

## Data sheet

# 50 MHz Arbitrary Waveform/ Function Generators

## Models 4076 & 4079



4076



4079

### Industry Leading Performance

Models 4076 and 4079 are versatile high performance function/arbitrary waveform generators with the largest arbitrary memory depth in their class. The generators combine the ability to produce nearly any conceivable arbitrary waveform with accuracy and precision and a DDS architecture offering easy to use conventional function generator capabilities. Arbitrary waveforms have 14 bit amplitude resolution, 125 MSa/s sample rate and up to 4,000,000 points length. Waveforms can be output in continuous, triggered, gated or burst modes. Front panel operation is straightforward and user-friendly. The instruments can be remotely controlled using SCPI-compliant commands via RS232 or GPIB interface.

Extensive features such as internal or external AM, FM and FSK modulation along with versatile sweep capabilities and variable edge pulse generation make these generators suitable for a wide range of applications including electronic design, sensor simulation, functional test or generation of I/Q modulated signals.

### Common Features & Benefits

- 14-bit, 125 MSa/s, 4,000 k point Arbitrary Waveform Generator
- 50 MHz Sine / 50 MHz Square waveforms
- Predefined Pulse, Ramp, Triangle, Noise, Sin (X)/X, Exponential and Gaussian waveforms
- AM, FM and FSK modulation
- 10 mVpp to 10 Vpp into 50  $\Omega$
- Large graphical LCD shows a detailed output waveform representation
- Fully programmable markers
- Fully protected output
- Closed case calibration
- Arbitrary waveform editing software included
- SCPI compliant command set
- GPIB and RS-232 interfaces (standard)

### Dual Channel Model 4079

- Both channels offer full functionality. All waveform parameters such as frequency, amplitude and offset can be set independently
- Synchronize both output signals to the same clock signal (external or internal) and precisely adjust the phase relationship between the two signals
- Economical baseband I/Q signal source
- Saves cost and bench space

## ▲ Front panel



Informative LCD with detailed display of waveform parameters

Easy-to-use keypad allows efficient parameter configuration

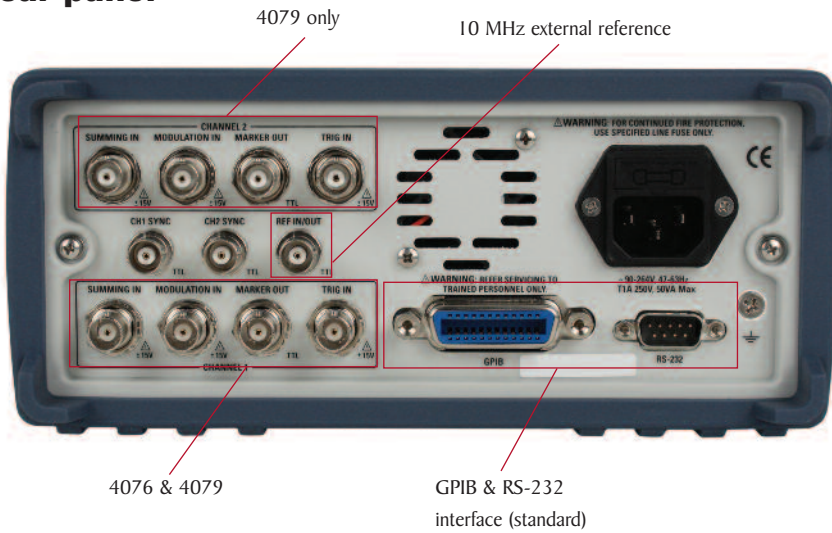
Model 4079 allows for both independent and phase synchronized waveform generation

## Intuitive user interface

These Waveform Generators use a menu-driven front panel keypad and control knob along with an easy-to-read graphical LCD to adjust all waveform parameters, which are visible at one glance. Arbitrary waveform editing and definition is flexible and easy: Waveforms can be defined from scratch by entering data point by point, by

loading and modifying predefined built-in waveforms or by downloading waveforms via the remote interface, using either the included arbitrary waveform generation software Wave-X or a custom program. Standard function generator waveforms sine, square, ramp and pulse can be created by pressing a single button.

## ▲ Rear panel



4079 only

10 MHz external reference

4076 & 4079

GPIB & RS-232 interface (standard)

## Flexible interface

Built-in 10 MHz external reference is included at no extra cost (both models).

This input/output let's you synchronize with another 4076/4079 generator or to an external 10 MHz Clock for precise phase adjustment.

Connect the programmable marker Output to the Trigger input of additional generators to create complex polyphase scenarios.

