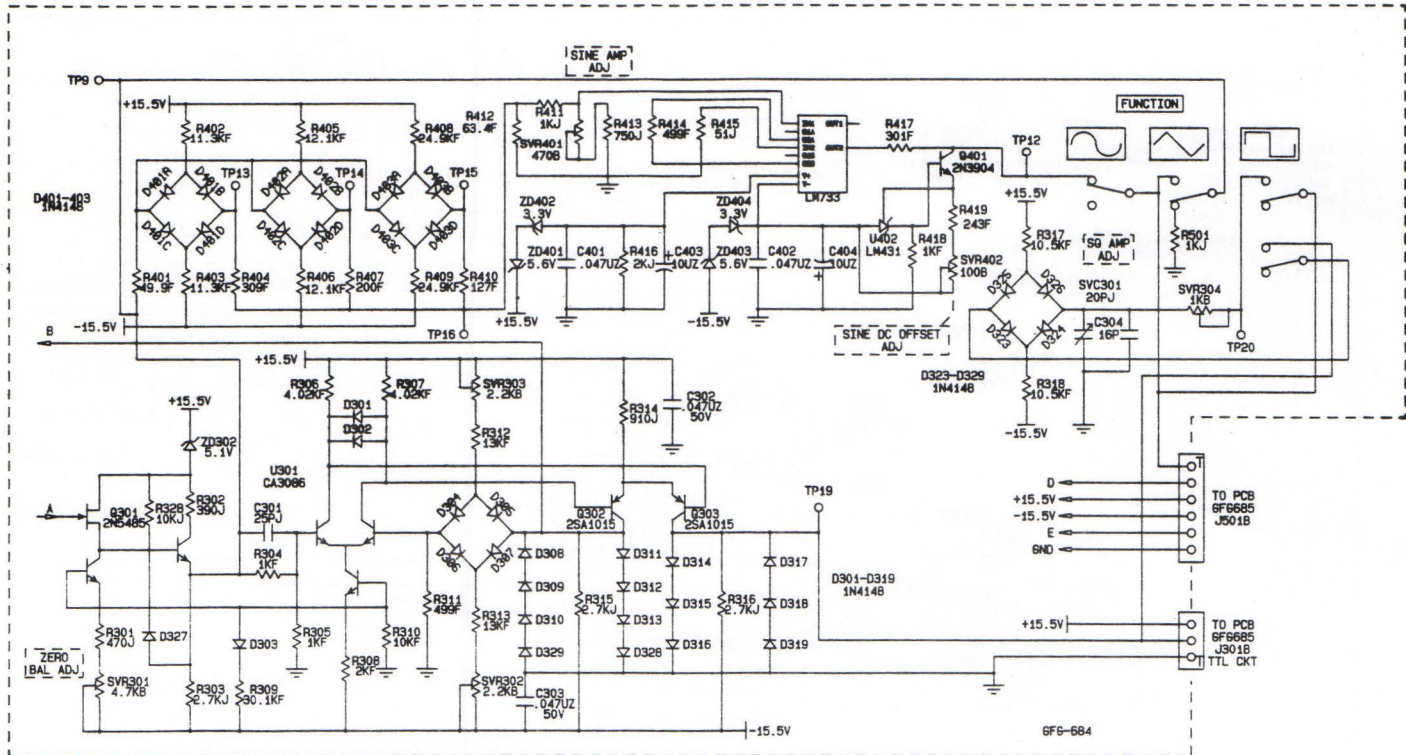


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1 \*ADJUSTED IN FACTORY  
 2 CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT  
 3 RESISTANCE VALUES IN Ω 1/4 WATT AND CAPACITANCE IN μF UNLESS OTHERWISE SPECIFIED

