Global® Specialties

# 4005

## Sweep Function Generator with External Frequency Counter

Instruction Manual

Revision: 11/2010

# Model 4005 5MHz Sweep/Function Generator

Thank you for purchasing the Model 4005. For proper use of this precision instrument, please read this operation manual carefully.

**Note**

1. To fully maintain the precision and reliability of the 4005, please use it within the range of its intended use (temperature 10 °C~35 °C, humidity 45%~85%)
2. Please allow a pre-heating period of 30 minutes before use.
3. This instrument should be used with a triple line power cord for safety.
4. Specification of this instrument may be changed without notice.
5. Please contact Global Specialties if you have further questions beyond the scope of this manual.

**Safety Summary**

Please take a moment to read these operating instructions thoroughly and completely before operating this instrument. Pay particular attention to WARNINGS used for conditions and actions that may pose a hazard to the user and CAUTIONS used for conditions and actions that may damage the instrument.

- Always inspect the instrument and other accessories for any sign of damage or abnormality before every use.
- Never ground yourself and keep your body isolated from ground.
- Never touch exposed wiring, connections or any live circuit conductors.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Use caution when working above 60V DC or 30V AC rms. Such voltages pose a shock hazard.
- Remember that line voltage is present on some power input circuit points such as on-off switches, fuse, power transformers, etc., even when the equipment is turn off.
- Also, remember that high voltage may appear at unexpected points in defective equipment.

- **Safety Symbols**

**1.** 

Protective earth (ground)

To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.

**2.**  **Functional earth terminal on the rear panel.**

**3** 

**"IN" position of a bi-stable push control**

To associate the "IN" position of a bi-stable push control with the corresponding function.

**4.** 

**"OUT" position of a bi-stable push control**

To associate the "OUT" position of a bi-stable push control with the corresponding function.

**5.** 

Alternating current

To indicate on the rating plate that the equipment is suitable for alternating current only; to identify relevant terminals.

**6.**  **Caution, risk of danger**

**7.**  **Caution, risk of electric shock**

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## 1. Model 4005 PRODUCT DESCRIPTION

1-1. Introduction

The 4005 is designed to be used as a FUNCTION GENERATOR, SWEEP GENERATOR, PULSE GENERATOR and a FREQUENCY COUNTER, offering a wide range of applications in both analog and digital electronics such as engineering, manufacturing, servicing, education and hobbyist fields.

VCF (voltage controlled frequency) produces precision sine, square and triangle waves over the 0.05Hz to 5MHz for sub-audible, audio, ultrasonic and RF applications. A continuously variable DC offset allows the output to be injected directly into circuits at the correct bias level.

Variable symmetry of the output waveforms converts the instrument to a pulse generator capable of generating rectangular waves or pulses, ramp or sawtooth waves and skewed sine waves of variable duty cycle. The sweep generator offers linear sweep with variable sweep rate and sweep width up to 100:1 frequency change. The frequency response of any active or passive device up to 5 MHz can be determined.

1-2. Technical Specifications

■ OUTPUT CHARACTERISTICS

| | |
|---|---|
| Waveforms | : Sine, Square, Triangle, Skewed Sine, Pulse, Ramp Sawtooth, TTL/CMOS Leveled Square, DC |
| Frequency Range | : 0.05Hz to 5MHz in 7 Ranges (5, 50, 500, 5K, 50K, 500K, 5M) |
| Frequency Accuracy | : ± 2% (5, 50, 500, 5K, 50K, 500K, 5MHz Range, Full Scale) |
| Output Level | : Sine & Tringle wave:<br>20 Vpp in open circuit, 10 Vpp into 50Ω Load<br>Square Wave: 19 Vpp in open circuit, 9.5 Vpp into 50Ω Load |
| Output Impedance | : 50Ω ±5% |
| Attenuator | : -20 dB fixed and continuously variable (more than –20dB) |

## ■ WAVEFORM CHARACTERISTICS

| | | |
|---|---|---|
| Sine wave | -Flatness | : ± 3dB to 5 MHz (more than 14Vpp) |
| | -Distortion | : Less than 1% at 10 Hz to 100 KHz |
| Square wave | -Rise and Fall Time | : Less than 25 nS (at 5MHz) |
| Triangle wave | -Linearity | : More than 99% at 0.5 Hz to 100 KHz |
| TTL Output | -Rise and Fall Time | : Less than 30 nS (at 1MHz) |
| | -Output Level | : TTL Level (H $\geq$ 2.4V, L $\leq$ 0.4V) |
| CMOS Output | -Rise and Fall Time | : Less than 180 nS (at 1MHz) |
| | -Output Level | : 4V to 15V ± 2V, Variable |
| DUTY RATIO | | : 1:1 to 10:1 |

## ■ SWEEP FUNCTION CHARACTERISTICS

| | |
|---|---|
| Mode | : Linear |
| Width | : Variable from 1:1 to 100:1 |
| Rate | : 0.5 Hz to 50 Hz (20 mS to 2 S) |
| External VCF Input | : Input Voltage: 0 to 10 V |
| Input Impedance | : Approx. 1 KΩ |

