200MS/s Four-Channel Arbitrary Waveform / Function Generator

TABOR'S NEW WONDER WAVE SERIES

New

MODEL WW2074

- Four-channel 200 MS/s waveform generator
- Sine and Square waves generated to 100MHz
- 16 Bit amplitude resolution
- 1M waveform memory, 2M/4M waveform memory, optional
- 10 Separate sequences link and loop segments in user-definable order
- Four separate SYNC outputs for independent channel synchronization
- 10 Vpp into 50Ω, double into open circuit
- Multiple run modes including trigger, re-trigger and trigger delay
- (n)PSK and (n)QAM modulation
- High resolution 3.8" LCD, color display
- Ethernet 10/100, USB 2.0 and GPIB interfaces
- Multi-Instrument synchronization
- ArbConnection software for easy waveform creation&control

The Model 2074, is a four-channel universal waveform synthesizer. It is built in a small case size to save space and cost but without compromising bandwidth and signal integrity. The instrument outputs either standard or user-defined waveforms in the range of 100 mHz to 80 MHz. 16-bit DAC's are used for building waveforms with excellent accuracy and resolution which are suitable for the finest test signals that are needed for today's sensitive instruments. Using the latest technology, you can be assured that the features and capabilities of the Model 2074 will be useful for many years.

Signal Integrity

As technology is evolving and new devices are developed every day, faster signals are needed to simulate and stimulate these new devices. The 2074 provides the highest bandwidth in its class and hence providing accurate duplication and simulation of test signals. With its wide range of sample clock generator (up to 200 MS/s), 16-bit vertical resolution and wide output bandwidth (over 100 MHz), one can create mathematical profiles, download the coordinates to the instrument and re-generate waveforms without compromising their fidelity and compatibility to the original design.

Four Synchronized Channels

The 2074 has four output channels of which are all synchronized to the same reference clock and share the same sample clock. This is not a limitation because the output frequency is a function of the number of points which are used for creating the waveform shape. On the other hand, the advantage of having four synchronized channels is huge in applications that require accurate and controlled phase between channels. Many applications require XY drive so two channels is just what is needed however, for three phase power simulation and four channel MEMS micro engine actuators, the Model 2074 is the most suitable product to use.

High Speed Function Generator

Care to use the instrument as a function generator? No need to fuss with loading complex waveform coordinates because the 2074 does the work for you. Select the standard waveforms tab and start generating any one from the ten waveforms that are pre-computed and available for immediate use. Included are: sine, triangle, square, pulse, ramp, sinc and others. Remember, however, that waveforms are created from sampling waveform points and therefore some of the waveforms cannot be generated above certain frequencies where the number of points are insufficient to draw a perfect shape. Regardless, using some trick, the 2074 will generate standard sine and square waveforms up to 80 MHz.

Stable and Accurate Output Signals

As standard, the instrument is equipped with a frequency reference that has 1ppm accuracy and stability over a period of 1 year. An external frequency reference is provided on the rear panel for applications requiring greater accuracy and stability.

200MS/s Four-Channel Arbitrary Waveform / Function Generator

Model WW2074

Waveform Memory and Memory Segmentation
Waveform memory is the internal "black board" where the waveforms are created and reside. Large memory bank provides for longer waveforms. One can use the entire memory for a single waveform or split the length to smaller segments. In this case, many waveforms can be stored in the same memory and replayed, one-at-a-time, when recalled to the output. The memory segmentation is combined with a sequence generator that can take different memory segments and link (and loop) them in any order as required for the test. The ability to loop waveform segments in a sequence saves a lot of memory space and hence, extends the capability of the generator to produce complex and much longer waveforms, which would otherwise require large banks of memory. The 2074 has four sequence generators that can be designed to generate unique sequences for each of its output channels.

Easy to use
Large and user-friendly 3.8" 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.

