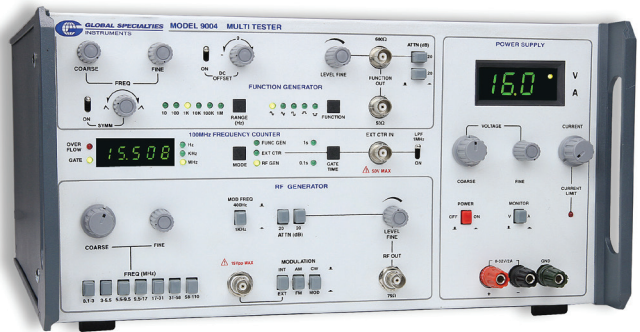


9004

4-Instrument Test Station

User Manual



Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and repair of this instrument. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. This instrument is grounded through the ground conductor of the supplied, three-conductor ac power cable. The power cable must be plugged into an approved three-conductor electrical outlet. Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified service personnel. Disconnect the power cord before removing the instrument covers and replacing components. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is

present.

DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications to this instrument. Return the instrument to Global Specialties for service and repair to ensure that safety features are maintained.

WARNINGS AND CAUTIONS

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

WARNING: Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

WARNING: To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.

CAUTION: Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.

CAUTION: This product uses components which can be damaged by electrostatic discharge (ESD). To avoid damage, be sure to follow proper procedures for handling, storing and transporting parts and subassemblies which contain ESD-sensitive components.

1 Introduction

1. Overview

The Model 9004 is a 4-Instrument Test Station. It is a compact versatile instrument useful for testing and servicing of electronic instruments & circuits.

It is a four-in-one instrument consisting of:

- 100 MHz frequency counter
- 1 MHz function generator capable of providing sine, triangle, square, positive pulse, and negative pulse
- 110 MHz RF generator with AM & FM
- 32 V/ 2 A power supply with digital readout & continuously adjustable voltage & current limits

2. Applications

The model 9004 is a high performance general purpose instrument. Its RF generator can be used for testing the frequency response of various types of amplifiers and bandwidth measurement of various types of filters. It is useful in testing communication instruments for sensitivity and modulation parameters. Typical areas include testing and repairs of AM/FM radios, transceivers, sound sections of TV/Video etc.

ts counter can be used to measure frequencies up to 100 MHz with typical signal levels as low as 50 mVrms.

Its function generator can provide up to 30 Vp-p output at 600 Ω & 50 Ω terminals with adjustable duty cycle & DC offset. The direct unipolar signals are very useful for use as a clock source for digital circuits and as a signal source in general.

Its power supply meets many testing and servicing needs.

Apart from this, various experiments for academic purposes can be designed around this instrument, thus making it very useful in engineering colleges and technical schools.

2 Installation

1. Initial Inspection

This unit is tested prior to shipment. It is therefore ready for immediate use upon receipt. An initial physical inspection should be made to ensure that no damage has been sustained during shipment.

Inspect the packing box on receipt for any external damage. If any external damage is evident, remove the instrument and visually inspect its case and parts for any damage. If damage to the instrument is evident, a description of the damage should be noted on the carrier's receipt and signed by the driver or carrier agent. Save all shipping packaging for inspection. Forward a report of any damage to the agent through which the unit is procured.

Retain the original packing in case subsequent repackaging for return is required. Use of the original packing is essential.

After the mechanical inspection, verify the contents of the shipment. The items included in this package are:

- 9004 Instrument
- User manual
- BNC (m) to BNC (m) cable
- BNC (m) to mini alligator cable
- Power cord

2. Input Power Requirements

The instrument can operate on 120 V or 240 VAC source at 50 or 60 Hz. The line selector plug on the rear panel allows you to select the line voltage. Before connecting the power plug to an AC line outlet, be sure to check that voltage selector plug is set in the correct position corresponding to the line voltage in your location and the fuse rating is as shown in the table.

Selector	Line Voltage	Fuse
120 V	100 - 125 V, 50/60 Hz	1 A
240 V	220 - 240 V, 50/60 Hz	500 mA

3. Ventilation

Before applying power to unit, make sure that input voltage setting is correct and the ventilation holes are not blocked. Ensure that the ventilation fan located on the rear panel is working well (it should turn on when powered on). Do not load the output if ventilation fan is not working otherwise it may cause the power supply to overheat.

