

# 50MS/s Dual-Channel Arbitrary Waveform Generator

TABOR'S NEW

WW

WONDER WAVE SERIES



## MODEL WW5062

- Dual-channel 50MS/s waveform generator
- Sine and Square waves to 25MHz
- 10 Built-in popular standard waveforms
- 14 Bit amplitude resolution
- 12 digits frequency resolution (limited by 1µHz)
- 512k standard waveform memory (1M option)
- 1 ppm clock accuracy and stability
- Comprehensive memory management, including segmentation and sequences
- AM, FM, Arbitrary FM, FSK, Ramped FSK modulation

- Linear and Logarithmic Sweep
- User friendly and menu driven 3.5" color LCD display
- Multi-Instrument synchronization
- DDS technology for extremely low phase noise signals
- Ethernet 10/100, USB 2.0 and GPIB interfaces
- ArbConnection software for easy waveform creation & control

Models 5062 represent the company's next generation of products in the field of function, pulse and arbitrary waveform generators. These instruments are superior and far more versatile than any existing equivalent whether it is an analog or digital product. As a waveform source, this model can replace analog generators in almost every application. The Instrument combines high-frequency performance, versatility and compact size in a boxed format. Featuring signal output in the range of 1µHz to 25MHz and 14-bit vertical DAC resolution and up to 2M arbitrary waveform buffer, these instruments exhibit performance and provide solutions to the most demanding test stimulus challenge.

### Versatility

Four waveform types may be generated: standard, arbitrary, sequenced arbitrary, and modulated. It is virtually like having four different generators in a single, compact package.

### As a Function Generator

Most applications require simple and controllable waveforms such as sine and square waves; these functions and more are resident in a built-in library and can be called to the output using simple and easy keystrokes. The built-in waveforms are generated digitally from lookup tables that ensure accuracy and fidelity. The use of DDS technology to generate the controlling clock enhances clock stability and thus provides jitter-free and excellent spectral purity. Sine and square waves can be generated at up to 25MHz. There are eight additional waveforms of which have controllable parameters, all accessible from the front panel.

### Arbitrary Waveform Generator

Complex waveforms are used for testing purposes throughout the industry. While coordinates for such waveforms can easily be generated on paper or on computers, there is a need for digital instruments to take this data and convert it to electrical signals. An arbitrary waveform generator is about the only tool that can take a set of X-Y coordinates and convert them to real life signals.

Combined with the power of ArbConnection, there is no limit to what you can create and generate. Waveform coordinates can be imported from a variety of sources such as MathLab, ASCII files etc. Anything you can display on one of the composer screens is downloaded in split-second time and generated by the main output.

### Waveform Memory for High Speed Testing

The instruments are sold with 512k waveform memory as standard. Optional 1M waveform memory is offered for applications requiring longer waveforms, placing the 5062 series in a far better position than its traditional competitors. The waveform memory is accessible from a remote host, using fast GPIB, USB or LAN interface thus minimizing test time needed when downloading multiple waveforms for one or more tests.



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The entire space of the waveform memory is backed up by rechargeable batteries allowing waveforms to be downloaded in the lab and the generator moved to another location for field operation.

### **Sequence Generator**

Memory management is a must in today's arbitrary waveform generators. While very few applications require one long memory, most of the waveforms require a limited number of horizontal points. As a sequence generator, the model 5062 lets you divide the entire memory into 2048 smaller segments, load each segment with a different waveform, and then, select the order in which these segments will be linked and the number of loops that each segment will perform. This allows test software to switch between many different waveforms rapidly and without having to download multiple times, enhancing test throughput in a way that cannot be duplicated by other competing products.

### **Modulation Capability**

Agility and modulation capabilities open the door to diverse applications. In addition to the power to generate any shape and any style of waveforms with the arbitrary waveform generation power, the product can generate standard modulation schemes such as AM, FM, Arbitrary FM, FSK, and Linear and Logarithmic sweep, all of which are easily created and executed by the generator.