## 50 MHz Arbitrary / Function Generators Models 4076 & 4079

### Flexible memory management

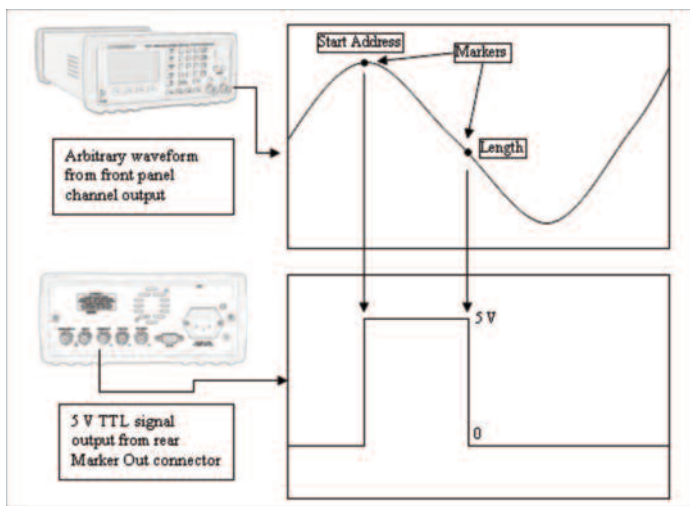
Unlike other comparable generators, which typically contain only a few fixed-size memory locations for waveform storage, the 4076 and 4079 gives users more freedom - the 4,000,000 point flash memory can be allocated to one large waveform or up to 50 different waveforms, each with a customizable length.

### Versatile noise generation

In Arb mode you can conveniently add noise to your waveform directly from the front panel and precisely adjust the scale of the noise amplitude. Unlike other generators that only produce a noise waveform, this feature allows you to choose between generating a noise waveform or adding noise to an existing waveform.

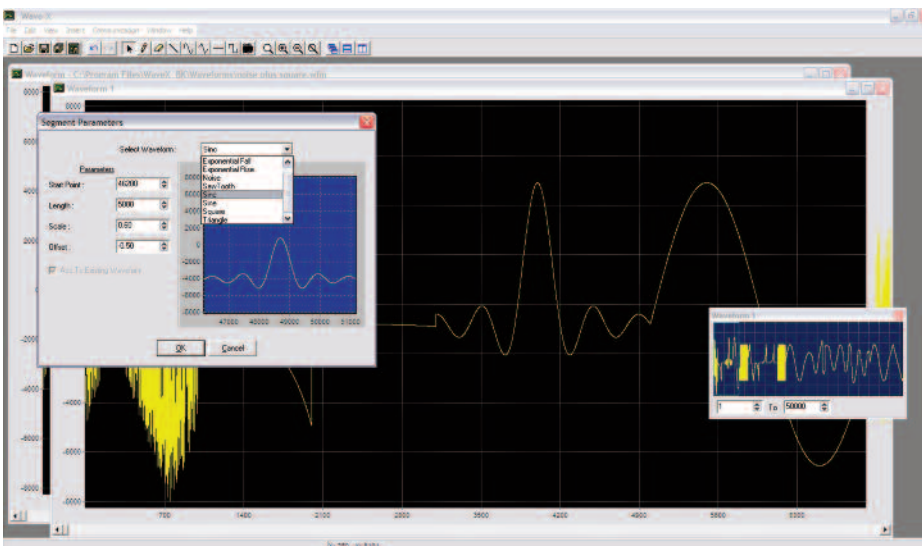
### Waveform Summing

The Summing Input on the rear panel allows waveforms from external signal sources to be summed with the output signal of the 4076 or 4079.



### Programmable Markers

Models 4076 and 4079 provide fully programmable markers, allowing you to generate a positive TTL level output signal at the points specified by address and length up to 4000 points. This feature is available in Arbitrary mode and can not be found in other comparable waveform generators. It could be used for applications requiring polyphase signal generation, e.g. simulation of a real world 3 phase AC network where one of the phases is degraded with spikes or noise.



### Generate waveforms with ease

The included PC Software allows you to easily generate, edit and download custom arbitrary waveforms.