Remote Control
Access speed is an increasingly important requirement for test systems. Included with the instrument is a variety of interfaces: Ethernet, USB and GPIB so one may select the most suitable interface for the application. Remote control of instrument functions, parameters and waveform download is easily tailored to specific system environment regardless if it is just a laptop to instrument or full-featured ATE system. IVI drivers and factory support will speed up system integration and hence minimize time-to-market as well as significantly reduce system development costs.

Remote Calibration
Normal calibration cycles in the industry range from one to three years where instruments are sent to a service center, opened to allow access to trimmers, calibrated and certified for repeated usage. Leading-edge technology was implemented to allow calibration from any interface, USB, GPIB or LAN. Calibration factors are stored in a flash memory thus eliminating the need to open instrument covers.

Multiple Environments to Write Your Code
Model 2074 comes with a complete set of drivers, allowing you to write your application in various environments such as: Labview, CVI, C++, VB, MATLab. You may also link the supplied dll to other Windows based API's or, use low level SCPI commands (Standard Commands for Programmable Instruments) to program the instrument, regardless if your application is written for Windows, Linux or Macintosh operating systems.

MODULAR
Tabor's MODULAR software package gives wireless design and manufacturing engineers access to the most flexible signal generation tool in the market - the Arbitrary Waveform Generator (AWG). The AWG answers virtually all their test stimulus needs at baseband or IF/RF levels, whether required signals are analog or digital. With none of the limitations of traditional generators, Tabor's AWG allow any signal, simple or composed, clean or noisy, ideal or impaired, to be downloaded and played back.

ArbConnection
ArbConnection is a graphical tool that provides an unlimited source of 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.

Multi-Instrument Synchronization
Multiple 2074 can be synchronized using a Master-Slave arrangement allowing users to benefit from the same high quality performance in their multi-channels system.

200MS/s Four-Channel Arbitrary Waveform / Function Generator

Model WW2074

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 Wonder 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.

Specification
200MS/s Four-Channel Arbitrary Waveform / Function Generator

Model WW2074

CONFIGURATION

Output Channels 4, semi-independent

INTER-CHANNEL CONTROL

LEADING EDGE OFFSET

Description: Channel 1 used as start reference channel 2, 3 and 4 can be offset by a programmable number of points. Channels 3&4 must have the same duration in one of the following run modes: Triggered, Burst, or gated.
Jitter Between Channels: 0 ps
Offset Range: 0 to ±1M points (2M option), each CH. in reference to CH 1
Resolution and Accuracy: 1 point, channel 1/2; 4 points, channels 3/4
Initial Skew: ±(1 SCLK +1 ns) between channels; 1 ns between channels 3 and 4.

INTER-CHANNEL DEPENDENCY

Separate controls: Output on/off, amplitude, offset, standard waveforms, user waveforms, user waveform size, sequence table
Common Controls: Sample clock (Arb), frequency (Std), reference source, trigger modes, trigger advance source, SYNC output, Modulation

STANDARD WAVEFORMS

Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian, Exponential, Repetitive Noise, DC, Half-Cycle.
Frequency Range: Waveform dependent
Source: Internal synthesizer

SINE

Frequency Range: 700µHz to 80MHz
Start Phase Range: 0-360°
Start Phase Resolution: 0.01°

Harmonics Distortion:

	≤ 3Vpp	≤5Vpp	≤10Vpp
DC to 1MHz	-55dBc	-48dBc	-37dBc
1 to 10MHz	-50dBc	-43dBc	-35dBc
10 to 50MHz	-35dBc	-30dBc	-28dBc
50 to 80MHz	-28dBc	-25dBc	-23dBc

Non-Harmonic Distortion:

DC to 50MHz	-65dBc
50 to 80MHz	-60dBc

Total Harmonic Distortion:

DC to 20MHz	0.1%

Flatness (1kHz):

DC to 1MHz	1%
1MHz to 10MHz	3%
10MHz to 25MHz	5%
25MHz to 80MHz	10%
80MHz to 100MHz	15%