### **Flexible Triggering Capability**

Continuity of signals is required in most application however, at times when single output cycles are required or synchronization to other devices is mandatory, the 5062 can be placed in different run mode that provides synchronization to other system components. Built into the product are gated, triggered and burst modes of which the last two can be operated with the built-in, free-running trigger generator, when external stimulating devices are not available.

### **Easy to use**

Large and user-friendly 3.5" back-lit color LCD display facilitates browsing through menus, updating parameters and displaying detailed and critical information for your waveform output. Combined with numeric keypad, cursor position control and a dial, the front panel controls simplifies the often complex operation of an arbitrary waveform generator.

### **High Speed Access**

Access speed is an increasingly important requirement for test systems. Included with the instrument is a variety of interfaces: Ethernet 10/100, USB 2.0 and GPIB so one may select the interface most compatible to individual requirements. Using any of the external interfaces, controlling instrument function and features as well as downloading waveforms and sequences are fast, time saving and easily tailored to every system regardless if it is just a laptop to instrument or full-featured ATE system. IVI drivers and factory support will speed up system integration thus minimizing time-to-market and reduce system development costs significantly.

### **Precise Inter-Channel Phase Control**

In the 5062, both channels share a common sample clock, and both channels are triggered from the same source assuring tightly synchronized channel-to-channel timing. Precise control over channel-to-channel phase offset is achieved by allowing control over channel start phase with a resolution down to as small as 1 waveform point. This enables extremely accurate timing or phase dependencies to be studied, such as those found in high speed digital communication systems.

### **Multi-Instrument Synchronization**

Multiple 5062 can be synchronized using a Master-Slave arrangement allowing users to benefit from the same high quality performance in their multi-channels needs.

### **ArbConnection**

ArbConnection is a graphical tool that provides an unlimited source of Arbitrary Waveforms. With the ArbConnection software you can control instruments functions, modes and features. You can also create a virtually infinite amount of test waveforms. Freehand sketch allows you to draw your own custom waveform for quick analysis of analog signals. You can use the built-in equation editor to create your own exotic functions. Add or subtract components of a Fourier series to characterize digital or analog filters or inject random noise into a signal to test immunity to auxiliary noise.

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### Service and Support

Beyond providing precision Test & Measurement instruments, Tabor Electronics provides unparalleled service and support, and is continuously finding new ways to bring added value to its customers.

Our after-sales services are comprehensive. They include all types of repair and calibration, and a single point of contact that you can turn to whenever you need assistance. As part of our extensive support, we offer individualized, personal attention Help Desk, both online and offline, via e-mail, phone or fax.

Tabor Electronics maintains a complete repair and calibration lab as well as a standards laboratory in Israel and USA. Service is also available at regional authorized repair/calibration facilities.

Contact Tabor Electronics for the address of service facilities nearest you.

### Applications

For expert technical assistance with your specific needs and objectives, contact your local sales representative or our in-house applications engineers.

### Manuals, Drivers, and Software Support

Every instrument comes equipped with a dedicated manual, developer libraries, IVI drivers, and software. However, if your specific manual is lost or outdated, Tabor Electronics makes it possible to log-on to its Download Center and get the latest data "in a click".

### Product Demonstrations

If your application requires that you evaluate an instrument before you purchase it, a hands-on demonstration can be arranged by contacting your local Tabor Electronics representative or the Sales Department at our Corporate Headquarters.

### Five-year Warranty

Every instrument from the Woder Wave series comes with a five-year warranty. Each one has full test results, calibration certificate, and CD containing product's manual and complete software package. Our obligation under this warranty is to repair or replace any instrument or part thereof which, within five years after shipment, proves defective upon examination. To exercise this warranty, write or call your local Tabor representative, or contact Tabor Headquarters and you will be given prompt assistance and shipping instructions.