3 Product Description

1. Front panel

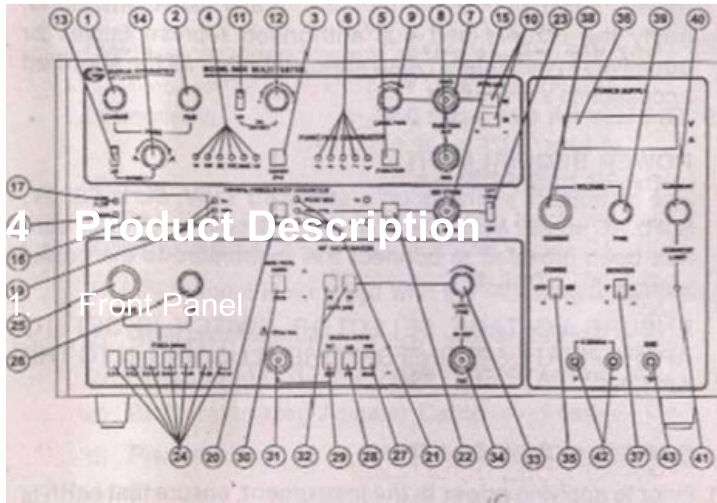


Figure 1. Front Panel

a. Function Generator Section

1. FREQUENCY COARSE: This control varies FUNCTION GENERATOR frequency from minimum to maximum value in a selected range.
2. FREQUENCY FINE: This control finely adjusts the FUNCTION GENERATOR frequency.
3. RANGE: This switch selects one of the 6 frequency ranges of the FUNCTION GENERATOR in a round robin fashion.
4. RANGE ANNUNCIATORS: These LEDs indicate the frequency range selected by the RANGE switch.
5. FUNCTION: This switch selects one of the 5 waveforms provided by the FUNCTION GENERATOR. They are: SINE, TRIANGLE, SQUARE, POSITIVE PULSE, NEGATIVE PULSE.
6. FUNCTION ANNUNCIATORS: These LEDs indicate the function selected by the FUNCTION switch.
7. FUNCTION OUT 600 Ω : This is a BNC connector for the FUNCTION GENERATOR output. The O/P impedance is 600 Ω .
8. FUNCTION OUT 50 Ω : This is a BNC connector for the FUNCTION GENERATOR output. The output impedance is 50 Ω .
9. LEVEL (FINE): This is a vernier level control & has a range of 20dB.
10. LEVEL (ATTN): These switches attenuate the FUNCTION GENERATOR output in steps of 20dB (1/10th). The attenuation is 40dB in steps of 20dB.
11. DC OFFSET ON/OFF: This switch enables addition of DC offset to the FUNCTION GENERATOR output.
12. DC OFFSET: When DC offset is turned ON, this control varies the amount of DC offset added to the FUNCTION GENERATOR output. The range is 0 to $\pm 15V$ (Open circuit) depending on the setting of LEVEL (ATTN) control.
13. SYMMETRY ON/OFF: This switch enables control of

the waveform symmetry. In the 'OFF' mode, all the waveforms have a 50% duty cycle.

14. SYMMETRY: When SYMMETRY is turned 'ON', this control enables duty cycle variation from 10% to 90%. The output frequency is also reduced to 1/10th

b. Counter Section

15. EXT IN: This is a BNC connector for the external input signal.
16. DISPLAY: It's a 5 digit 7segment display indicating the frequency of the selected source.
17. OVERFLOW: This LED turns 'ON' in the EXT COUNTER mode to indicate that the Ext. signal frequency -is greater than or equal to 100 MHz when GATE TIME is 0.1s and is greater than or equal to 100 KHz when GATE TIME is 1s.
18. GATE: This LED indicates the measurement period.
19. Hz, KHz, MHz: These LEDs indicate the unit of measurement.
20. MODE: This switch selects one of the 3 modes of the counter, viz FUNCTION GENERATOR RF GENERATOR EXTERNAL COUNTER
21. MODE ANNUNCIATORS: These LEDs indicate the COUNTER MODE selected by MODE switch.
22. GATE TIME: In EXTERNAL COUNTER MODE this switch is used to select GATE TIME between 0.1s and 1s.
23. LPF: The LPF can be used to kill HF noise in low frequency signal measurement.