Phase Noise - Internal SCLK

100Hz Offset	-70dBc/Hz
1kHz Offset	-85dBc/Hz
10kHz Offset	-92dBc/Hz
100kHz Offset	-112dBc/Hz
1MHz Offset	-140dBc/Hz

TRIANGLE

Frequency Range: 700µHz to 25MHz
Start Phase Range: 0-360°
Start Phase Resolution: 0.01°

SQUARE

Frequency Range: 700µHz to 80MHz
Duty Cycle Range: 0% to 99.9%
Rise/Fall Time: <4ns
Aberration: <5%+10mV

PULSE

Frequency Range: 700µHz to 25MHz
Delay, Rise/Fall Time, High Time Ranges: 0%-99.9% of period (each independently
Rise/Fall Time: <4ns
Aberration: <5%+10mV

RAMP

Frequency Range: 700µHz to 25MHz
Delay, Rise/Fall Time Ranges: 0%-99.9% of period (each independently)

SINC (Sine(x)/x)

Frequency Range: 100µHz to 25MHz
"0 Crossings": 4-100

GAUSSIAN

Frequency Range: 700µHz to 25MHz
Time Constant: 10-200

EXPONENTIAL PULSE

Frequency Range: 700µHz to 25MHz
Time Constant: -100 to 100

REPETITIVE NOISE

Bandwidth: 80MHz

DC

Range: -5V to 5V

HALF-CYCLE WAVEFORMS

Function Shape: Sine, Triangle, Square
Frequency Range: 0.01Hz to 1MHz
Phase Start Range (Sine/triangle only): 0 to 360°
Phase Resolution: 0.01°
Duty Cycle Range: 0% to 99.9%
Run Modes: Continuous, Triggered
Delay Between Half Cycles (Continuous only): 200ns to 20s
Delay Resolution 20ns

ARBITRARY WAVEFORMS

Sample Rate: 1.5S/s to 200MS/s (typically 250MS/s)
Vertical Resolution: 16 bits
Waveform Memory: 1M points (2M or 4M optional)

MEMORY SEGMENTATION

No. of Segments: 1 to 10k
Min. Segment Size: 16 points
Resolution: 4 points size increments from 16 to 1M points (2M or 4M optional)

SEQUENCED WAVEFORMS

Operation: Segments may be linked and repeated in a user-selectable order to generate extremely long waveforms. Segments are advanced using either a command or a trigger

ADVANCE MODES

Automatic Sequence Advance: No trigger required to step from one segment to the next. Sequence is repeated continuously per a pre-programmed sequence table.
Stepped Sequence Advance: Current segment is sampled continuously until a trigger advances the sequence to the next programmed segment and sample clock rate.
Single Sequence Advance: Current segment is sampled the specified number of repetitions and then idles at the end of the segment. Next trigger samples the next segment the specified repeat count, and so on.

Specification
200MS/s Four-Channel Arbitrary Waveform / Function Generator

Model WW2074

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).
Sequencer Steps: 1 to 4096
Segment Loops: 1 to 1Meg
Min. Seg. Duration: 600ns
Multi Sequence: 1 to 10, Selectable

DIGITAL PULSE GENERATOR

Channel Dependency: All 4 channels share pulse parameters except level, polarity, delay and state
Pulse State: On/Off
Pulse Mode: Single or double, programmable
Polarity: Normal, inverted or complemented
Period: 80 ns minimum, programmed with 4 ns increments
Pulse Width: 4 ns minimum, 1e3 Sec max.
Rise/Fall Time: <4ns
High Time: 0 ns minimum, 1e3 Sec max.
Delay: 0 ns minimum, 1e3 Sec max.
Double Pulse Delay: 0 ns minimum, 1e3 Sec max.
Amplitude Window: 10mVp-p to 10Vp-p
Low Level -5V to +4.990V
High Level -4.990V to +5V