## ■ FREQUENCY COUNTER CHARACTERISTICS

| | |
|---|---|
| Display | : 6 Digit Seven Segment – Green LED, Gate time, MHz, KHz, Hz and mHz. |
| Frequency Range | : 2Hz to 50 MHz with Auto Range. |
| Accuracy | : ±Time base Error ± 1 count |
| Time base | : 10 MHz Crystal Oscillator, ±20ppm |
| Input Sensitivity | : 200 mVrms (2Hz ~100Hz), 100mV rms (100Hz~50MHz) |
| Input Impedance | : 50Ω |
| Max. Input Voltage | : 250 Vpp |

## ■ PHYSICAL CHARACTERISICS

- Dimensions WHD : 3.4 x 3.5 x 10.6” (240 x 90 x 270mm)
- Weight : Approx. 5.5 lb (2.5 kg.)

1-3. Equipment Ratings

- Plug and Socket : 3 wire AC power plug and 3 wire outlet
- Power & Fuse Ratings

| Input Voltage | Fuse | Power Max. |
|---|---|---|
| 103 ~ 126V AC (50/60Hz) | F 0.5A / 250V | 15 W |
| 206 ~ 252V AC (50/60Hz) | F 0.2A / 250V | |

- Operating Environment
  TEMPERATURE : 0 °C to + 40 °C (Accuracy Specified at 23°C ± 5 °C)
  HUMIDITY : up to 85% to 40°C without temperature extremes which may cause condensation within the instrument.
- Storage Environment
  TEMPERATURE : -20°C to +70°C
  HUMIDITY : below 85% RH
- Overvoltage Category : CAT II
- Insulation Category II: Portable equipment.
- Pollution Degree : 2
- Protection to IEC 529: Ordinary

**Note: Specifications are subject to change without notice Please visit www.globalspecialties.com for the most current product informaiton.**

1-4. Supplied Accessories

- User's Manual ---------- 1
- BNC Cable ---------- 1
- Power Cord ---------- 1
- Spare Fuse ---------- 1

## 2. INSTALLATION

2-1. Initial Inspection

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of damage. To confirm this, the instrument should be inspected for physical damage in transit. Also, check that supplied accessories are present and correct.

2-2. Connecting AC Power

This instrument requires 115V AC or 230V AC (50-60 Hz) power socket with protective earth contact (PE-contact).

**CAUTION**

**AC POWER OF THIS INSTRUMENT IS PRESET TO 115V IN FACTORY. BEFORE POWERING ON THIS INSTRUMENT, CHECK AND MAKE SURE THE VOLTAGE OF THE POWER SOURCE IS SAME WITH THE MARKING OF UNIT**.

**FOR USE WITH AC230V, THE VOLTAGE SELECTOR (on rear panel) SHOULD BE SWITCHED TO THE 230V POSITION.**

2-3. Cooling and Ventilation

No special cooling and ventilation is required. However, the instrument should be operated where the ambient temperature is maintained.

2-4. Position

This instrument is built as a bench-type instrument with rubber feet and tilt stand in place. Stand-up angle can be adjusted by rotating angle of carrying handle.

2-5. WARM-UP

Allow 30 minutes for the unit to warm up so that it is stabilized and ready for use.