c. RF Generator Section

24. RANGE SWITCH: This switch selects one of the following bands.

- 100 KHz -3 MHz
- 3 MHz - 5.5 MHz

- 5.5 MHz - 9.5 MHz
- 9.5 MHz - 17 MHz
- 17 MHz - 31 MHz
- 31 MHz - 58 MHz
- 58 MHz - 110 MHz

25. FREQUENCY COARSE: This control adjusts the carrier frequency continuously within a selected band.
26. FREQUENCY FINE: This is a continuous fine tuning control for the carrier frequency.
27. CW / MOD: This switch selects output to be either carrier wave or a modulated signal.
28. AM / FM: This selects modulation type to be either AM or FM.
29. INT/EXT: This selects modulating signal to be an internal (400 Hz/ 1 KHz) or an external signal.
30. MOD. FREQ.: This switch selects either 400 Hz or 1 KHz as internal modulating signal.
31. EXT IN: This is a BNC input connector for the external modulating signal.
32. LEVEL (ATTN): It consists of 2 switches. Each switch when pressed provides 20dB attenuation to the RF signal. Thus total of 40dB attenuation can be provided by these switches.
33. LEVEL (FINE): This is a vernier control for the RF output level. The variation is approximately 20dB.
34. RF OUT: This is a BNC connector for the RF GENERATOR output.

d. Power Supply Section

35. POWER ON / OFF: This switch is used to turn ON or OFF the power supply independent of the main instrument.
36. DISPLAY: 3 digit display is used to indicate either voltage or current.
37. MONITOR: This switch is used to select whether

- voltage or current is displayed.
38. **VOLTAGE COARSE:** This control is used to coarsely set the voltage.
 39. **VOLTAGE FINE:** This is used to finely set the voltage.
 40. **CURRENT:** This control is used to set the current limit.
 41. **CURRENT LIMIT LED:** This indicates whether current limit is reached & the power supply is operating in CC mode.
 42. Power Supply Output terminals.
 43. Ground Terminal for Power Supply.

2. Rear Panel

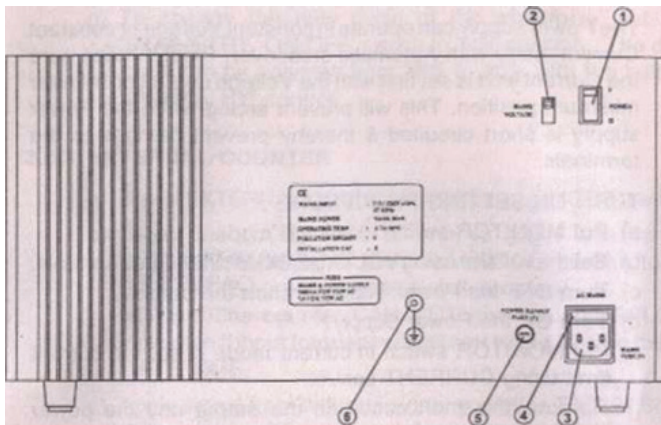


Figure 2. Rear Panel

1. **MAINS ON/OFF SWITCH:** This applies AC power to the instrument.
2. **VOLTAGE SELECTOR:** This switch selects the operating voltage of the instrument as either 115 V or 230 V.
3. This is a mains socket receptacle for the AC mains.
4. **FUSE:** 1A fast blow fuse is incorporated within the socket for protection. A spare fuse of 500 mA is provided for 230 V mains operation.
5. **POWER SUPPLY FUSE:** An independent fuse of 1A fast blow is provided for protection on 115 V mains

- operation. A spare fuse of 500 mA is provided for 230 V mains operation.
6. This terminal for connection of external earth to the instrument.

5 Operating Instructions

1. Starting

Push 'POWER ON' switch to 'ON' position to operate power supply and MAINS 'ON' switch (on rear panel) to 'ON' position to operate the main instrument. The two switches can be operated independent of each other. The display will light and indicate the frequency. Various other LEDs will also glow. Power supply display will indicate voltage or current depending on the status of monitor switch.

2. Power Supply

The Power supply can operate in constant Voltage or constant Current mode with Automatic crossover. Please make sure the Current limit is set first with the Voltage control pot at near minimum position. This will prevent arcing when the Power supply is short circuited & thereby prevent damage to the terminals.

Turn On Setting Procedure:

1. Put MONITOR switch in voltage mode.
2. Set the voltage using VOLTAGE COARSE & FINE controls.
3. Turn OFF the Power Supply & short the output.
4. Turn ON the Power Supply.
5. Put MONITOR switch in current mode & set the current limit using CURRENT control.
6. Remove the short circuit on the output and the power supply is now ready for use.

