100MS/s Dual-Channel Arbitrary Waveform Generator

MODEL 8026

- **Dual-channel 100 MS/s waveform generator**
- **Multi-Instrument synchronization**
- **14 Bit amplitude resolution, 18-bit offset resolution**
- **1 Meg word waveform memory, 4 Meg word memory, optional**
- **1ppm clock accuracy and stability**
- **Extensive modulation capabilities AM, FM, Arbitrary FM, FSK, Ramped FSK and Sweep**
- **Waveform sequencing with up to 4096 segments and sequences**
- **10 Built-in popular standard waveforms**
- **DDS technology delivers extremely low phase noise signals**
- **GPIB and RS-232 interfaces**
- **ArbConnection software for easy waveform creation & control**

The 8026 system breaks new ground in arbitrary waveform generator design. With its unprecedented combination of arbitrary generator and synthesizer, its versatility, its high resolution and wide frequency range, and its extremely good performance-to-price ratio, the 8026 offers a range of benefits that will facilitate work in many fields.

100 MS/s Sample Rate
The 100 MS/s sample rate allows the vertical accuracy to be converted into excellent performance at high frequencies. This opens up many applications in communication, video and television, telecommunication, radar, and ultrasonics, for example.

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.

Bench Operation
Looking at the instrument as a simple function generator, there are eleven basic waveforms with adjustable parameters. These are sine, triangle, square, pulse, ramp, sinc, Gaussian, exponential up, exponential down, noise, as well as DC. All are accessible from the front panel.

4 Meg Memory
The 8026 offers 1 Meg word (4 Meg word optional, per channel) memory for arbitrary waveforms. Given the 14-bit resolution, and the ability to operate the two channel instrument with two different clock frequencies, the generator offers enormous power. In addition, the memory can be divided into as many as 4096 segments, which can be looped and linked in many different ways. Using 1 Mword at 25 MS/s to generate a video signal, for example, the duration is 0.04 s, 25 Hz, even without any looping of repetitive elements.

Sequence Generator
When the sequencing facilities are invoked, the 8026 becomes truly unique. The memory segments can be linked and repeated in any combination both manually and under programmed control. Additional versatility is obtained by using the independent sequencing on the two channels.

In the automatic advanced mode, the complete sequence runs continuously and automatically under the control of a pre-programmed table. In the stepped sequence-advance mode, the current segment is looped continuously until a trigger is received, when the next segment is invoked. The single sequence advance mode runs the current segment once only, and then idles until the next trigger is received. There is even a mixed sequence mode in which each segment can be preprogrammed to run under either automatic-advance mode or in stepped advance mode.

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Fast Data Transfer
Arbitrary waveform data may be quickly transferred to the 8026 via RS-232C or GPIB - IEEE 488.2 - using a very fast DMA mode.

Sample Clock Modulation
One of the many attractive features of the 8026 is the sample clock modulation function. In a normal arbitrary waveform generator, to make a frequency modulated sinewave, you have to enter the complete mathematical function. Not so with the 8026: all you need to do is to generate the carrier signal, and then modulate the clock to obtain the required result. The sample clock modulation can be done by internal waveforms - sine, square, triangle, and ramp. Using downloaded arbitrary modulating waveforms, you can generate signals that would be difficult or impossible to define using an equation.

Frequency Shift Keying
Frequency shift keying could be accomplished by using the facilities already mentioned, but the 8026 includes an FSK function to simplify operations. A TTL input is used to control the shifting.

As a further refinement, the 8026 offers a ramped FSK function, in which the rate of change of frequency is controlled by the ramp time parameter.

Linear Logarithmic Frequency Sweep
A linear or logarithmic frequency sweep is offered, and of course the FM functions can be used to define more complicated variations.

Triggering Facilities
However versatile the waveform generation systems are made, the need for external control of generation is vital. The triggering facilities of the 8026 match the generation functions in versatility. In the simplest mode, signals are output continuously. The 8026 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.

Any point in a wave can be designated as a start point. On receipt of a trigger, the wave starts at this point, runs to the end, restarts seamlessly at the beginning, and stops at the point before the trigger point.
Separate breakpoints are programmable in each channel, triggerable from SCPI commands via GPIB or RS-232C, or by signals at the trigger input.

ArbConnection
Unlimited Source of Arbitrary Waveforms. With the ArbConnection software you can control instruments functions, modes and features. You can also create virtually an unlimited variety 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.