## 3. OPERATION

3-1. Controls, Indicators and Connectors

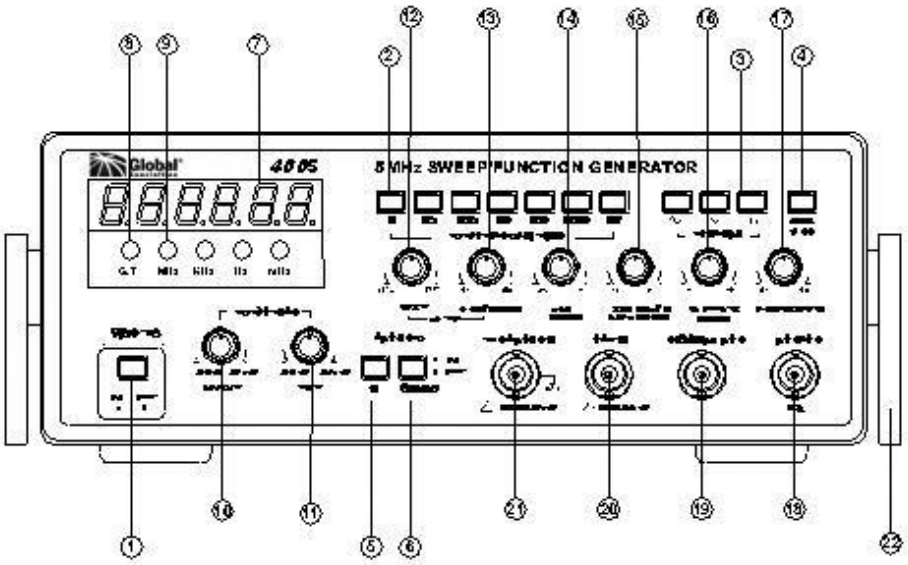


**Figure 1.** **FRONT PANEL OPERATOR'S CONTROLS**

| | |
|---|---|
| ① POWER SWITCH: | Push for Power On/Off |
| ② RANGE SWITCHES: | Frequency Range Selector |
| ③ FUNCTION SWITCHES: | Select Sine wave, Triangle Wave or Square Wave Output |
| ④ ATTENUATOR: | Selects Output Level by -20 dB. |
| ⑤ INTERNAL/EXTERNAL SWITCH: | IN: for External Frequency Counter<br>OUT: for Internal Frequency Counter. |
| ⑥ LOW PASS FILTER: SWITCH | With this switch pushed in, the input is routed through a (LPF) low- pass filter with-3dB point of approximately 100KHz. |
| ⑦ DISPLAY: | 6 Digit (0.4") Green 7 segment display . |
| ⑧ GATE TIME INDICATOR: | Gate Time is selected automatically by the input signal. |
| ⑨ MHz, KHz, Hz, mHz INDICATOR: | Indicates Unit of Frequency. |
| ⑩ COARSE FREQUENCY DIAL: | Controls the output coarse frequency in the selected range. |

| | |
|---|---|
| ⑪ FINE FREQUENCY DIAL: | Controls output fine frequency in the selected range. |
| ⑫ SWEEP RATE CONTROL: | On-Off Switch for the Internal Sweep Generator. Adjusts Sweep Rate of the Internal Sweep Generator. |
| ⑬ SWEEP WIDTH CONTROL: | Pull out to adjust the Sweep Magnitude |
| ⑭ SYMMETRY CONTROL: | Adjust Symmetry of Output Waveform 1:1 to 10:1 with Push/Pull Switch On. |
| ⑮ TTL/CMOS CONTROL: | Selects TTL or CMOS Mode<br>Out: for CMOS Level Control<br>In: for TTL Level. |
| ⑯ DC OFFSET CONTROLS: | Adds Positive or Negative DC Component to the Output Signal. |
| ⑰ AMPLITUDE CONTROL: | Adjusts Output Level from 0 to 20 dB. |
| ⑱ MAIN OUTPUT BNC: | 50 Ohm Impedence. |
| ⑲ TTL/CMOS OUTPUT BNC: | TTL/CMOS Level Output. |
| ⑳ VCF INPUT BNC: | Voltage Controlled Frequency Input<br>Permits External Sweep.<br>Frequency Control Sweep Rate Control should be off when applying external voltage at to this BNC. |
| ㉑ INTERNAL/EXTERNAL SWITCH: | IN: External Frequency Counter<br>OUT: Internal Frequency Counter. |
| ㉒ TILT STAND. | Pull Out to Adjust Tilt. |

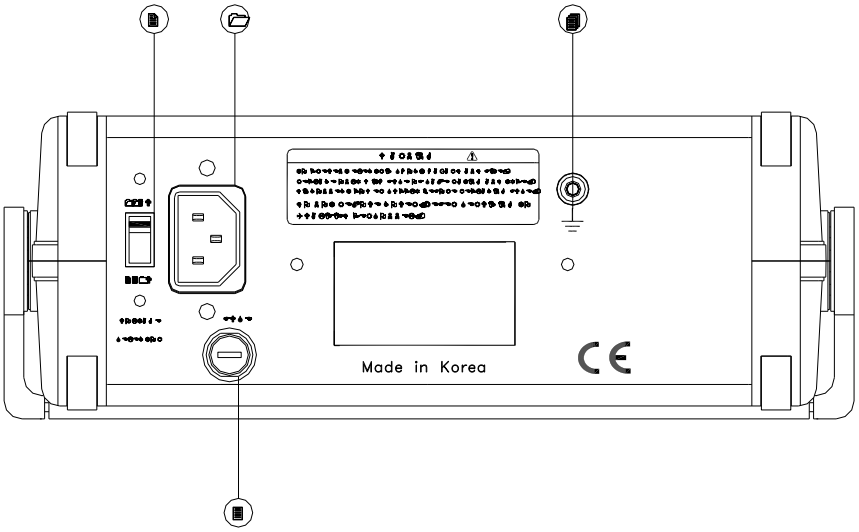


**Figure 2. REAR PANEL**

① AC INLET: AC power input connector
② VOLTAGE SELECTOR: Selects the AC Power (115V or 230V)
③ FUSE HOLDER: Replace fuse by unscrewing.
④ GROUND TERMINAL:

3-2. Operating Instructions

This instrument is capable of generating a wide variety of waveforms, as well as the ability of counting an external frequency with high resolution of 6 digits. All of its benefits and features can be mastered by thoroughy understanding the operating procedures outlined in this manual. One of the best ways to initially gain this familiarization is to connect the generator to an oscilloscope. Observe the waveforms and notice the effects of the various controls on the waveforms. Use this manual as a reference until becoming accustomed to operating procedures.

