

# GP1665W



## PROGRAMMABLE 50 MHZ WAVEFORM SYNTHESIZER - WAVETEK 178 COMPATIBLE

- 100% Form-Fit-Function compatibility with Wavetek 178 Programmable Waveform Synthesizer
- Generates sine, square, triangle, ramps, haversine, havertriangles, AM (sine), and DC waveforms
- Frequency range from 1  $\mu$ Hz to 50 MHz
- National Stock Number: 6625-01-550-0545
- AFMETCAL procedure available



## DESCRIPTION

The GP1665W is a direct drop-in replacement solution for the obsolete Wavetek 178 waveform synthesizer. The GP1665W is a programmable instrument capable of generating sine, square, triangle, ramps, pulse, and haverwaves from 1  $\mu$ Hz to 50 MHz. The firmware is customized for the Wavetek 178 command set. Test applications using the Wavetek 178 require no code modification when upgrading to the GP1665W.

## FEATURES

The GP1665W can operate in a trigger, gate, or burst generator mode at levels up to 20  $V_{PP}$ . It is synthesized to 8 digits in all modes. The main generator produces the sine and square waves, as well as triangles, ramps, pulses, and haverwaves at reduced frequencies.

The internal sweep generator varies the main generator frequency linearly or logarithmically between start and stop frequencies. It operates in triggered, gated, hold at start, and hold at stop modes. It also has 10 programmable frequency markers to show critical frequencies within the sweep. The sweep generator can trigger the main generator to produce pulses with a 10  $\mu$ s to 10 min repetition rate and 5  $\mu$ s to 5 pulse width.

The GP1665W can be phase locked by using an external reference input to lock the reference source. This allows the synthesizer to operate as a variphase generator with phase offset in 0.01° increments.

The generator's output level into a 50 ohm load can be programmed from 1 mV to 20  $V_{PP}$  with 3 digits resolution. DC offset can be programmed over a range of  $\pm 10$  V. The GP1665W also has two external inputs for phase-amplitude-modulation. If phase modulated, the main generator varies  $\pm 360^\circ$  at frequencies above 500 kHz. With amplitude modulation, the output can be modulated up to 200%.

## APPLICATIONS

- Automatic Test Equipment (ATE)
- Component Analysis
- Communication Signals
- Process Control
- Sonar

# GP1665W



## SPECIFICATIONS

OPERATING MODES	
Continuous	Generator runs continuously.
Triggered	Generator is quiescent until triggered by an external signal, internal sweep signal, GPIB, or manual trigger, then it generates one cycle at the selected frequency.
Gated	Same as triggered except generator oscillates for the duration of the gate signal plus the remainder of the waveform in progress.
Triggered Haverwave	Same as triggered mode except output is sine or triangle waveform starting at -90° or +90°.
Gated Haverwave	Same as gated mode except output is a sine or triangle waveform starting at -90° or +90°.
Triggered Burst	Same as triggered mode except the number of cycles output for each trigger input is selectable from 1 to 65,536 ( $2^{16}$ ) counts.
Triggered Haverwave Burst	Same as triggered burst except output is a sine or triangle waveform starting at -90° or +90°.
Frequency Sweep	Output can be swept by internal sweep generator.
<b>Frequency Range</b>	
Low end frequency for all waveforms is 1 $\mu$ Hz.	
Continuous Mode	<ul style="list-style-type: none"> <li>to 50 MHz in sine, square, and AM sine modes</li> <li>to 500 kHz in triangle mode</li> <li>to 20 kHz in ramp mode</li> </ul>
All Triggered Gated and Burst Modes	<ul style="list-style-type: none"> <li>to 200 kHz in sine, square, triangle, and AM sine modes</li> <li>to 20 kHz in ramp mode</li> </ul>
Main Output	20 $V_{PP}$ into 50 ohm load. Combined amplitude / DC offset waveforms not to exceed $\pm 10$ V peak into 50 ohm. Output voltage into an open circuit is double indicated voltage when a voltage less than $\pm 5$ V peak is selected.
Amplitude Conversion	Permits entry and display of amplitude for all waveforms in units $V_{RMS}$ , $V_{PP}$ and dBm.
Frequency Resolution	8 digits or 1 $\mu$ Hz
Accuracy	Better than 0.0005% of program setting, $\pm 0.01$ $\mu$ Hz
Stability	Long term: $\pm 51 \times 10^{-6}$ / mo. Temperature: $\pm 51.2 \times 10^{-7}$ / °C.
Signal to Phase-Noise	Greater than 46 dB in a 30 kHz band centered on carrier, but excluding a $\pm 1$ Hz band around the carrier.
Spurious	60 dBc or 30 $\mu$ V, whichever is greater, 1 $\mu$ Hz to 500 kHz 50 dBc or 30 $\mu$ V, whichever is greater, 500 kHz to 50 MHz.