Three-year Warranty

Every Tabor Electronics instrument comes with a three-year warrantee. 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 three 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 Hattasia St. P.O.Box404,
Tel Hanan, Israel 20302
☎ +972 (4) 8213393
FAX +972 (4) 8213388
www.taborelec.com

EUROPE

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

Benelux (Belgium, The Netherlands and Luxembourg)
BFI Optilas B.V.
☎ +31 172 44 60 60
FAX +31 172 44 34 14

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

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

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

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

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

Germany
CompuMess Elektronik GmbH
☎ +49 89 321501-0
FAX +49 89 321501-11

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

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

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

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

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

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

Russia
CDIP
☎ +7 0959 56 2022
FAX +7 0959 56 2022

Spain & Portugal
Instrumentos De Media SL
☎ +34 91 300 0191
FAX +34 91 388 5433

Sweden & Finland
Ferner Elektronik AB
☎ +46 8 760 8360
FAX +46 8 760 8341

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

United Kingdom & Ireland
SEMATRON UK Ltd.
☎ + 44 1256 812222
FAX + 44 1256 812666

Yugoslavia (Bosnia, Croatia, Macedonia,Montenegro, Serbia, Slovenia)
Mechanic & Electronic Measurement
☎ +43 1943 4254
FAX +43 1943 4251

ASIA PACIFIC & JAPAN

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

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

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

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

New Zealand
Electrotest Ltd.
☎ +64 9 448 2600
FAX +64 9 448 2611

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

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

Taiwan, China & Hong Kong
Precision International Corp.

Taiwan
☎ +886 2 85124888
FAX +886 2 85124900

China & Hong Kong
☎ +86 21 64401300
FAX +86 21 64400524

AFRICA

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

MIDDLE EAST

Israel
Dan-El Technologies Ltd.
☎ +972 3 9271888
FAX +972 3 9271666

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

UNITED STATES

US SALES & SUPPORT OFFICE
☎ +1 909 7970484
FAX +1 909 7974955

IL, IN, IA, KS, KY, MN, MO, NE, ND, SD, WI
Base Eight, Inc.
☎ +1 847 670 1680
FAX +1 847 670 1737

AZ, CO, ID, MT, NM, TX, El Paso, UT, WY
Berry Technical Sales Inc.
☎ +1 303 665 9116
FAX +1 303 833 1294

AR, LA, OK, TX
Data Marketing Associates Inc.
☎ +1-972 661 0300
FAX +1 972 490 0836

OH, WV, PA, MI
Dytec EAST
☎ +1-330 405 8311
FAX +1 330 405 8313

DC, MD, VA
Eastern Instrumentation Corp.
☎ +1 410 884 7303
FAX +1 410 884 7306

PA, NJ
El Philly
☎ +1 856 231 0668
FAX +1 856 231 9022

HAW, NV, CA
Sierra Technical Sales
☎ +1 510 713 9957
FAX +1 510 713 9958

NJ, NY
Tera Technologies Inc.
☎ +1 888 921-TERA
FAX +1 888 449 2799

CT, ME, MA, NH, RI, VT
Test-Rep Associates, Inc.
☎ +1 978 692 8000
FAX +1 407 839 0337

AL, FL, GA, MS, NC, SC, TN
W.A Brown Instruments
☎ +1 407 648 9660
FAX +1 407 839 0337

CA, NV
W5 Inc.
☎ +1 949 212 1199
FAX +1 714 281 0767

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

LATIN AMERICAS

SALES & SUPPORT OFFICE
☎ +1 440 543 7710
FAX +1 440 543 9681

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Specification
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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 999999 points (1Meg, 4Meg optional)
Resolution and Accuracy: 1 point, or 1 sample clock period of channel 2
Initial Skew: < ±2ns, with sclk divider = 1; < ±3ns, 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 Pulse, Exponential Fall, Rising Pulse, Noise, DC.
Frequency Range: Waveform dependent
Source: Internal synthesizer

SINE

Frequency Range: 100µHz to 50MHz
Band Flatness: 5% to 10MHz; 20%, to 50MHz
Programmable Parameters: Start phase, 0 to 360°
Harmonics and non-related spurious at 5Vp-p:
<-55dBc for carrier frequencies 1MHz
<-45dBc for carrier frequencies 5MHz
<-40dBc for carrier frequencies 10MHz
<-22dBc for carrier frequencies 50MHz
Total Harmonic Distortion: 0.1% to 100kHz

TRIANGLE

Frequency Range: 100µHz to 12.5MHz
Start phase: 0 to 360°

SQUARE

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

PULSE

Frequency Range: 100µHz to 6.25MHz
Adjustable Parameters:

Delay	0% to 99.9% of period
Rise Time	0% to 99.9% of period
High Time	0% to 99.9% of period
Fall Time	0% to 99.9% of period

Rise/Fall time: <10 ns
Aberration: <5%

RAMP

Frequency Range: 100µHz to 12.5MHz
Adjustable Parameters:

Delay	0% to 99.9% of period
Rise Time	0% to 99.9% of period
Fall Time	0% to 99.9% of period

SINC (SINE(x)/x)

Frequency Range: 100µHz to 3.125MHz
"0" Crossing: 4 to 100 cycles

GAUSSIAN PULSE

Frequency Range: 100µHz to 3.125MHz
Time Constant: 10 to 200

EXPONENTIAL FALL/RISING PULSE

Frequency Range: 100µHz to 6.25MHz
Time Constant: -20 to 20

NOISE

Bandwidth: 25MHz

DC

Range: -100% to 100% of amplitude

ARBITRARY WAVEFORMS

SAMPLE CLOCK SOURCE

INTERNAL
Range: 100mS/s to 100MS/s

EXTERNAL
Connector: Rear panel BNC
Range: DC to 100MHz
Level: ECL 100k compatible

Vertical Resolution: 14Bits
Waveform Memory: 1Meg points standard, 4Meg points optional (per channel)

MEMORY SEGMENTATION

Number of Segments: 1 to 4096
Min Segment Size: 16 points
Memory Interleave: 4 (All trace lengths must be multiples of 4)

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.