3-3. Use as a Function Generator

1) Procedure

A. Connect AC power cord into the receptacle on the rear panel and plug into an AC inlet.
B. To turn on equipment, push power on-off switch on.
C. To make sure that the output is symmetrical and unaffected by the sweep generator, set the following controls as below.

| CONTROLS | POSITION |
|---|---|
| Sweep width | OFF(push) |
| Symmetry | OFF(push) |
| DC offset | OFF(push) |
| Attenuator | RELEASE(button out) |
| Counter | INTERNAL(button out) |

D. To select the desired frequency, set the Range Switch and FREQ. dial as follows: The output frequency equals the FREQ. dial setting multiplied by the Range Switch setting. *For example, a FREQ. dial setting of 0.5 and a Range switch setting of 50K produces a 2.5 KHz output. A FREQ. dial setting of 5.0 and a Range switch setting of 5M produces 5 MHz output. It also can display the desired frequency of 6 digits.*
F. Select sine, square, or triangle wave output by pressing the corresponding FUNCTION button. FIG 3 illustrates the output waveforms and their phase relationships.
G. Connect a cable from the 50Ω BNC to the point where it is desired to inject the signal.
H. Adjust the 50Ω output to the desired amplitude with the AMPLITUDE control.

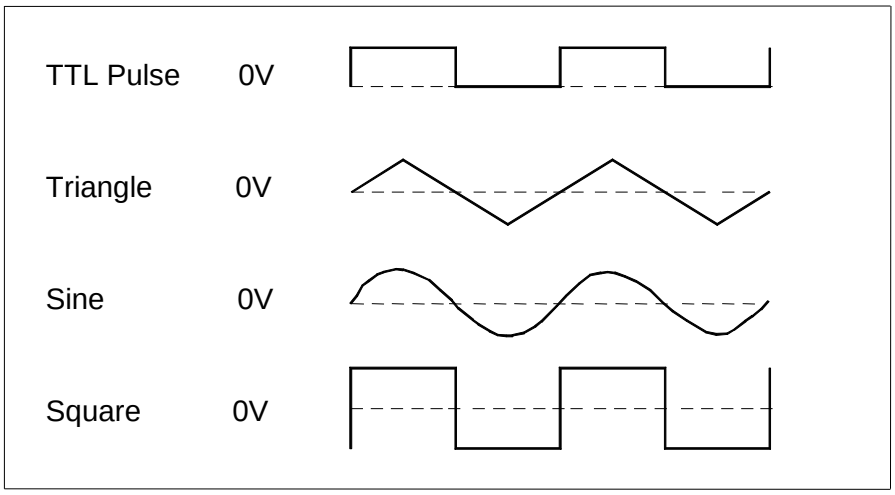


**Figure 3 OUTPUT WAVEFORMS AND PHASE RELATIONSHIPS**

I. A positive or negative DC component can be added to the signal at the 50Ω BNC by use of the DC OFFSET control, as required by the circuit into which the signal is being injected.

J. A fixed amplitude TTL square wave is available at the TTL OUT BNC on the front panel. This signal is unaffected by the AMPLITUDE, ATTENUATOR or DC OFFSET. TTL output is a square wave for use in digital circuits, even though FUNCTION SWITCH is on sine or triangle wave.

2) Considerations

***CAUTION***

*KNOWLEDGE OF THE FOLLOWING FACTORS IS ESSENTIAL FOR PROPER OPERATION OF THE INSTRUMENT:*

A. The DC offset control can provide over ±10 volts open-circuited, or ± 5 volts into 50Ω load. Remember that the combined signal swing plus DC offset is also limited to ±10 V open-circuited, or ±5 V into 50Ω. Clipping may occur slightly above these levels. FIG 4 illustrates the various operating conditions encountered when using DC offset. If the desired output signal is large or if a large DC offset is used, an oscilloscope should be used to make sure that the desired combination is obtained without clipping. Keeping the Amplitude control in the lower half of its adjustment range reduces the probability of clipping.

B. To set the DC offset to zero or a specific DC voltage, depress the Function Switches slightly so that all switches are released (all buttons out). This removes the signal from the output and leaves the DC only. Measure the DC output on an oscilloscope or DC voltmeter and adjust the DC offset control for the desired value.

C. It is easier to accurately set the FREQ. dial if settings between 0.1 and 5.0 are used. Since the dial rotation overlaps ranges, it is not usually necessary to use readings below 1. If this occurs, change to a lower range and use a higher dial setting.