AMPLITUDE CHARACTERISTICS	
<b>Range and Accuracy</b>	
Note: DC offset range is 0 to $\pm 10$ V DC. Specified for 1 kHz sine wave or for DC output into a precision 0.1% 50 ohm load.	
10.02 to 20 $V_{PP}$	$\pm 1\% \pm 20$ mV
1.01 to 10 $V_{PP}$	$\pm 1\% \pm 10$ mV
0.101 to 1 $V_{PP}$	$\pm 3\% \pm 2$ mV
10.1 to 100 mV $_{PP}$	$\pm 4\% \pm 100$ $\mu$ V
1 to 10 mV $_{PP}$	$\pm 5\% \pm 20$ $\mu$ V
Resolution	3 digits 10.0 $V_{PP}$ , 4 digit (20 mV) < 10 $V_{PP}$
DC Offset	$\pm 1\%$ of setting $\pm 40$ mV (worst case) Note: Amplitude and DC offset share the output attenuator.
Frequency Response	$\pm 1\%$ for 1 $\mu$ Hz to 20 kHz $\pm 3\%$ for 20 kHz to 500 kHz $\pm 7\%$ for 500 kHz to 25 MHz $\pm 15\%$ for 25 MHz to 50 MHz
OFFSET CHARACTERISTICS	
Phase Offset	Output phase may be changed from $\pm 1,000$ revolutions ( $\pm 360,000$ degrees) in 0.01 degree resolution steps up to 500 kHz and 0.1 degree resolution steps above 500 kHz.
DC Offset and DC Voltage Output	0 to $\pm 10$ V DC into 50 ohm Output voltage is double into open circuit when voltage is less than $\pm 5$ V DC is selected.
WAVEFORM CHARACTERISTICS	
Sine Distortion	-55 dB to 50 kHz -40 dB to 500 kHz -30 dB to 50 MHz Specified for 1 $V_{RMS}$ (2.83 $V_{PP}$ ) sine wave
Square Rise and Fall Times	Less than 8 ns, 1.01 to 10 $V_{PP}$ Less than 10 ns, greater than 10 $V_{PP}$
Square Aberrations	Less than 5% of pk-pk voltage
PULSES	
Period	10 $\mu$ s to 600 s 4 digits or 10 $\mu$ s resolution (Control: Sweep Time); jitter < 2% of pulse width
Width	5 $\mu$ s to 500,000 sec (> 5 days) 8 digits (Control: Main Frequency); < 0.05% jitter Note: Width is usable to 1 $\mu$ s

# GP1665W



SWEEP MODE	
Sweep Generator	Sweep generator is fully synthesized any may be used independently or for frequency sweeping and triggering the main generator. Frequency sweep may be selected linear or logarithmic, and up or down. Sweep may be triggered, interrupted with hold, and continued with resume. Triggered, gated, and burst are permitted during sweep.
Continuous Sweep	Sweep generator sawtooth runs continuously
Triggered Sweep	Incoming trigger causes a single sweep and resets to the start frequency
Triggered Sweep / Triggered Reset	As in triggered sweep, but sweep holds at stop frequency until subsequent trigger returns frequency to start frequency
Sweep Time	0.01 to 600 seconds, 4 digit or 10 $\mu$ s resolution
Output	0 to approximately +5 V ramp synthesized to 2,000 steps per sweep. 600 ohm output impedance.
Frequent Marker Output	TTL levels. One of the ten preset markers can be selected. Output is low when then main generator frequency is below marker frequency; output is high when above.
Maximum Sweep Range	Low Band: 1 $\mu$ Hz to 500 kHz High Band: 5 kHz to 50 MHz
Minimum Sweep Range	Linear: Low Band: 20 MHz per 1 s of sweep time High Band: 2 Hz Log: In addition to the above, any start and stop frequencies with ratio greater than 2.
Sweep Resolution	Frequency Resolution (Start, Stop, Hold, Markers): 8 digits or 1 $\mu$ Hz Sweep Frequency Update: Every 5 $\mu$ s (lin and log) Log Slope Updates: Every 2 ms
AUXILLARY OUTPUTS	
TTL and TTL Sync	At generator frequency, 50 ohm source impedance, 50% duty cycle, < 5 ns transition time.
Reference Output	10 MHz, 1 V <sub>PP</sub> sine, 50 ohm source impedance
Sweep Ramp	See Sweep Generator
Frequency Marker	See Sweep Generator

INPUTS	
Trigger	A TTL level transition can trigger or gate both the main generator and/or internal sweep generator. Triggering slope up or down is selectable.
Reference	An external 0.5 V to 10 V <sub>PP</sub> sine or pulse clock of $\pm 5$ ppm or better stability and accuracy automatically locks the internal reference. External clock may be 1, 2, 3...9 or 10 MHz. Input impedance is 1 K ohm.
Amplitude Modulation	Rates from DC to 10 MHz minimum. Input impedance is 600 ohm. 5 V <sub>PP</sub> input gives 100% modulation. Main output halved with no modulation. 200% modulation permitted. Sync output not affected by modulation.
Phase Modulation	Rates from DC to 10 kHz minimum. Input impedance is 10 K ohm. $\pm 5$ V input delivers approximately $\pm 360^\circ$ shift. Output deviation is $\div 100$ for main output frequencies 500 kHz and below.
GENERAL	
Interface	Fully compatible with Wavetek 178
Memory	Up to 5 complete instrument settings can be stored and recalled from volatile (RAM) memory. Settings may be modified or deleted.
Power Requirements	100 - 240 V selectable, 50 VA (max)
Weight	5 kg
Dimensions	13.0 cm H x 21.2 cm W x 40 cm L (5.25" x 8.3" x 15.75")
Operating Temperature	0 $^\circ$ C to +50 $^\circ$ C
Humidity	To 95% RH, 0 $^\circ$ C to +40 $^\circ$ C
Connectors	Rear panel connectors optional
Rack Mount	Optional
AFMETCAL Procedure	33K3-4-3583
Calibration Interval	1 year

Note: Specifications are subject to change without notice

# GP1665W



## ORDERING INFORMATION

GP1665WR	Programmable Function Generator with Rack Mount - Wavetek 178 Compatible
GP1665W	Programmable Function Generator, Wavetek 178 Compatible
ACCESSORY	
GT90002	GPIB Cable, 1m
GT90003	GPIB cable, 2m
GT-BNC50-2	Cable, BNC to BNC, 50 Ohm, 2 ft
GT-BNC50-5	Cable, BNC to BNC, 50 Ohm, 5 ft