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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 4096
Segment loops: From 1 to 1Meg
Segment Duration: Minimum 1µs for more than one loop.

COMMON CHARACTERISTICS

CHANNEL 1 and 2 OUTPUT

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

Frequency
Resolution: 7 digits limited by 1µS/s
Accuracy: 1ppm
Stability: 1ppm
Reference:
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, amplitude dependent
Resolution: 2.2 mV
Accuracy: ±1%

FILTERS 50 MHz Elliptic, 25 MHz Elliptic

SYNC/MARKER OUTPUT

Connector: Front panel BNC
Impedance: 50Ω, ±1%
Level: >2 V into 50Ω, 4V nominal into 10kΩ
Protection: Protected against temporary short to case ground
Validators: BIT, LCOM
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 100kHz
Harmonics and non-related spurious: < -30dBc

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
Sensitivity: 0V to +5V (5Vp-p) produce 100% modulation
Source: External
Modulation Range: 0 to 100%
Bandwidth: DC to 500kHz

MODULATION

FM

Waveform Modulation: Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian Pulse, Exponential Fall, Rising Pulse, Noise, DC, Arb
Source: Internal
Resolution: 7 digits
Accuracy: 0.1%
Frequency Distortion: <0.1%
Deviation Range: 100mS/s to 100MS/s
Trigger
Advanced Mode: Automatic, Triggered, Gated or Software Command

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

FM – BUILT-IN STANDARD WAVEFORMS

Carrier Waveforms: Sine, Square, Triangle and Ramp
Modulation Frequency Range: 1mHz to 100kHz

FM – DOWNLOADED ARBITRARY WAVEFORMS

Modulation Source: User waveform, any shape, 10 to 20000 waveform points
Modulation Sample Clock Range: 1mS/s to 2MS/s

FSK

Carrier Sample Clock Range: 100mS/s to 100MS/s
Source: External, Rear panel Trigger input BNC.
Low level: Carrier sample clock
High level: Hop frequency
Frequency Range: From 10MHz to DC
FSK Delay: Minimum 1 waveform cycle + 50ns

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RAMPED FSK

Ramp Time Range: 10µs to 1s, 3 digits, ±0.1%

SWEEP

Carrier Waveforms: Sine, Square, Triangle, Ramp, Arb
Type: Linear or Logarithmic
Direction: Up or down, depending on the start and stop setting
Sweep Time: 1ms to 1000s, 7 digits, ±0.1%
Range: 100mS/s to 100MS/s
Trigger
Advanced Mode: Automatic, Triggered, Gated or Software Command

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

TRIGGERING CHARACTERISTICS

TRIGGER SOURCES

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: 7 digits
Accuracy: 0.1%

MANUAL

Single trigger (front panel push-button) simulates an external trigger signal.

TRIGGER START PHASE

Description: Waveform starts from point n and completes at point n-1.
Range: 0 to 999999 waveform points (1Meg, 4Meg optional)
Resolution: 4 points

START/STOP CONTROL (BREAKPOINT)

Range: 0 to 999999 waveform points (1Meg, 4Meg optional)
Source: External (Rear Panel Trigger Input BNC), Manual, or software command through RS232 or GPIB
Resolution: 4 points
Breakpoint Error: ±4 points

SYSTEM DELAY

Trigger to waveform output: 1 Sample Clock+150ns

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

Number of cycles per burst: 1 to 1000000
Trigger source: Manual (Single), External or Internal

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 999999 points (1Meg, 4Meg optional)

Resolution and Accuracy: 4 point
Initial Skew: < ±15ns, depending on cable length and quality, typically with 1meter coax cables

GENERAL

Power requirements: 90 to 264V, 47 to 63Hz, 50W max
Display: 4 lines, 80 characters, backlit LCD.

Operating temperature: 0 - 40°C
Humidity (non-condensing): 11°C to 30°C: 85 %
31°C to 40°C: 75 %
Storage temperature: -40°C to + 70°C.
Interface: GPIB and RS232C standard
Language: IEEE-488.2 - SCPI – 1993.0
Dimensions: 212 x 88 x 415mm (WxHxD)
Weight: Approx 4kg
Safety: EN61010-1
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, CD containing Operating Manual, ArbConnection software and developer libraries.

ORDERING INFORMATION

MODEL	8026
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OPTIONS

4Meg: 4 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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