#### CORPORATE HEADQUARTERS

9 Hattiasia St. P.O.Box404,  
Tel Hanan, Israel 20302  
☎ +972 (4) 8213393  
☎ +972 (4) 8213388  
[www.taborelec.com](http://www.taborelec.com)

#### EUROPE

**Austria**  
UEI-Viena  
☎ +43 15451 588  
☎ +43 15451 464

**Belenlux** (Belgium, The Netherlands and Luxembourg)

BFI Optilas B.V.  
☎ +31 172 44 60 60  
☎ +31 172 44 34 14

**Bulgaria**  
New-Tek Ltd.  
☎ +359 296 25286  
☎ +359 268 7110

**Cyprus**  
Sprel Ltd.  
☎ +357 2237 7159  
☎ +357 2237 7284

**Czech Republic & Slovakia**  
Testovací Technika s.r.o.  
☎ +420 2 7478 2237  
☎ +420 2 7478 1285

**Denmark**  
Atimco AS  
☎ +45 8625 8899  
☎ +45 8625 5889

**France**  
Racal Instruments SAS  
☎ +33 1 3923 2205  
☎ +33 1 3923 2225

#### Germany

Compulless Elektronik GmbH  
☎ +49 89 321501-0  
☎ +49 89 321501-11

#### Greece

American Technical  
Enterprises S.A  
☎ +30 210 5240 740  
☎ +30 210 5249 995

#### Hungary

ProMet Merestechnika  
☎ +36 24 521 240  
☎ +36 24 521 253

#### Italy

LP Instruments srl  
☎ +39 2 4840 1713  
☎ +39 2 4840 1852

#### Norway

Nortelco AS  
☎ +47 2257 6100  
☎ +47 2257 6130

#### Poland

Helmar  
☎ +48 22 436 3106  
☎ +48 22 436 3110

#### Romania

InterNET SRL  
☎ +40 21 312 1662  
☎ +40 21 312 1663

#### Russia

CDIP  
☎ +7 0959 56 2022  
☎ +7 0959 56 2022

#### Spain & Portugal

Instrumentos De Media SL  
☎ +34 91 300 0191  
☎ +34 91 388 5433

#### Sweden & Finland

Ferner Elektronik AB  
☎ +46 8 760 8360  
☎ +46 8 760 8341

#### Switzerland

Elstar Elektronik AG  
☎ +41 56 427 1888  
☎ +41 56 427 1976

#### United Kingdom & Ireland

SEMATRON UK Ltd.  
☎ +44 1256 812222  
☎ +44 1256 812666

**Yugoslavia** (Bosnia, Croatia, Macedonia, Montenegro, Serbia, Slovenia)

Mechanic & Electronic  
Measurement  
☎ +43 1943 4254  
☎ +43 1943 4251

#### ASIA PACIFIC & JAPAN

**Australia**  
Trio Test & Measurement  
Solutions  
☎ +61 8 8234 0504  
☎ +61 8 8234 0130

#### India

AIMIL Ltd.  
☎ +91 11 2695 0001  
☎ +91 11 2695 0011

#### Japan

TOYO Corporation  
☎ +81 3 3279 0771  
☎ +81 3 3246 0645

#### Korea

ITB Corporation  
☎ +82 2 549 8501  
☎ +82 2 549 8502

#### New Zealand

Electrotest Ltd.  
☎ +64 9 448 2600  
☎ +64 9 448 2611

#### Philippines

Sunley Inc.  
☎ +63 2751 1216  
☎ +63 2815 0730

#### Singapore

Thailand & Vietnam  
Gold Lite Engineering Pte Ltd.  
☎ +65 6273 0487  
☎ +65 6273 5006