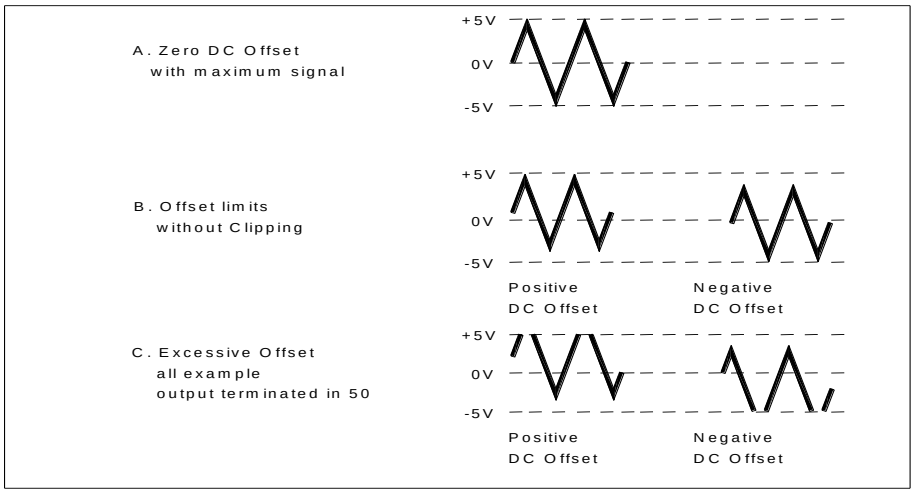


**Figure 4. USE OF DC OFFSET CONTROL**

D. The main output BNC is labeled 50Ω. This means that the source impedance is 50Ω, but the output may be fed into any circuit impedance. The output level varies in proportion to the terminating impedance. If it is desired to maintain a constant output level while injecting signal into various circuits with various impedance, constant terminating impedance is necessary. When the generator output is connected to a coaxial connector on the equipment under test, it's usually a moderate to high impedance. A reasonably constant terminating impedance may be maintained while injecting signal into moderate and high impedance circuits (500Ω and up) by adding a coaxial tee in the output cable and connecting a 50Ω termination to one leg. Remove the 50Ω termination when injecting into a 50Ω circuit. Also, to keep DC injection point, the DC offset should be set to match the circuit voltage, or blocking capacitor may be required to avoid DC loading with 50Ω.

E. When using the higher output frequencies while using the square wave output, terminate the cable in 50Ω to minimize ringing. Keep the cables as short as possible.

F. To set output amplitude to a specific level, measure peak to peak amplitude on an oscilloscope.

3-4. Use as a Pulse Generator

In a symmetrical square wave, sine wave, or triangle wave, the positive and negative transitions are of equal time duration, or 1:1 ratio. This condition is present when the SYMMETRY control is off. When the SYMMETRY control is pulled and rotated, the positive transition can be stretched in relation to the negative transition, up to at least, 10:1 ratio. Square waves can be stretched into rectangular waves or pulses, triangle waves can be stretched into distorted wave shape called a skewed sine wave. FIG 5 illustrates the types of waveforms possible and includes a summary of control settings used to obtain the desired waveform.

1) Procedure

A. Setup generator as described for function generator operation. Display the output of generator on an oscilloscope.

B. Select the desired type of waveform with the Function Switches. Press the square wave button for pulses, triangle button for ramp waves or sine wave button for skewed sine waves.

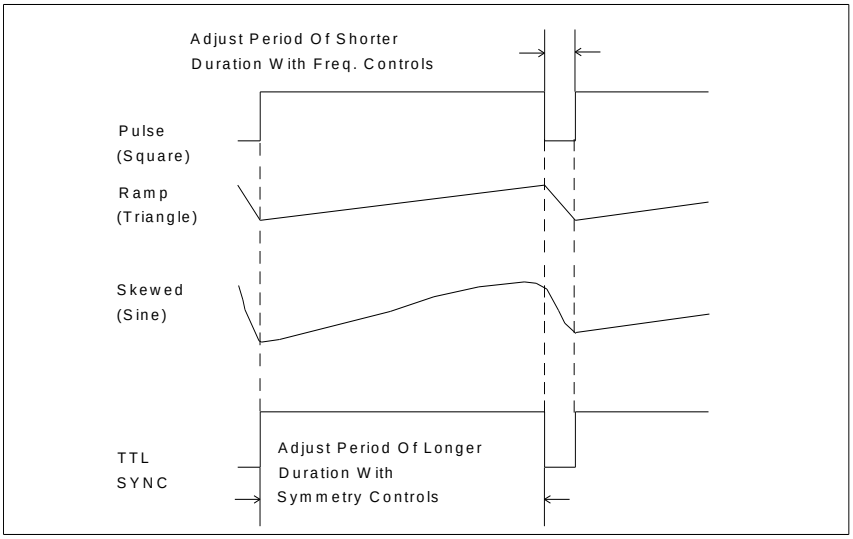


**Figure 5. PULSE, RAMP, AND SKEWED SINE WAVE GENERATION**

C. If both a specific pulse width and repetition rate (specific rise time and fall time for ramp wave) are required, the waveform may be obtained as follows:

a. Adjust the shorter duration portion of the waveform (pulse width for pulse, fall time for ramp waves) with the frequency controls FREQ dial and RANGE switch.

b. Adjust the longer duration portion of the waveform (rest time for pulses, rise time for ramp waves) with the SYMMETRY control.