3. Function Generator

1. Select the desired FUNCTION (Sine, Triangle, Square, Positive Square and Negative Square) using FUNCTION switch.
2. Select the FREQUENCY RANGE by using 'RANGE' switch.
3. Select FUNCTION GENERATOR MODE by using MODE switch. The counter will indicate the frequency of the Function Generator.
4. Adjust the frequency using COARSE and FINE controls.
5. The selected FUNCTION is available at FUNCTION OUT BNCs. Feed this to CRO using the BNC to BNC cable provided. Adjust the amplitude using LEVEL (ATTN) switch and LEVEL FINE control. The O/P is capable of delivering 30Vp-p (Open Circuit) signal at 600 Ω & 50 Ω terminals. With a matching load, the output will be halved.
6. For adding DC offset to the waveform, turn DC OFFSET ON/OFF switch to 'ON' position. The DC offset can be adjusted over 0 to $\pm 15V$ (Open Circuit). The 20dB O/P attenuator attenuates both the AC & DC offset.
7. To change the duty cycle of the waveform, set the 'SYMMETRY ON/OFF' switch to 'ON' position. The duty cycle can be adjusted from 10% to 90% with the help of 'SYMMETRY' control.

4. External Counter

1. Select EXTERNAL COUNTER MODE using 'MODE' switch.
2. Select the GATE TIME of 0.1 s to begin with. If the frequency displayed is less than 99 kHz, switch to 1s GATE TIME for better resolution & accuracy.
3. NOTE : The counter CAN NOT give an OVERFLOW indication if input frequency is greater than 1 MHz in the 1 s GATE TIME.

4. Apply signal from external signal source to EXT IN BNC. Please take care that signal doesn't exceed 50Vp-p.
5. The counter will display the signal frequency. If overflow LED glows the O/P signal frequency is >100 kHz (see NOTE above) & change the GATE TIME to 0.1 s.

5. RF Generator

1. Select RF GENERATOR MODE using 'MODE*' switch.
2. Select the desired FREQUENCY RANGE by RANGE' switch in RF GENERATOR section. The counter will display the RF GENERATOR frequency.
3. Adjust the frequency by 'COARSE' and 'FINE' controls. The RF signal is available at the RF OUT BNC.
4. Feed this signal to CRO or Spectrum Analyser using 75 Ω termination and BNC to BNC cable provided.
5. Adjust the RF level by using LEVEL (ATTN) and LEVEL (FINE) controls.
6. For modulation, press CW/MOD switch. The RF carrier will be modulated by internal AF signal (400Hz or 1 kHz) as seen on CRO or spectrum. The internal modulation frequency can be selected by using MOD FREQ switch.
7. For FM press AM/FM switch. The RF carrier will then be frequency modulated by internal AF signal. Note that FM modulation can't be seen/noticed on an oscilloscope.
8. For External modulation press INT/EXT switch and apply modulating signal at 'EXT IN' BNC in the RF GENERATOR section. Depending on the amplitude of this signal modulation depth and frequency deviation can be adjusted. Be sure that this signal doesn't exceed 15 Vp-p.

6 Specifications

All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 25 °C ±5 °C. Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current version from our website: globalspecialties.com.

1. RF Signal Generator

Characterisitic	Description
CW Signal	100 kHz to 110 MHz in 7 ranges and continuously variable over the whole range with a coarse & fine control
AM Signal	100 kHz to 110 MHz
Modulation Frequency	Selectable 400 Hz / 1 kHz
Modulation Depth	a) Internal Modulation 30% (approx.) b) External Modulation: (0 to 85%) Freq. Range 50 Hz to 4 kHz Bandwidth ±3dB
Output Amplitude	>200 mV p-p at 75 Ω
Attenuation	2 x 20dB step and continuously variable 20dB (approx)
FM Signal	30 MHz to 110 MHz
Modulation Frequency	Selectable 400 Hz / 1 kHz
Frequency Modulation	a) Internal - 30KHz (approx.). b)External Modulation - Freq. Range- 50 Hz to 4 kHz- Bandwidth ±3dB
Output Amplitude	>200 mV p-p at 75 Ω
Attenuation	2 x 20dB step and continuously variable 20dB (approx.)