**Taiwan, China & Hong Kong**  
Precision International Corp.

#### Taiwan

☎ +886 2 85124888  
☎ +886 2 85124900

#### China & Hong Kong

☎ +86 21 64401300  
☎ +86 21 64400524

#### AFRICA

**South Africa**  
Channels Measurement  
☎ +27 11 254 8362  
☎ +27 11 254 8451

#### MIDDLE EAST

#### Israel

Dan-EI Technologies Ltd.  
☎ +972 3 9271888  
☎ +972 3 9271666

#### Turkey

Alfatek Test &  
Automation Ltd.  
☎ +90 216 474 7355  
☎ +90 216 474 7357

#### UNITED STATES

#### US SALES & SUPPORT OFFICE

☎ +1 909 7970484  
☎ +1 909 7974955

**IL, IN, IA, KS, KY, MN, MO, NE, ND, SD, WI**  
Base Eight, Inc.

☎ +1 847 670 1680  
☎ +1 847 670 1737

**AZ, CO, ID, MT, NM, TX, EI Paso, UT, WY**

Berry Technical Sales Inc.  
☎ +1 303 665 9116  
☎ +1 303 833 1294

#### AR, LA, OK, TX

Data Marketing Associates Inc.  
☎ +1-972 661 0300  
☎ +1 972 490 0836

#### OH, WV, PA, MI

Dytec EAST  
☎ +1-330 405 8311  
☎ +1 330 405 8313

#### DC, MD, VA

Eastern Instrumentation Corp.  
☎ +1 410 884 7303  
☎ +1 410 884 7306

#### PA, NJ

EI Philly  
☎ +1 856 231 0668  
☎ +1 856 231 9022

#### HAW, NV, CA

Sierra Technical Sales  
☎ +1 510 713 9957  
☎ +1 510 713 9958

#### NJ, NY

Tera Technologies Inc.  
☎ +1 888 921-TERA  
☎ +1 888 449 2799

#### CT, ME, MA, NH, RI, VT

Test-Rep Associates, Inc.  
☎ +1 978 692 8000  
☎ +1 407 839 0337

#### AL, FL, GA, MS, NC, SC, TN

W.A Brown Instruments  
☎ +1 407 648 9660  
☎ +1 407 839 0337

#### CA, NV

W5 Inc.  
☎ +1 949 212 1199  
☎ +1 714 281 0767

#### CANADA

Testforce Systems Inc.  
☎ +1 514 856 0970  
☎ +1 514 856 6983

#### LATIN AMERICAS

#### SALES & SUPPORT OFFICE

☎ +1 440 543 7710  
☎ +1 440 543 9681



# Specification 50MS/s Dual-Channel Arbitrary Waveform Generator

## Model WW5062



### CHANNELS

**Number of Channels:** 2, semi-independent

### INTER-CHANNEL CONTROL

#### LEADING EDGE OFFSET

**Description:** Channel 2 edge trails channel 1 edge by a programmable number of points.

**Range:** 0 to 512k points (1M option)

**Resolution and Accuracy:** 1 point, or 1 sample clock period of channel 2

**Initial Skew:** <math>\pm 2\text{ns}</math>, with sclk divider = 1;  
<math>\pm 3\text{ns}</math>, with sclk divider > 1

#### CHANNEL 2 SAMPLE CLOCK DIVIDER

**Description:** The sample clock source is common to both channels 1 and 2, however, the sample clock for the slave channel can be divided.

**Range:** 1 to 65,535

**Resolution:** 1

#### INTER-CHANNEL DEPENDENCY

**Separate controls:** Output on/off, amplitude, AM, offset, standard waveforms, user waveforms, user waveform size, sequence table, channel 2 clock divider, trigger start phase, breakpoints

**Common Controls:** Sample clock, frequency, reference source, trigger modes, sequence advance mode, SYNC output, FM, FSK, sweep, arm start/stop

### STANDARD WAVEFORMS

**Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC.

**Frequency Range:** Waveform dependent

**Source:** Internal synthesizer

#### SINE

**Frequency Range:** 100 $\mu$ Hz to 25MHz

**Start phase:** 0 to 360°

#### Harmonics Distortion (at 5Vpp):

DC to 1MHz	-50dBc
1 to 5MHz	-45dBc
5 to 10MHz	-35dBc
10 to 25MHz	-28dBc

#### Non-Harmonic Distortion:

DC to 9MHz	-60dBc
9 to 50MHz	-50dBc

#### Total Harmonic Distortion:

DC to 100kHz	0.1%
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#### Flatness (1kHz):

DC to 25MHz	5%
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#### TRIANGLE

**Frequency Range:** 100 $\mu$ Hz to 6.25MHz  
**Start phase:** 0 to 360°

#### SQUARE

**Frequency Range:** 100 $\mu$ Hz to 25MHz  
**Duty cycle:** 1% to 99%  
**Rise/Fall time:** <math>< 10\text{ns}</math>, typically <math>< 8\text{ns}</math>  
**Aberration:** <math>< 5\%</math>