D. If a specific pulse width (specific fall time for ramp wave) is not critical, but a specific repetition rate is required, the desired waveform may be obtained as follows:

a. Observe the oscilloscope and adjust the SYMMETRY control to obtain the approximate desired pulse width vs. rest time ratio (rise time vs. fall time ratio for ramp waves).
b. Adjust the repetition rate with the frequency controls FREQ. dial and RANGE switch. The frequency controls affect both the pulse width and repetition rate.

2) Considerations

A. When generating ramp waves or skewed sine waves, it may be easier to measure the time periods on oscilloscope using the square wave mode, then switch to the desired operating mode.

B. For ease and accuracy in measurement, use a higher sweep speed on the oscilloscope to expand the pulse width for measurement, and then reduce the sweep speed to measure the repetition rate.

C. Repetition rate may be expressed as a frequency or time period. Measure the repetition rate as a time period on oscilloscope and convert to frequency if required. The repetition rate includes the full cycle, both the pulse width and rest time for pulses, the rise time and fall time for ramp waves.

D. Repetition rate can be measured accurately and easily as a frequency or time period with a frequency counter.

E. Pulse width also can be measured on a frequency counter, but only with the SYMMETRY control set off before the pulse waveform is “stretched”. Pulse width equals one-half the time period of the square wave. If the counter is not equipped for period measurement, calculate the frequency, which is equivalent to the desired pulse width, and measure the frequency of the waveform.

$$\textit{DESIRED FREQUENCY} = \frac{1}{\textit{DESIRED PULSE WIDTH} \times 2}$$

## 3-5. TTL/CMOS OUTPUT

TTL/CMOS output is specifically designed for compatibility with TTL/CMOS digital logic circuits. Set-up time is considerably reduced because the fixed logic levels and polarity are ready for direct injection into TTL/CMOS circuits. There is a need for protection from the accidental application of too high an amplitude or incorrect DC offset which might damage semiconductors. Another advantage is the extremely fast rise time and fall time of signal. To use the TTL/CMOS output, connect a cable from TTL/CMOS BNC on the Front panel to the point at which it is desired to inject the signal. TL/CMOS output may be used in several modes of operation. See examples to follow.

A. Using the square wave generator or pulse generator modes, clock pulses can be generated for testing, troubleshooting or circuit analysis. The instrument could even be used as a substitute master clock generator as TTL/CMOS circuits can be driven from the TTL/CMOS BNC.
B. The CMOS Level Control potentiometer (out position) provides CMOS level output from 5V to 15V Variable and Continuously. To adjust the TTL/CMOS output level, rotate the potentiometer switch and observe the TTL or CMOS output. Push the potentiometer in for TTL or out for CMOS.

## 3-6. Use as FM Signal Generator

1) Procedure

A. Set up equipment as described for function generator operation. Use the frequency and amplitude controls to set the carrier to the desired frequency and amplitude.
B. Connect an AC modulating signal with no DC component to the VCF IN BNC on the front panel of the generator.
C. Adjust amplitude of the AC modulating signal for the desired frequency deviation.

2) Considerations

A. The approximate frequency deviation for a given VCF IN signal can be determined as follows: The 0.1 V change at the VCF IN BNC produces a frequency change of 1% of the highest frequency obtainable on a given range. For example, the highest frequency obtainable on the 500 K range is 500 KHz. One percent of 500 KHz equals 5KHz, therefore a 0.1 V change at the VCF IN BNC will deviate the output frequency 5KHz on the 500K range. The following table summarizes the frequency deviation versus VCF IN voltage for all ranges.

| RANGE | HIGHEST FREQ. OBTAINABLE(Hz) | FREQ. DEVIATION FOR EACH 0.1 VOLT VCF IN CHANGE(Hz) |
|---|---|---|
| 5 | 5 | 0.05 |
| 50 | 50 | 0.5 |
| 500 | 500 | 5 |
| 5K | 5K | 50 |
| 50K | 50K | 500 |
| 500K | 500K | 5K |
| 5M | 5M | 50K |

**Frequency Deviation vs VCF IN Voltage.**

B. For an example, it is assumed that we wish to generate a 455 KHz signal with FM deviation of ±15 KHz (30 KHz swing). The 500k range will be used to obtain the 455 KHz carrier with the FREQ. dial set to 4.55. The highest frequency obtainable in this range is 500kHz. One percent of 500kHz is 5 KHz. Our requirement of 30 KHz deviation is 6 times greater than 5 KHz deviation produced by a 0.1 volt VCF IN swing, thus we will use 6 times as much peak-to-peak voltage swing, or 0.6 V.