NOTES:

1. All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 1,000,000 to 1. With the 2M/4M option, the ratio is extended to 2,000,000 (4,000,000) to 1, hence the specifications below do not show maximum limit as each must be computed from the above relationship.
2. Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 100,000 to 1.
3. The sum of all pulse parameters must not exceed the pulse period setting

COMMON CHARACTERISTICS

FREQUENCY

Resolution:
Front Panel 11 digits (limited by 1µHz)
Remote 14 digits (limited by 1µHz)
Accuracy & Stability: Same as reference

10MHz REFERENCE CLOCK

Internal 0.0001% (1 ppm 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 (1kHz):
10mV to 99mVp-p ±(1% + 5mV)
100mV to 999mVp-p ±(1% + 10mV)
1V to 10Vp-p ±(1% + 70mV)

OFFSET

Range: 0 to ±4.995V, into 50Ω
Resolution: 1mV
Accuracy: ±(1%+1% of Amplitude +5mV)

FILTERS

Type: 25MHz Bessel
50MHz Bessel
60MHz Elliptic
120MHz Elliptic

OUTPUTS

MAIN OUTPUTS

Connectors: Front panel BNC, each channel
Impedance: 50Ω ±1%
Protection: Short Circuit to Case Ground, 10s max
Standby: Output On or Off (Output Disconnected)

SYNC OUTPUTS

Connectors: Rear panel BNC, separate for each channel.
Level: TTL
Sync Type: Pulse with Arbitrary and Standard Waves; LCOM in Sequence and Burst Modes

SAMPLE CLOCK OUTPUT

Connector: Rear panel SMB
Level: 400mVp-p
Impedance: 50Ω

COUPLE OUTPUT

Connector: Rear panel SMB
Level: LVPECL
Impedance: 50Ω, terminated to +1.3V

INPUTS

TRIGGER INPUT

Connector: Rear panel BNC
Impedance: 10kΩ
Slope: Positive or Negative (selectable)
Programmable Level: ±5V
Sensitivity: 200mV
Damage Level: ±12V
Pulse Width: >10ns minimum

EXTERNAL REFERENCE INPUT

Connector: Rear panel SMB
Frequency: 10MHz
Impedance&Level:
Default 10kΩ ±5%, TTL, 50% ±2% duty cycle
Option 50Ω ±5%, 0dBm Sinewave (with internal jumper)

SAMPLE CLOCK INPUT

Connector: Rear panel SMB
Input Level: 300mVp-p to 1Vp-p
Impedance: 50kΩ
Minimum Pulse Width: 4 ns

COUPLE INPUT

Connector: Rear panel SMB
Input Level: LVPECL
Impedance: 50Ω, terminated to +1.3V
Minimum Pulse Width: 4 ns

MODULATION

Carrier Waveform: Sinewave
Modulation Source: Internal
Run Modes: Off (Outputs CW), Continuous, Triggered, Delayed Trigger, Burst, Re-trgger and Gated
Advance Source: Front panel button, Software commands, Rear panel TRIG IN

(n)PSK and (n)QAM

Carrier Waveform: Sine wave
Carrier Frequency: 1Hz to 75MHz
Carrier Control: On/Off
Modulation Type: PSK, BPSK, QPSK, OQPSK, PI/4 DQPSK, 8PSK, 16PSK, 16QAM, 64QAM, 256QAM and User Defined
Symbol Rate Range: 1S/s to 1MS/s
Carrier Control: On/Off
Symbol Period Accuracy: ±(500ns + Carrier Period)
Table Size: 2 to 4096

WIRELESS SIGNAL GENERATION

EVM (Error Vector Magnitude)

	0.1 MS/s	1 MS/s	5 MS/s
10 MHz	0.15% (1)	0.30% (1)	1.40% (1)
80 MHz	0.25% (2)	0.50% (2)	1.20% (2)

Test conditions:
Sample Clock Frequency = as specified
Sample Clock = External
Modulation = QPSK
Baseband Filter = Raised Cosine
Alfa = 0.35