#### PULSE

**Frequency Range:** 100 $\mu$ Hz to 6.25MHz  
**Delay, Rise/Fall Time, High Time Ranges:** 0%-99.9% of period (each independently)

**Rise/Fall time:** <math>< 10\text{ns}</math>, typically <math>< 8\text{ns}</math>  
**Aberration:** <math>< 5\%</math>

#### RAMP

**Frequency Range:** 100 $\mu$ Hz to 6.25MHz  
**Delay, Rise/Fall Time Ranges:** 0%-99.9% of period (each independently)

#### SINC (SINE(x)/x)

**Frequency Range:** 100 $\mu$ Hz to 3.125MHz  
**"0" Crossing:** 4 to 100 cycles

#### GAUSSIAN PULSE

**Frequency Range:** 100 $\mu$ Hz to 3.125MHz  
**Time Constant:** 1 to 200

#### EXPONENTIAL FALL/RISING PULSE

**Frequency Range:** 100 $\mu$ Hz to 3.125MHz  
**Time Constant:** -100 to 100

### REPETITIVE NOISE

**Bandwidth:** 25MHz

#### DC

**Range:** -100% to 100% of amplitude

### ARBITRARY WAVEFORMS

**Sample Rate:** 100ms/s to 50MS/s

**Vertical Resolution:** 14 Bits

**Waveform Memory:** 512k points standard (1Meg option)

### MEMORY SEGMENTATION

**No. of Segments:** 1 to 2048

**Min. Segment Size:** 16 points

**Resolution:** 4 points size increments from 16 to 512k points (1Meg option)

### SEQUENCED ARBITRARY WAVEFORMS

**Operation:** Permits division of the memory bank into smaller segments. Segments may be linked, and repeated in user-selectable fashion to generate extremely long waveforms.

### ADVANCE MODES

#### Automatic Sequence Advance:

No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table

#### Stepped Sequence Advance:

Current segment is sampled continuously, external trigger advances to next programmed segment. Control input is TRIG IN connector.

#### Single Sequence Advance:

Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment. Control input is TRIG IN connector.

#### Mixed Sequence Advance:

Each step of a sequence can be programmed to advance either: a) automatically (Automatic Sequence Advance), or b) with a trigger (Stepped Sequence Advance)

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**Advance Source:** External, rear panel BNC;  
Internal; GPIB  
**Sequencer steps:** From 1 to 2048  
**Segment loops:** From 1 to 1Meg  
**Minimum Segment Duration:** 1µs for more than one loop.

### COMMON CHARACTERISTICS

#### FREQUENCY

**Resolution:** 12 digits limited by 1µS/s  
**Accuracy & Stability:** Same as reference

#### 10MHz REFERENCE CLOCK

Internal 0.0001% (1ppm TCXO) initial tolerance over a 19°C to 29°C temperature range; 1ppm/°C below 19°C and above 29°C; 1ppm/year aging rate  
External 10MHz TTL, 50% ±2% duty cycle

#### AMPLITUDE

**Range:** 10mV to 10Vp-p, into 50Ω;  
Double into open circuit  
**Resolution:** 4 digits  
**Accuracy (1 KHz):**  
1.000V to 10Vp-p ±(1% + 25mV)  
100mV to 999.9mVp-p ±(1% + 5mV)  
10mV to 99.99mVp-p ±(1% + 2mV)

#### OFFSET

**Range:** 0 to ±4.5V Independent to amplitude setting as long as (amplitude/2) + (offset) does not exceed 5Vp-p  
**Resolution:** 2.2 mV  
**Accuracy:** ±1%

#### FILTERS

**Type:** 25 MHz Elliptic  
12.5 MHz Elliptic

#### OUTPUTS

##### MAIN OUTPUTS

**Connector:** Front panel BNC  
**Stand-by:** Output Off or Normal  
**Impedance:** 50Ω, ±1%  
**Protection:** Protected against temporary short to case ground