Generate waveforms by importing a textfile, or define via freehand, point draw or waveform math. Waveforms can also be uploaded from the generator for documentation purposes.

| Specifications                   |                                                                                                                                                                                                                                  | models     |      |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|
|                                  |                                                                                                                                                                                                                                  | 4076       | 4079 |
| Channels                         | 1 Channel                                                                                                                                                                                                                        | 2 Channels |      |
| <b>Frequency Characteristics</b> |                                                                                                                                                                                                                                  |            |      |
| Sine                             | 1 $\mu$ Hz to 50 MHz                                                                                                                                                                                                             |            |      |
| Square                           | 1 $\mu$ Hz to 50 MHz                                                                                                                                                                                                             |            |      |
| Triangle, Ramp                   | 1 $\mu$ Hz to 5 MHz                                                                                                                                                                                                              |            |      |
| Pulse                            | 0.5 mHz to 25 MHz                                                                                                                                                                                                                |            |      |
| Accuracy                         | 0.001 % (10 ppm)                                                                                                                                                                                                                 |            |      |
| Resolution                       | 12 digits or 1 $\mu$ Hz                                                                                                                                                                                                          |            |      |
| <b>Arbitrary Characteristics</b> |                                                                                                                                                                                                                                  |            |      |
| Built-in Waveforms               | Sine, Triangle, Square, Noise, Ramp Up, Ramp Down, Sine(X)/X, Exponential Up, Exponential Down, Gaussian                                                                                                                         |            |      |
| Waveform Length                  | 2 points to 4,000,000 points                                                                                                                                                                                                     |            |      |
| Vertical Resolution              | 14 bits (16,384 levels)                                                                                                                                                                                                          |            |      |
| Noise                            | Add 1% to 100% to output waveform                                                                                                                                                                                                |            |      |
| Sampling Rate                    | 125 MSa/s, Point execution rate adjustable from 8 ns-100 s                                                                                                                                                                       |            |      |
| Frequency                        | Accuracy: 0.005% (50 ppm)<br>Resolution: 4 digits or 1 ps                                                                                                                                                                        |            |      |
| <b>Output Characteristics</b>    |                                                                                                                                                                                                                                  |            |      |
| Amplitude Range                  | 10 mV to 10 Vp-p into 50 $\Omega$                                                                                                                                                                                                |            |      |
| Amplitude Resolution             | 3 digits (1000 counts)                                                                                                                                                                                                           |            |      |
| Amplitude Accuracy (1 kHz)       | $\pm 1\% \pm 20$ mV of programmed output from 1 V – 10 V                                                                                                                                                                         |            |      |
| Flatness (relative to 1 kHz)     | $\pm 0.1$ dB to 10 MHz<br>$\pm 1$ dB to 50 MHz                                                                                                                                                                                   |            |      |
| Offset Range                     | $\pm 4.99$ V into 50 $\Omega$ , depending on the Amplitude setting                                                                                                                                                               |            |      |
| Offset Resolution                | 10 mV with 3 digits resolution                                                                                                                                                                                                   |            |      |
| Offset Accuracy                  | $\pm 1\% \pm 10$ mV into 50 $\Omega$                                                                                                                                                                                             |            |      |
| Output Impedance                 | 50 $\Omega$ typical                                                                                                                                                                                                              |            |      |
| Output Protection                | The instrument's output is protected against short circuit or nominal accidental voltages applied to the main output connector                                                                                                   |            |      |
| Filter                           | 9 pole Elliptic and 5 pole Bessel filters                                                                                                                                                                                        |            |      |
| <b>Waveform Characteristics</b>  |                                                                                                                                                                                                                                  |            |      |
| Harmonic Distortion (sine)       | DC-20 kHz, -65 dBc<br>20 kHz-100 kHz, 60 dBc<br>100 kHz-5 MHz, -45 dBc<br>5 MHz-50 MHz, -35 dBc                                                                                                                                  |            |      |
| Spurious (sine)                  | DC-1 MHz < -65 dBc                                                                                                                                                                                                               |            |      |
| Rise/Fall Time (square, pulse)   | < 6 ns (10% to 90%) at full amplitude into 50 $\Omega$                                                                                                                                                                           |            |      |
| Variable Duty Cycle              | 20% to 80% to 10 MHz (square)<br>40% to 60% to 30 MHz (square)<br>50% > 30 MHz (square)                                                                                                                                          |            |      |
| Variable Symmetry                | 10%-90% to 5 MHz (triangle)                                                                                                                                                                                                      |            |      |
| Symmetry at 50%                  | < 0.5 %                                                                                                                                                                                                                          |            |      |
| Linearity (triangle, ramp)       | < 0.1% of peak output (1 $\mu$ Hz to 250 kHz)                                                                                                                                                                                    |            |      |
| Aberrations                      | < 3 % of p-p amplitude $\pm 50$ mV                                                                                                                                                                                               |            |      |
| Pulse Width                      | 20 ns to <(Period-20 ns)<br>(10 ns resolution)                                                                                                                                                                                   |            |      |
| Variable Edge Time               | 100 ns to Width/0.625 (50 % duty cycle)<br>10 ns resolution                                                                                                                                                                      |            |      |
| <b>Operating Modes</b>           |                                                                                                                                                                                                                                  |            |      |
| Continuous                       | Output continuous at programmed parameters                                                                                                                                                                                       |            |      |
| Triggered                        | Output quiescent until triggered by an internal or external trigger, at which time one waveform cycle is generated to programmed parameters. Frequency of waveform cycle is limited to 20 MHz in ARB mode and 10 MHz in DDS mode |            |      |
| Gate                             | Same as triggered mode, except waveform is                                                                                                                                                                                       |            |      |