Oscillator

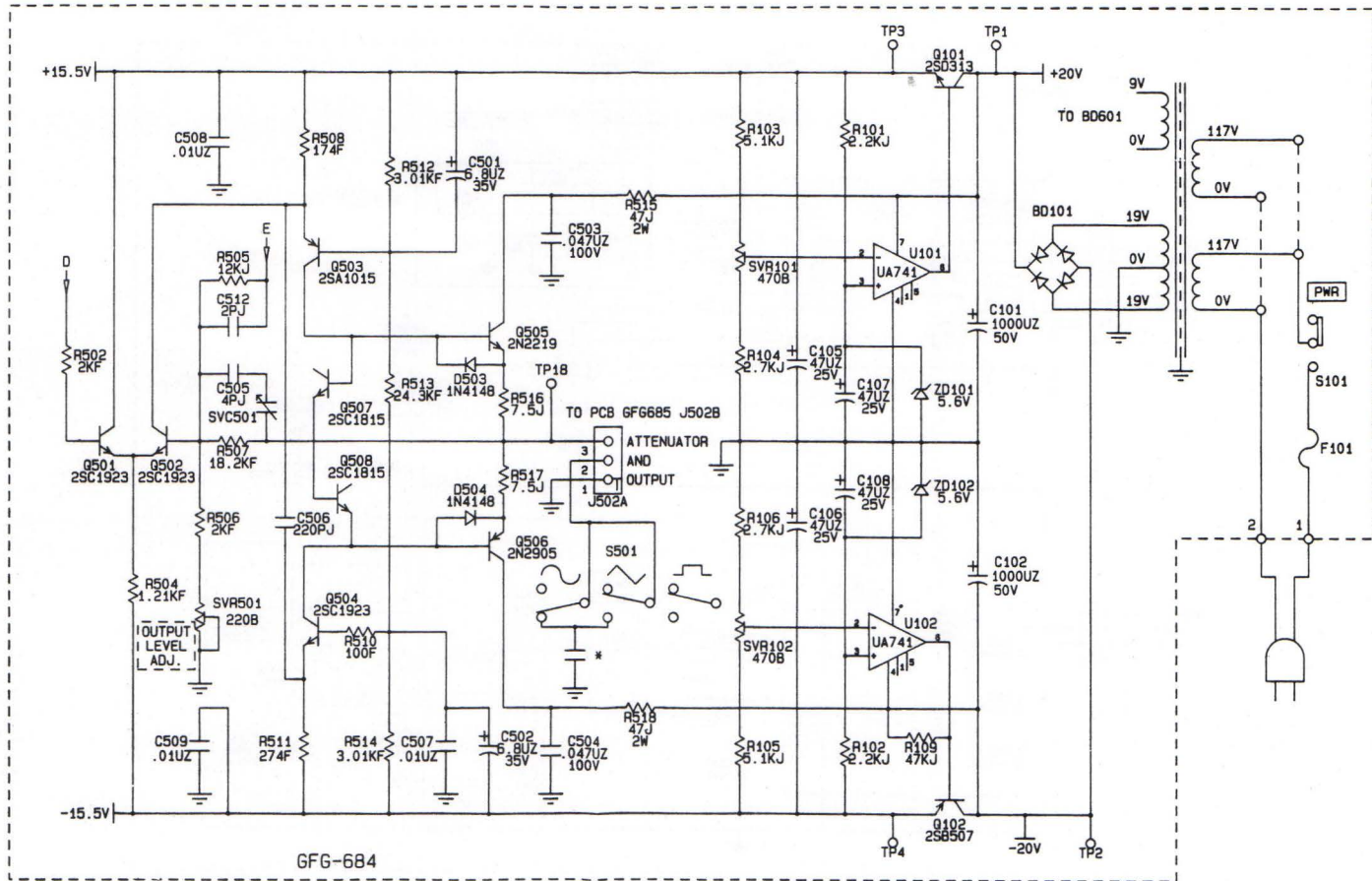
= Front Panel Label



1 \* ADJUSTED IN FACTORY  
 2 CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT  
 3 RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED

Sine/Square Shaper

= Front Panel Label



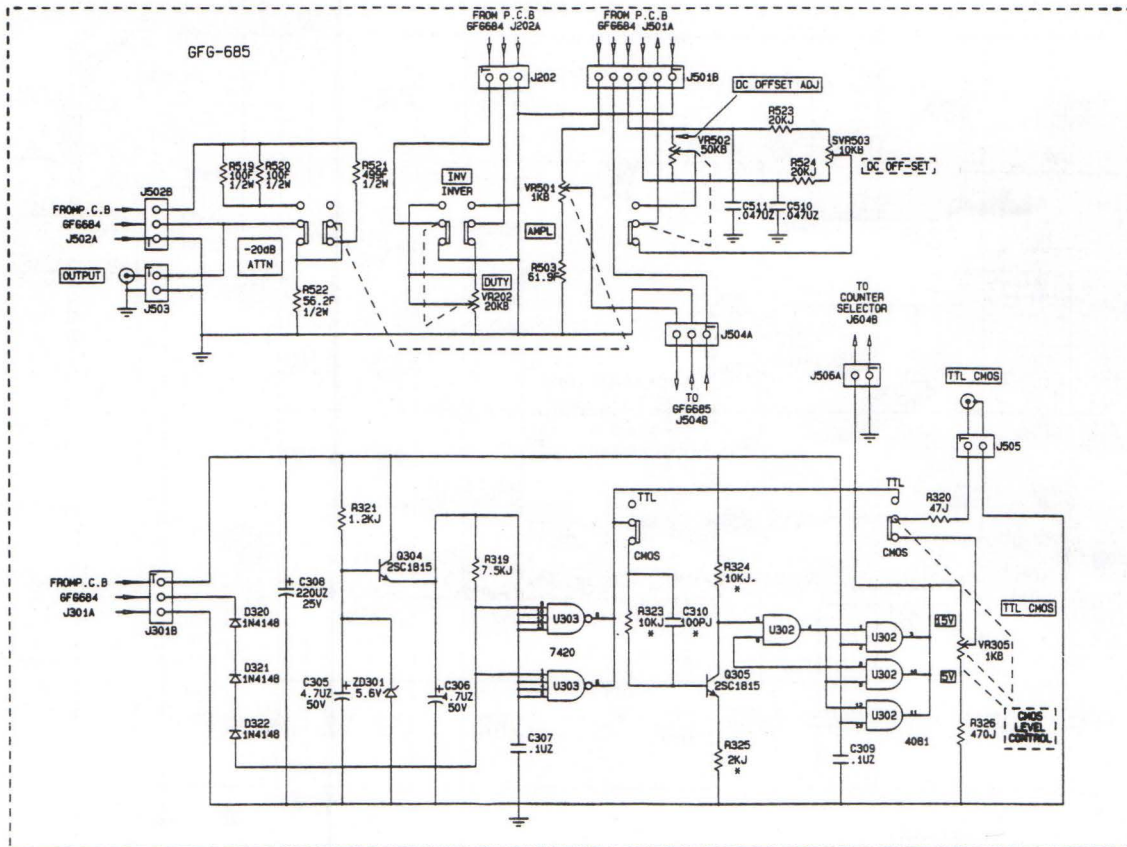
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- 1 \*ADJUSTED IN FACTORY
- 2 CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT
- 3 RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED

### Output Amplifier-Power Supply

= Front Panel Label



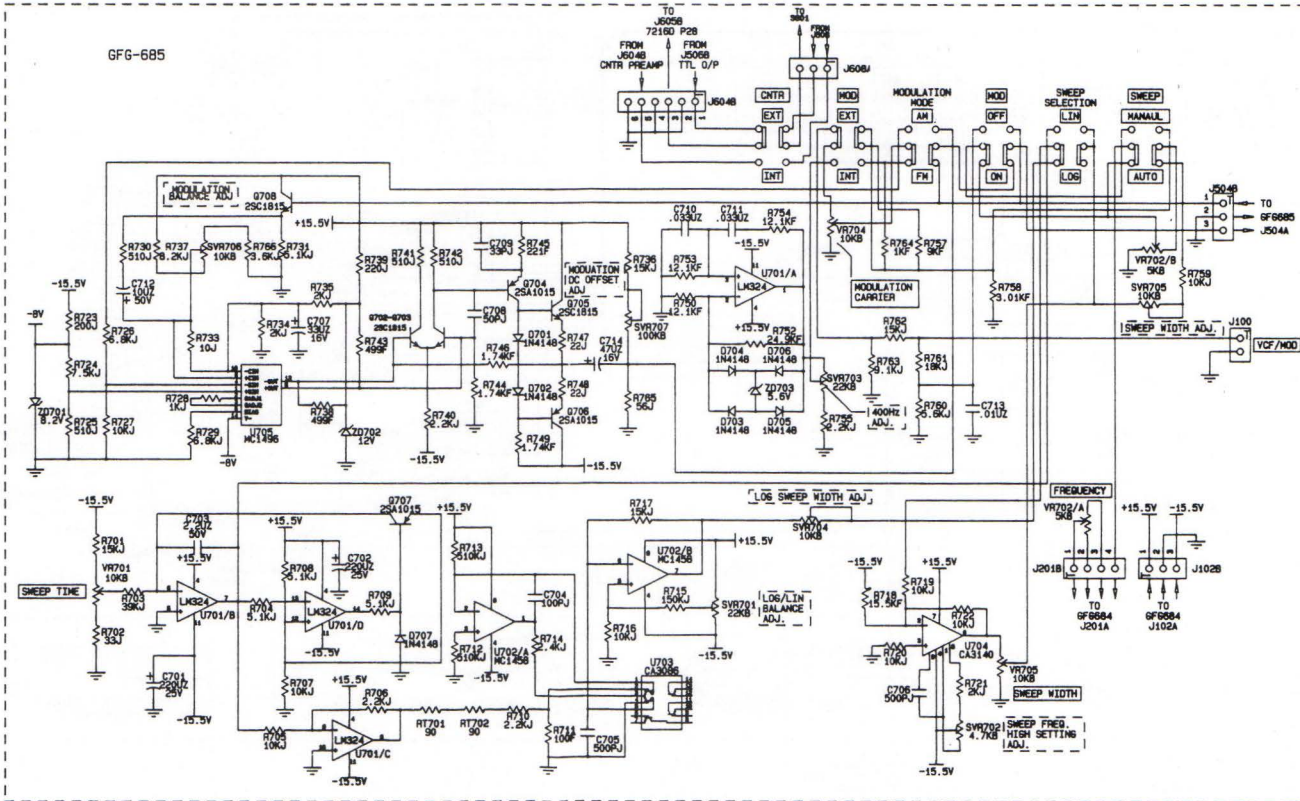


- 1 \*ADJUSTED IN FACTORY
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- 3 RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED

## Pulse Output-Switch Board

= Front Panel Label

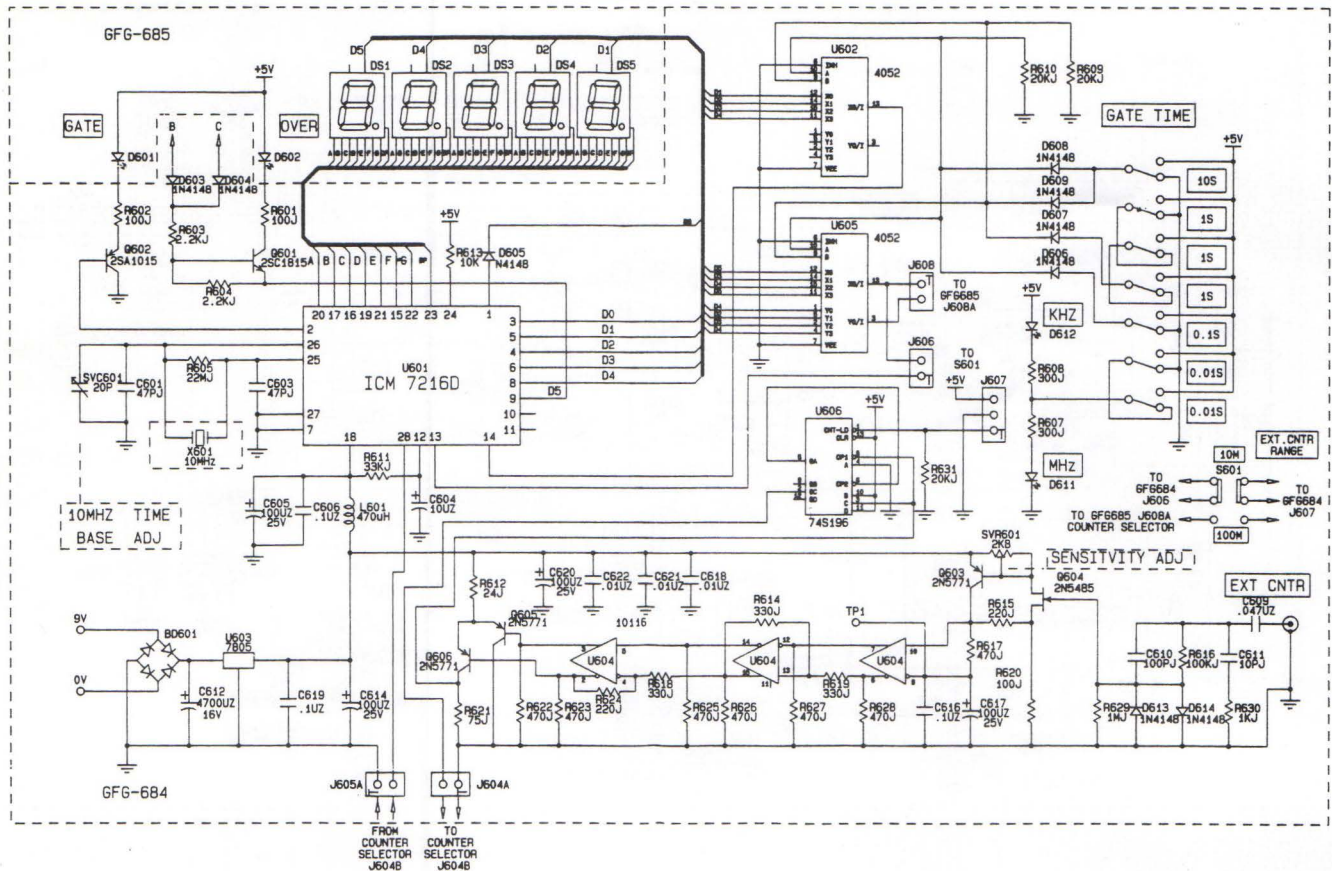
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- 1 \*ADJUSTED IN FACTORY
- 2 CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT
- 3 RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED

Sweep/Modulation Circuitry

= Front Panel Label



- 1 \*ADJUSTED IN FACTORY
- 2 CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT
- 3 RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED

Frequency Counter

= Front Panel Label



**8.1 In Case of Difficulty**

- A. Instrument inoperative; Gate indicator does not flash and Frequency Display does not light.
  - 1. Push power connector firmly into rear panel connector.
  - 2. Verify that AC power is present at the outlet, and that the instrument power cord is good.
  - 3. Check the internal fuse. Refer to Section 8.2 for details.
  
- B. Counter does not read function generator frequency.
  - 1. Make certain the CNTR INP button is released.
  - 2. On the 1Hz range it will take at least 20 seconds for a frequency reading. This is normal.
  
- C. There is excessive distortion in the output signal, especially on the 1M range.
  - 1. When using the Output connector and a coaxial cable, connect a 50 ohm termination to the other end.
  - 2. Reduce the output amplitude.

**NOTE:** In general, if difficulty is experienced during operation of the Model FG3B Sweep/Function Generator, carefully reread the operating instructions and specifications first. Make certain the instrument is being used properly before returning it for service.

## **8.2 Fuse Replacement**

If the instrument fails to operate, and the Gate indicator does not flash, the fuse may be defective. Use this procedure to change it:

- A. Verify that power is present from the AC outlet and that the power cord is good.
- B. Disconnect the power cord from the rear panel connector.

