# 100MS/s Single-Channel Arbitrary Waveform Generator

TABOR'S NEW WW WONDER WAVE SERIES

# MODEL WW1071

- Single-channel 100MS/s waveform generator
- 1 Meg waveform memory, 2Meg memory, optional
- 14 digits frequency resolution (limited by 1μHz)
- 14 Bit amplitude resolution
- 1 ppm clock accuracy and stability
- Sine and Square waves to 50MHz
- 10 Built-in popular standard waveforms library
- Sophisticated Memory Management, including segmentation and sequences
- AM, FM, Arbitrary FM, FSK, Ramped FSK modulations
- Linear and Logarithmic Sweep
- User-friendly 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

The 1071 system represents a new dimension in arbitrary waveform generator design. With an unprecedented combination of arbitrary generator and synthesizer, versatility, high resolution and wide frequency range, and outstanding performance-to-price ratio, the 1071 delivers diverse benefits that will facilitate tasks in many fields.

**100MS/s Sample Rate**
New technology requirements are driving communications systems to use increasingly narrow channel widths. A high sample rate of 100MS/s makes the 1071 an ideal modulation source for troubleshooting new encoding schemes. The 1071 also provides high-speed waveforms to simulate signal distortion, video signals, component failures, and power supply line cycle dropouts and transients.

**High Performance**
Each channel of the 1071 delivers precise waveforms with 14 bits of amplitude resolution and 14 digits of frequency resolution with extremely low phase noise.

Exceptional electrical performance includes up to 10Vp-p into 50Ω over the full frequency range. Selectable filters ensure clean stimulus waveforms enabling the generator to simulate modulation waveforms.

**14 Bit Resolution**
The 14-bit resolution provides 16,384 output levels. This means that even audio waveforms can be generated with excellent fidelity. It also allows video-and other complex waveforms-to be generated with small details superimposed on large signals, in order to test the response of receiving systems.

**Function Generator**
When used as a simple function generator the instrument offers ten basic waveforms with adjustable parameters all of which are accessible from the front panel. These are sine, triangle, square, pulse, ramp, sinc, Gaussian, exponential (up and down), noise, as well as DC. Sine and square waves can be generated at up to 50MHz.

**2M Memory**
The 1071 offers 1M word (2M word optional) memory for arbitrary waveforms. In addition, the memory can be divided into as many as 4096 segments, which can be looped and linked in many different ways. Using 1M word at 25MS/s to generate a video signal, for example, the duration is 0.04 seconds, 25Hz, even without any looping of repetitive elements.

**Sequence Generator**
When the sequencing facilities are employed, the 1071's uniqueness is obvious. The memory segments can be linked and repeated in any combination both manually and under programmed control. This allows test software to switch between many different waveforms rapidly without the need to download multiple times, enhancing test throughput in a way that unmatched by competing products.

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The sequence generator has four advanced modes: automatic, stepped, single and mixed, which make it even a more powerful tool.

**High-Quality Modulation Signal Source**

One of the many attractive features of the 1071 is the sample clock modulation function. In ordinary arbitrary waveform generators, to make a frequency modulated sine wave you have to enter the complete mathematical function. Not so with the 1071: all that is necessary is generating the carrier signal, and then modulating the clock to obtain the required result. The sample clock modulation can be done using internal waveforms such as sine, square, triangle, and ramp or using downloaded arbitrary modulating waveforms. This allows you to generate signals that would be difficult or impossible to define using an equation. AM, Linear and Logarithmic Sweeps, FSK and Ramped FSK are available as well.

**Triggering Facilities**

However versatile the waveform generation systems are made, the need for external control of generation is vital. The triggering facilities of the 1071 match the generation functions in versatility. In the simplest mode, signals are output continuously. The 1071 also offers the triggered mode, gated mode, external burst mode, and internal burst mode, all of which can use an external trigger signal or an internal trigger. The use of external sources to prompt the switching of segments has already been mentioned.

**Easy to use**

Large and user-friendly 3.5" back-lit color LCD display facilitates browsing though 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.

**Multi-Instrument Synchronization**

Multiple 1071 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.