TABOR ELECTRONICS Inc.
Since 1971

Specification
200MS/s Four-Channel Arbitrary Waveform / Function Generator

Model WW2074

ACLR (Adjacent Channel Leakage Power Ratio)

	0.1 MS/s	1 MS/s	5 MS/s
10 MHz	73 dB (1)	73 dB (1)	65 dB (1)
80 MHz	64 dB (2)	64 dB (2)	60 dB (2)

Test conditions:

Sample Clock Frequency = as specified
Sample Clock = External
BW = Symbol Rate;
Offset = 1.35 x Symbol Rate

(1) Sample Clock Frequency = 100 MS/s
(2) Sample Clock Frequency = 200 MS/s

TRIGGER CHARACTERISTICS

RUN MODES

Continuous: Free-run output of a waveform.
Triggered: Upon trigger, outputs one waveform cycle. Last cycle always completed.
Gated: External signal transition enables or disables generator output. Last cycle always completed
Burst: Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.
Mixed: First output cycle is initiated by a software trigger. Consequent output requires external triggers through the rear panel TRIG IN

TRIGGER SOURCE

EXTERNAL

Source: Rear panel BNC
Trigger Level: ±5V
Resolution: 1mV
Input Frequency: DC to 2.5MHz
Min. Pulse Width: >10ns
Slope: Positive/Negative transitions, selectable
Trigger Jitter: ±1 sample clock period

DELAYS (Trigger input to waveform output)

System Delay: 6 sample clock cycles+150ns
Trigger Delay: [(0; 200ns to 20s) + system delay]
Trigger Resolution: 20ns
Trigger Delay Error: 6 sample clock cycles+150ns

INTERNAL / RETRIGGER (BUS)

Range: 200ns to 20s
Resolution: 20ns
Error: 3 sample clock cycles+20ns

MANUAL

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

FREQUENCY COUNTER / TIMER

Measurements: Frequency, Period, Avaraged Period, Pulse Width and Totalize
Source: Trigger Input
Range: 10Hz to 100MHz (typically 120MHz)
Sensitivity: 500mVpp
Accurcay: 1ppm
Slope: Positive/Negative transitions
Gate Time: 100µSec to 1 Sec
Input Range: ±5V
Trigger Modes: Continious, Hold and Gated
Period Avaraged
Range 10ns to 50ms
Resolution 7 digits / Sec
Period and Pulse Width
Range 500ns to 50ms
Resolution 100ns
Totalize
Range 10^{12}-1
Overflow Led indication

MULTI-INSTRUMENT SYNCHRONIZATION

Description: Multiple instruments can be daisy-chained together and synchronized to provide multi-channel synchronization.
Initial Skew: <25 ns + 1 sample clock cycle, depending on cable length and quality, typically with 1m cables
Waveform Types: Standard, Arbitrary and Sequenced using the automatic sequence advance mode only
Run Modes: Continuous, Triggered, Gated and Counted Burst

LEADING EDGE OFFSET

Description: Leading edge offset is programmable for master and slave units.
Run Mode: Continuous run mode only
Offset Range: 200 ns to 20 s
Resolution&Accuracy: 20 ns

GENERAL

Power Supply: 85 to 265Vac, 48-63 Hz
Power Consumption: 60W
Front Panel Display: Color LCD, 3.8" reflective, 320 x 240 pixels, back-lit
Operating temperature: 0°C - 50°C
Humidity (non-condensing): 11°C - 30°C 85%
31°C - 40°C 75%
41°C - 50°C 45%
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 415 mm (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	WW2074

200MS/s Four-Channel ArbitraryWaveform Generator

OPTIONS

2Meg: 2 Meg Memory
4Meg: 4 Meg Memory

ACCESSORIES

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.