**DANGER!** Never attempt to open the instrument or change the fuse when AC power is present.

- C. Use a Phillips screwdriver to remove the four screws from the case. Lift off the bottom half case, exposing the circuitry.
- D. The fuse is in the rear corner of the instrument. If blown (glass is discolored), carefully pry it out with a screwdriver and replace it with a new one of the same value.
- E. Replace the bottom half case and tighten the Phillips screws.
- F. Reconnect the power cord and test the instrument. If it fails to operate, have it serviced.

### 8.3 Line Voltage Changes

The Model FG3B Sweep/Function Generator is hard soldered internally to a particular line voltage selection. This selection must be changed only if operation on a different AC line voltage is required. Use the following procedure to change the line voltage requirements of the instrument:

- A. Disconnect the power cord from the rear panel connector.

**DANGER!** Never attempt to open the instrument or change the line voltage selector when AC power is present.

- B. Use a Phillips screwdriver to remove the four screws from the case. Lift off the bottom half case, exposing the circuitry.
- C. The line voltage selection is located between the power transformer and the side of the case. If the unit is originally set for 117VAC, there are two jumpers soldered into the board (zero ohm resistors).
- D. To change the unit to 234VAC operation, these two jumpers must be removed and one of them soldered into the space labeled 234V (between the two 117V jumper spaces).

**WARNING!** Make certain the proper jumper wire is selected. Using the 117V connection and powering the instrument from a 234V line will cause extensive damage.

- E. The fuse is in the rear corner of the instrument. Carefully pry it out with a screwdriver, and replace with a unit of the proper value.

**NOTE:** For 117V operation use a 0.5A, 3AG unit.  
For 234V operation use a 0.25A, 3AG unit.

- F. Replace the bottom half case and tighten the Phillips screws.
- G. Place a paper label over the rear panel label so that it covers the previous AC line voltage requirement. Write the new voltage on the label.
- H. Replace the AC power cord or change the plug on the present one so that it will connect to your AC power outlet.
- I. Connect the power and turn on the instrument.

## 8.4 Factory Service and Repair

Read the warranty located at the front of this manual before requesting warranty or non-warranty repairs.

### Shipping Instructions

For in- and out-of-warranty repairs in the United States, we recommend shipping your Instrument to the factory for repair. Our factory service center features 24-hour turnaround time under normal circumstances, with a maximum of 48 hours guaranteed. Combined with low flat rate charges and fast turnaround time, the factory service center provides your best overall service alternative. Any Instrument returned for calibration or repair, should be shipped with the following : your company name (if applicable), your name, address, telephone number, proof of purchase (for warranty repairs) and any test leads used with the meter.

In addition, make sure to include a written description of the problem encountered or service required. For minimum turn-around time on out-of-warranty repairs please phone in advance for service-charge rates. Ship the Instrument in original packaging or a sturdy box to the following address and marked *Attention: Instrument Repair Service*:

**For U.S.A.:**

Wavetek Corp.  
9045 Balboa Ave.  
San Diego, CA 92123  
Tel: (619) 279-2200, ext. 670  
Fax: (619) 495-3296

**For U.K.:**

Wavetek Ltd.  
Hurricane Way  
Norwich, NR6 6JB, U.K.  
Tel: 011-44-603-404824  
Fax: 011-44-603-483670

**Other:**

Contact either Factory Service Center for the name of a local authorized service center.

The Instrument will be returned with the shipping charge paid by Wavetek Corp. For questions in North America, contact the Instrument Repair & Service Department at (619) 279-2200, ext. 670.

**Ship your FG3B in the original packaging or a sturdy box, with the items listed above and shipping charges prepaid, to:**

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San Diego, CA 92123  
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**Wavetek Corporation**

Instruments Division  
9045 Balboa Ave.  
San Diego, CA 92123

**European Distribution  
and Service Center**

Wavetek Ltd.  
Hurricane Way  
Norwich, NR6 6JB  
England