##### SYNC/MARKER OUTPUT

**Connector:** Front panel BNC  
**Impedance:** 50Ω, ±1%  
**Level:** >2 V into 50Ω,  
4V nominal into 10kΩ  
**Validators:** BIT, LCOM  
**Protection:** Protected against temporary short to case ground  
**Position:** Point 0 to n, Programmable with 4-point resolution  
**Width Control:** Programmable  
**Range:** 4 to 100000 waveform points  
**Resolution:** 4 points  
**Source:** Channel 1

##### SINEWAVE OUTPUT

**Connector:** Rear panel BNC  
**Impedance:** 50Ω, ±1%  
**Level:** 1V into 50Ω  
**Protection:** Protected against temporary short to case ground  
**Source:** Sample clock frequency  
**Frequency Range and Resolution:** Same as Sample clock  
**Total Harmonic Distortion:** 0.05% to 100 kHz  
**Harmonics and non-related spurious:** < -30dBc to 50 MHz

##### SAMPLE CLOCK OUTPUT

**Connector:** Rear panel SMB  
**Level:** ECL  
**Impedance:** 50Ω, terminated to -2V

#### INPUTS

##### TRIG INPUT

**Connector:** Rear panel BNC  
**Impedance:** 10kΩ, ±5%  
**Threshold Level:** TTL  
**Min Pulse Width:** 20ns  
**Slope:** Positive or negative going edge.

##### 10 MHz REFERENCE INPUT

**Connector:** Rear panel BNC  
**Impedance:** 10kΩ, ±5%  
**Threshold Level:** TTL  
**Duty Cycle:** 50%, ±5%

##### AM INPUT

**Modulation Input:** Rear panel BNC  
**Impedance:** 1MΩ, ±5%  
**Max Input Voltage:** 12V

##### SAMPLE CLOCK INPUT

**Connector:** Rear panel SMB  
**Input Level:** ECL  
**Impedance:** 50Ω, terminated to -2V  
**Range:** DC to 50MHz  
**Min. Pulse Width:** 4 ns

##### SYNCHRONIZATION CONNECTOR

**Connector:** Rear panel 9-pin DSUB  
**Interconnecting Cable:** Optional, consult factory at the time of purchase

#### MODULATION

**Carrier Waveform:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbitrary waveforms  
**Run Modes:** Continuous, Triggered, Burst and Gated  
**Trigger Advanced Mode:** Automatic, Triggered, Gated or Software Command

##### Marker

**Output & Level Position:** Same as SYNC output.  
Programmable for selected frequency

#### FM

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbitrary waveforms

**Carrier Frequency:** Waveform dependent  
**Modulating Waveforms:** Sine, Square, Triangle and Ramp  
**Modulation Source:** Internal  
**Modulating Frequency:** 1mHz to 100 kHz  
**Deviation Range:** 100mS/s to 25MS/s  
**Frequency Distortion:** <0.1%  
**Resolution:** 12 digits, limited by 1µHz  
**Accuracy:** 0.1%

#### ARBITRARY FM

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbitrary waveforms

**Carrier Frequency:** Waveform dependent  
**Modulating Waveform:** Arbitrary waveform, 10 to 20000 waveform points

**Modulation Source:** Internal  
**Modulating Waveform:**  
**Sample Clock:** 1mS/s to 2MS/s  
**Deviation Range:** 100mS/s to 25MS/s  
**Frequency Distortion:** <0.1%  
**Resolution:** 12 digits, limited by 1µHz  
**Accuracy:** 0.1%