For Instance:

$$\frac{\text{desired deviation}}{1\%\ \text{deviation}} \times 0.1\ V = \text{required VCF IN} \quad \frac{30\ KHz}{5KHz} \times 0.1 = 6 \times 0.1V = 0.6V$$

C. Remember that the value of VCF IN signal is the peak to peak amplitude.

3-7. External Control of VCF

Within a given range, the FREQ dial setting normally controls the output frequency of generator. However, applying a voltage at the VCF IN BNC on the front panel also may control it. There are three basic possible modes of external VCF control as detailed below:

A. Applying an AC voltage produces FM modulation (previously described in the “Use as FM Signal Generator” paragraph)
B. Applying a specific fixed DC voltage will produce a specific output frequency described in following “Programmed Frequency Selection”paragraph)
C. Applying a ramp voltage (or other type waveform if desired) provides externally controlled sweep generator operation (described in the “Use as Externally Controlled Sweep Generator” paragraph)

The following considerations apply to all modes of operation involving external control of the VCF (voltage controlled frequency)

A. The output frequency of the generator is determined by the voltage applied to the VCF.

B. This voltage is first established by the setting of the FREQ dial. Any voltage input drives the VCF to a HIGHER FREQUENCY. However, the VCF can never be driven beyond its range limits (the highest and lowest frequencies that can be attained with the dial on a given range.)

B. With the FREQ dial set at its minimum ( 0.05) and 0 volts at the VCF in BNC, the generator's output frequency is at the lower limit of the selected range. Increasing the voltage to + 10 volts drives the generator frequency to the upper limit of the range. Between 0 and + 10 Volts, the generator output frequency is proportional to the VCF IN voltage. The VCF IN voltage can be correlated to equivalent dial settings as given in the table below.

| VCF voltage | Equivalent dial Setting |
|---|---|
| 0 | 0.05 |
| 1 | 0.5 |
| 2 | 1.0 |
| 3 | 1.5 |
| 4 | 2.0 |
| 5 | 2.5 |
| 6 | 3.0 |
| 7 | 3.5 |
| 8 | 4.0 |
| 9 | 4.5 |
| 10 | 5.0 |

**Correlation Between the VCF IN Voltage and the Equivalent Frequency Dial Setting (dial set to 0.05)**

C. The FREQ dial is usually set to 0.05 when using external VCF control. This reduces the dialed VCF voltage to zero and allows the external VCF voltage to exercise complete control. It also reduces the effects of dial setting inaccuracy.

D. If the summed dial setting and VCF IN voltage exceeds +10 volts, oscillation ceases and no output is produced. If the swing of the VCF IN signal is too great, oscillation will cease each time the instantaneous voltage reaches the limit.

3-8. Programmed Frequency Selection

A specific output frequency can be selected each time a specific VCF input voltage is applied (assuming a common dial setting). Such operation may be advantageous where there is a requirement to return to a specific frequency periodically. Eliminating the need for frequency measurement reduces set-up time and precision tuning each time frequency is needed. Just set the dial against its lower stop and turn on the external VCF voltage. Using multiple DC voltage values, which may be selected by a switch or electronic switching circuits, may be valuable in programming a set of two or more specific frequencies. This type of operation would be desirable in production testing where signals at several specific frequencies are required for various tests. FSK (frequency shift keying) signals also may be generated in this manner. To maintain the original accuracy each time the operation is repeated, the FREQ dial must be accurately set to the same position. Probably the easiest way to assure this common dial setting is to set it against its lower stop (0.05).

Additional information on programmed frequency selection is given in the “APPLICATIONS” chapter of this manual.

3-9. Use as a Sweep Generator

1) Procedure

A. Set up the Model 4005 for function generator operation.

B. Select the highest frequency to be swept with the RANGE switch and the lowest frequency to be swept with the FREQ. dial.

C. Adjust amount of sweep with the sweep rate control.

D. Adjust repetition rate of sweep with the sweep rate control.

2) Considerations

The sweep generator will sweep upward from that point. However, it will sweep upward only to the set range limit (highest frequency to which the dial can tune on the selected range). Therefore, a low dial setting is required to obtain a sweep covering a wide frequency range. The 0.05 setting must be used to obtain the maximum sweep width of 100:1(highest frequency sweep is 100 times that of lowest frequency swept).If a high dial setting and high SWEEP WIDTH setting are used simultaneously, the generator will sweep to the range limit and ceases operation for a portion of the sweep cycle, effectively clipping the sweep. Of course, if only a small frequency band is to be swept, a low dial setting is not important. In fact, it may be easier to set to the desired frequencies if the dial setting is 0.5 or higher.

3-10. Use as an Externally Controlled Sweep Generator

A ramp voltage, or any other type waveform desired, can be used for externally controlled sweep generator operations. 0 to 10 volt swing will sweep frequencies over a 100:1 ratio (with dial set to 0.05). Set the Model 4005 as described for internally controlled sweep generator operation, however turn the SWEEP WIDTH control to OFF. Apply the sweep voltage with no DC component at the VCF Input BNC. Set the FREQ. dial to the highest frequency to be swept and apply a negative-going ramp voltage.