2. Frequency Counter

Characterisitic	Description
Readout	5 digit. 0.3" LED display
Frequency Range	10 Hz to 100 MHz
Range Selection	Hz /kHz/ MHz selection is automatic depending on mode selected
Source Selection	Internal RF Generator / Internal Function/ External Frequency - Logic selected
Annunciation	GATE, OVERFLOW. Hz. kHz. MHz, RF, FUNCTION, EXT FREQUENCY
Gate Period	0.1 sec & 1 sec by LED Indication for ext. counter Mode
Sensitivity	50 mV

Dynamic Range	50 mV to 1 Vrms
----------------------	-----------------

3. Function Generator

Characterisitic	Description
Frequency	1 Hz to 1 MHz
Waveform	Sine, Square, Triangular, +pulse, -pulse. Ramp
Amplitude	30V p-p (Open Circuit) at 600 Ω s & 50 Ω s terminal
Attenuation	2 x 20dB step & 20dB (approx.) continuous!/ variable
Output Impedance	600 Ω s, 50 Ω s
DC Offset	0 to ± 15 V max. (Open Circuit)
Sinewave Distortion	<3%
Pulse Duty Cycle	10% to 90% variable. Frequency is 1/10th inSymmetry ON mode
Symmetry On/Off	In off mode 50% duty cycle

4. Power Supply

Characterisitic	Description
Type	Independently ON/OFF switchable, linear CV /CC power supply
Reg. DC Power Supply	0 to 32 V / 2 A
Display	3 digit, 0.5" LED display for voltage or current switchable
Voltage	Coarse & Fine control
Current	0 to 2 A
Load Regulation	0.1%
Ripple	<5 mV
Current Limit	Desired current setting
Current Limit LED	Indicates when current limit is reached

5. General

Characterisitic	Description
Power	115V/230V AC $\pm 10\%$, 47-65HZ, 160VA (max.)
Dimensions	360 (W) x 190 (H) x 375 (D) mm. 14 $\frac{1}{4}$ " x 7 $\frac{1}{2}$ " x 14 $\frac{3}{4}$ "

Weight	27 lbs / 12 Kgs. (approx.)
AC Input	120/240 V switchable

7 Maintenance

1. Preventative Steps

Please follow these preventive steps to ensure the proper operation of your instrument.

- Never place heavy objects on the instrument.
- Never place a hot soldering iron on or near the instrument.
- Never insert wires, pins, or other metal objects into ventilation fan.
- Never move or pull the instrument with power cord or output lead. More importantly, never move the instrument when the power cord or output lead is connected.
- Do not obstruct the ventilation holes in the rear panel as this will increase the internal temperature.
- Do not operate the instrument with the cover removed unless you are a qualified service technician.
- Clean and recalibrate the instrument on a regular basis to keep the instrument looking nice and working well.
- Remove any dirt, dust, and grime whenever they become noticeable on the outside cover using a soft cloth moistened with a mild cleaning solution.

2. When the Unit is Not Turning On

Check if the power ON/OFF switch is turned ON. Check for blown fuse. If not, then check the power cord. Please make sure that the power cord is properly connected to the unit. Please also check the main switch and ensure that the AC supply at your site is the same as the one mentioned at the rear chassis of the unit.

3. Fuse Replacement

If the fuse blows, the LED will not light and the instrument will not operate. Replace only with the correct value fuse. The fuse is

located on the rear panel adjacent to the power cord receptacle.

Remove the fuse holder assembly as follows:

- Unplug the power cord from the rear of the instrument.
- Insert a small screwdriver in the fuse holder slot (located between fuse holder and receptacle).
- When reinstalling fuse holder, be sure that the fuse is installed so that the correct line voltage is selected.

8 Service and Warranty Information

1. One Year Warranty

Cal Test Electronics warrants this product to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Cal Test Electronics is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Cal Test Electronics that have been subject to abuse, misuse, damage or accident, or have been connected, installed or adjusted contrary to the instructions furnished by Cal Test Electronics, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Cal Test Electronics reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Cal Test Electronics is authorized to assume any other obligation in connection with the sale and purchase of this device.

2. Calibration and Repair

If you have a need for any calibration or repair services, please visit us on the web at: globalspecialties.com. See the “Service” tab. Or contact us via the “Contact” tab.

Cal Test Electronics

(parent company of Global Specialties®)

22820 Savi Ranch Parkway

Yorba Linda, CA 92887

800-572-1028 or 714-221-9330



20151002



Global[®]
Specialties