# Specification 50MS/s Dual-Channel Arbitrary Waveform Generator

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### AM

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbitrary waveforms

**Carrier Frequency:** Waveform dependent

**Modulation Source:** External

**Envelop Frequency:** 1μHz to 500kHz

**Sensitivity:** 0V to +5V (5Vp-p) produce 100% modulation

**Modulation Depth:** 0% to 100%

### FSK

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbitrary waveforms

**Carrier Sample**

**Clock Range:** 100mS/s to 50MS/s

**Modulation Source:** External, Rear panel Trigger input BNC.

**Low level:** Carrier sample clock

**High level:** Hop frequency

**Baud Rate Range:** 1bits/sec to 10Mbits/sec

**Minimum FSK Delay:** 1 waveform cycle + 50ns

### RAMPED FSK

**Ramp Time Range:** 10μs to 1s

**Resolution:** 3 digits

**Accuracy:** ±0.1%

### SWEEP

**Carrier Waveforms:** Sine, Square, Triangle, Ramp, Arb

**Sweep Step:** Linear, Logarithmic or Arb

**Sweep Direction:** Up or down

**Sweep Range:** 100mS/s to 50MS/s

**Sweep Time:** 1ms to 1000s

**Resolution:** 9 digits

**Accuracy:** ±0.1%

### TRIGGERING CHARACTERISTICS

**System Delay:** 1 Sample Clock+150ns

**Trigger Start, Stop,**

**Phase Control:** 0 to 512k points (1M option)

**Resolution:** 4 points

**Breakpoint Error:** ±4 points

**Breakpoint Source:** External (Rear Panel Trigger Input BNC), Manual, or software command through Ethernet, USB or GPIB

### EXTERNAL

**Connector:** Rear panel BNC  
**Level:** TTL  
**Slope:** Positive or negative  
**Frequency:** DC to 2MHz  
**Impedance:** 10kΩ, DC coupled

### INTERNAL

**Range:** 100mHz to 2MHz  
**Resolution:** 12 digits, limited by 1μHz  
**Accuracy:** 0.1%

### MANUAL

**Source:** Soft trigger command through the front panel or external interface

### GATED MODE

External signal enables generator. First output cycle synchronous with the active slope of the triggering signal. Last cycle of output waveform always completed

### BURST

**Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian Pulse, Exponential Fall, Rising Pulse, Noise, DC, Arb

**Counted Burst Cycles:** 1 to 1Meg, programmable  
**Source:** Manual, Internal or External

### MULTI-INSTRUMENT SYNCHRONIZATION

**Description:** Multiple instruments can be connected together and synchronized to provide multi-channel synchronization.

### PHASE (LEADING EDGE) OFFSET

**Description:** Leading edge of master output trails the leading edge of the slave output by a programmable number of points. Each slave can be programmed to have individual offset.

**Range:** 0 to 512k points (1M optional)  
**Resolution and Accuracy:** 4 point  
**Initial Skew:** < ±15ns, depending on cable length and quality, typically with 0.5 meter coax cables

### GENERAL

**Power Supply:** 85 to 265V, 48 to 63Hz,  
**Power Consumption:** 60W max  
**Display:** Color LCD, 3.5" reflective, 320 x 240 pixels, back-lit

**Operating temperature:** 0 - 50°C

**Humidity (non-condensing):** 11°C to 30°C: 85 %  
31°C to 50°C: 75 %

**Storage temperature:** -40°C to +70°C.  
**Interface:** Ethernet 10/100, USB 2.0 and GPIB standard

**Language:** IEEE-488.2 - SCPI - 1993.0  
**Dimensions:** 212 x 88 x 415mm (WxHxD)  
**Weight:** Approximately 7 lb  
**Safety:** EN61010-1, 2nd revision  
**EMC:** CE marked. Designed to meet VDE 0411/03.81 and UL 1244

**Reliability:** MTBF per MIL-HDBK-217E, 25°C, Ground Benign

**Workmanship Standards:** Conform to IPC-A-610D  
**Supplied Accessories:** Power Cord, USB cable, CD containing Operating Manual, ArbConnection software and developer libraries.  
**Warranty:** 5 years standard

### ORDERING INFORMATION

**MODEL** WW5062

50MS/s Dual-Channel ArbitraryWaveform Generator

### OPTIONS

**1Meg:** 1 Meg Memory

### ACCESSORIES

**Sync cable:** Sync cable for multi instrument synchronization  
**S-Rack mount:** 19" Single Rack Mounting Kit  
**D-Rack mount:** 19" Dual Rack Mounting Kit  
**Case Kit:** Professional Carrying Bag

**Note:** Options and Accessories must be specified at the time of your purchase.



**TABOR ELECTRONICS Ltd.**

*The measure of perfection*