3-11. Use as an External Frequency Counter

This instrument can be used as a counter by pushing in the INT/EXT selection switch.

A. EXT COUNT IN BNC: Accepts external frequency input.

B. COUNTER DISPLAY: Input frequency is displayed with high resolution on the 6 Digit 7 Segment display.

D. mHz, Hz, KHz, MHz INDICATOR: mHz, Hz, KHz, MHz indicators & decimal points display a maximum 50 MHz of external frequency.

E. FREQUENCY RANGES: W X 1.

F. LOW-PASS FILTER: If necessary, engage the LPF (low pass filter) switch. This will route the input through a low pass filter (-3 dB point of approximately 100 KHz) prior to passing through to the frequency counter. This helps eliminate counting errors in low frequency measurements by minimizing effects of high frequency noise present on the input.

***CAUTION***

*1. APPLICATION OF INPUT VOLTAGES HIGHER THAN THE LIMITS LISTED IN THE SPECIFICATIONS SECTION MAY DAMAGE THE COUNTER. BEFORE APPLYING ANY SIGNAL TO THE INPUTS, MAKE CERTAIN THAT IT DOES NOT EXCEED THESE SPECIFIED MAXIMUMS.*

*2. FREQUENCY COUNTER GROUND POINTS ARE CONNECTED DIRECTLY TO EARTH GROUND. ALWAYS CONNECT FREQUENCY COUNTER GROUND ONLY TO GROUND POINTS IN THE CIRCUIT UNDER TEST*

***NOTE***

*THE OVERVOLTAGE CATEGORY OF THE EXTERNAL FREQUENCY INPUT TERMINAL IS "CAT II". IT IS PERFORMED ON CIRCUITS DIRECTLY CONNECTED TO THE LOW VOLTAGE INSTALLATION.*

## 4. MAINTENANCE

***CAUTION***

*IT IS ESSENTIAL FOR SAFETY TO PROPERLY MAINTAIN AND SERVICE THIS INSTRUMENT*

***WARNING***

*VOLTAGES WITHIN THIS INSTRUMENT ARE SUFFICIENTLY HIGH AND MAY BE LIFE-THREATENING. COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORIZED TO DO SO. EXTREME CAUTION MUST BE OBSERVED ONCE THE COVERS HAVE BEEN REMOVED.*

4-1. Fuse replacement

- Disconnect and remove all connections from any live power source.
- Unscrew fuse holder with a screw driver.
- Locate the defective fuse and remove it with caution.
- Install a new fuse of the SAME SIZE AND RATING.
- Screwing fuse holder.

***CAUTION***

*MAKE SURE THAT THE RATED AND SPECIFIED FUSES ARE USED FOR REPLACEMENT.*

4-2. Adjustment and Calibration

It is recommendable to calibrate the Model 4005 every 12 months. Calibration and repair should only be performed by qualified and authorized personnel.

4-3. Cleaning and Decontamination

The instrument can be cleaned with a soft clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents. If the instrument gets wet for any reason, dry the instrument using low pressure clean air at less than 25 PSI. Use care and caution around the window cover areas where water or air could enter into the instrument while drying.

This marking shown on the product or literature indicates that it should The product should not be disposed with other household wastes.
To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly.

Household users should contact either the retailer where they purchased this product, or the appropriate local agency for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier. This product should not be mixed with other commercial wastes for disposal.

## Limited One-Year Warranty

Global Specialties, LLC warrants to the original purchaser that this product and its component parts will be free from defects in workmanship and materials for a period of one year from the date of purchase.

Global Specialties, LLC will without charge, repair or replace, at its' option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form a sales receipt.

To obtain warranty coverage, this product must be registered by visiting www.globalspecialties.com/warranty.php and completing the online registration form within fifteen (15) days of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alternations or repairs. Warranty is void if the serial number is altered, defaced or removed.

Global Specialties, LLC shall not be liable for any consequential damages.

**Model Number:** _____ **Date Purchased:**_____

## Service Information

Prior to sending any unit in for warranty, or non-warranty repair, the user must obtain a Return Merchandise Authorization (RMA) number from the factory. Please use the contact information below for the most convenient method of contact. After receipt of the RMA, return all merchandise to Global Specialties, LLC with pre-paid shipping.

**Warranty Service:** Please return the product in the original packaging with proof of purchase to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device.

**Non-Warranty Service:** Return the product in the original packaging to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device. For the most current repair charges contact the factory before shipping the product.

Global Specialties, LLC
22820 Savi Ranch Parkway
Yorba Linda, CA 92887
Phone: 800-572-1028
Facsimile: 714-921-6422
Email: service@globalspecialties.com
Include with the instrument your complete return shipping address, contact name, phone number and description of problem.


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Yorba Linda, CA 92887
USA
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FAX: 714-921-6422
www.globalspecialties.com