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**TABOR ELECTRONICS Ltd.**

# Specification
# 100MS/s Single-Channel Arbitrary Waveform Generator

# Model WW1071

## 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:** 100µHz to 50MHz
**Start phase:** 0 to 360°

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

| | |
|---|---|
| DC to 1MHz | -50dBc |
| 1 to 5MHz | -45dBc |
| 5 to 10MHz | -35dBc |
| 10 to 50MHz | -22dBc |

**Non-Harmonic Distortion:**

| | |
|---|---|
| DC to 10MHz | -60dBc |
| 10 to 50MHz | -50dBc |

**Total Harmonic Distortion:**

| | |
|---|---|
| DC to 100kHz | 0.1% |

**Flatness (1kHz):**

| | |
|---|---|
| DC to 1MHz | 1% |
| 1MHz to 25MHz | 5% |
| 25MHz to 50MHz | 20% |

### TRIANGLE

**Frequency Range:** 100µHz to 15MHz
**Start phase:** 0 to 360°

### SQUARE

**Frequency Range:** 100µHz to 50MHz
**Duty cycle:** 1% to 99%
**Rise/Fall time:** <10ns, typically < 8ns
**Aberration:** <5%

### PULSE

**Frequency Range:** 100µHz to 15MHz
**Delay, Rise/Fall Time, High Time Ranges:** 0%-99.9% of period (each independently)
**Rise/Fall time:** <10 ns, typically < 8ns
**Aberration:** <5%

### RAMP

**Frequency Range:** 100µHz to 15MHz
**Delay, Rise/Fall Time Ranges:** 0%-99.9% of period (each independently)

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

**Frequency Range:** 100µHz to 6.25MHz
**"0" Crossing:** 4 to 100 cycles

### GAUSSIAN PULSE

**Frequency Range:** 100µHz to 6.25MHz
**Time Constant:** 1 to 200

### EXPONENTIAL FALL/RISING PULSE

**Frequency Range:** 100µHz to 6.25MHz
**Time Constant:** -100 to 100

### REPETITIVE NOISE

**Bandwidth:** 25MHz

### DC

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

## ARBITRARY WAVEFORMS

**Sample Rate:** 100mS/s to 100MS/s
**Vertical Resolution:** 14Bits
**Waveform Memory:** 1Meg points standard, 2Meg points optional (per channel)

### MEMORY SEGMENTATION

**No. of Segments:** 1 to 2048
**Min. Segment Size:** 16 points
**Resolution::** 4 points size increments from 16 to 1M points (2M optional)

## 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)

**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:** 14 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%

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## FILTERS

**Type:** 50 MHz Elliptic
25 MHz Elliptic

## OUTPUTS

### MAIN OUTPUT

**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:** Main output

### 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 100KHz
**Harmonics and non-related spurious:** < -30dBc to 100MHz

### 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 100MHz
**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 Arbibrary waveforms
**Run Modes:** Continuous, Triggered, Burst and Gated
**Trigger Advanced Mode:** Automatic, Triggered, Gated or Software Command
**Marker**
Output & Level: Same as SYNC output.
Position: Programmable for selected frequency

### FM

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbibrary waveforms
**Carrier Frequency:** Waveform dependent
**Modulating Waveforms:** Sine, Square, Triangle and Ramp
**Modulation Source:** Internal
**Modulating Frequency:** 1mHz to 100KHz
**Deviation Range:** 100mS/s to 100MS/s
**Frequency Distortion:** <0.1%
**Resolution:** 14 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 Arbibrary waveforms
**Carrier Frequency:** Waveform dependent
**Modulating Waveform:** Arbitrary waveformm, 10 to 20000 waveform points
**Modulation Source:** Internal
**Modulating Waveform**
**Sample Clock:** 1mS/s to 2MS/s
**Deviation Range:** 100mS/s to 100MS/s
**Frequency Distortion:** <0.1%
**Resolution:** 14 digits, limited by 1µHz
**Accuracy:** 0.1%

### AM

**Carrier Waveforms:** Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC and Arbibrary 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 Arbibrary waveforms
**Carrier Sample Clock Range:** 100mS/s to 100MS/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%

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## SWEEP

| | |
|---|---|
| **Carrier Waveforms:** | Sine, Square, Triangle, Ramp, Arb |
| **Sweep Step:** | Linear, Logarithmic or Arb |
| **Sweep Direction:** | Up or down |
| **Sweep Range:** | 100mS/s to 100MS/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 1Meg points, (2Meg optional) |
| **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:** | 14 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 cyclesynchronous 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 1Meg points (2Meg 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 %<br>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** | **WW1071** |
| 100MS/s Single-Channel ArbitraryWaveform Generator | |

## OPTIONS

| | |
|---|---|
| **2Meg:** | 2 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.

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