|                                                                                                      |                                                                                                                                |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                      | executed for the duration of the gate signal. The last cycle started is completed                                              |
| Burst                                                                                                | 2-999,999 cycles                                                                                                               |
| Phase                                                                                                | -180 to +180 degrees with 0.1 degree resolution                                                                                |
| Trigger Source                                                                                       | Trigger source may be internal, external or manual. Internal trigger rate 0.01 Hz-1 MHz (1 $\mu$ s – 100 s)                    |
| <b>Modulation Characteristics</b>                                                                    |                                                                                                                                |
| Amplitude Modulation                                                                                 |                                                                                                                                |
| Internal                                                                                             | 0.01 Hz-20 kHz sine, square or triangle waveform variable modulation from 0% to 100%                                           |
| External                                                                                             | 5 Vp-p for 100% modulation, 10 k $\Omega$ input impedance, 0.01 Hz – 50 KHz bandwidth                                          |
| Frequency Modulation                                                                                 |                                                                                                                                |
| Internal                                                                                             | 0.01 Hz-20 kHz sine wave, square or triangle                                                                                   |
| External                                                                                             | 5 Vp-p for 100% deviation, 10 k $\Omega$ input impedance 0.01 Hz – 50 kHz bandwidth                                            |
| FSK                                                                                                  |                                                                                                                                |
| Internal                                                                                             | 0.01 Hz to 1 MHz                                                                                                               |
| External                                                                                             | 1 MHz max.                                                                                                                     |
| <b>Sweep Characteristics</b>                                                                         |                                                                                                                                |
| Sweep Shape                                                                                          | Linear and Logarithmic, up or down                                                                                             |
| Sweep Time                                                                                           | 10 ms to 500 s                                                                                                                 |
| Sweep Trigger                                                                                        | internal, external, continuous or burst                                                                                        |
| <b>Inputs and Outputs</b>                                                                            |                                                                                                                                |
| Trigger IN                                                                                           | TTL Compatible<br>Maximum rate 20 MHz<br>Minimum width 20 ns<br>Input Impedance 10 k $\Omega$ nominal                          |
| Sync OUT                                                                                             | TTL pulse at programmed frequency, 50 $\Omega$ source impedance                                                                |
| Modulation IN                                                                                        | 5 Vp-p for 100% modulation<br>10 k $\Omega$ input impedance<br>DC to >50 kHz minimum bandwidth                                 |
| Marker Out                                                                                           | Positive TTL pulse user programmable in Arbitrary waveform, 50 $\Omega$ source impedance                                       |
| Reference IN-OUT                                                                                     | 10 MHz, TTL compatible, input or output, for external unit synchronization 50 $\Omega$ output impedance and 1 k $\Omega$ input |
| Summing IN                                                                                           | Adds signal from an external source to the main output. Input impedance is 500 $\Omega$                                        |
| <b>Internal Trigger</b>                                                                              |                                                                                                                                |
| Repetition                                                                                           | 1 ms to 100 s                                                                                                                  |
| Resolution                                                                                           | 4 digits                                                                                                                       |
| Accuracy                                                                                             | $\pm 0.002\%$                                                                                                                  |
| <b>General</b>                                                                                       |                                                                                                                                |
| Display Resolution                                                                                   | 160 x 80 dots LCD                                                                                                              |
| Remote Control Interface                                                                             | GPIB, RS-232                                                                                                                   |
| Store Memory                                                                                         | 50 full panel settings at power-off                                                                                            |
| Dimensions (WxHxD)                                                                                   | 8.4(213) x 3.5(88) x 10.8(275) inches (mm)                                                                                     |
| Weight                                                                                               | Approx. 2.5 kg (5.55 lbs)                                                                                                      |
| Power                                                                                                | 100-240 VAC $\pm 10\%$ , 50 VA max.                                                                                            |
| Temperature                                                                                          | Operating 0 $^{\circ}$ C to + 50 $^{\circ}$ C<br>Non-operating -20 $^{\circ}$ C to + 70 $^{\circ}$ C                           |
| Humidity                                                                                             | 95 % RH, 0 $^{\circ}$ C to 30 $^{\circ}$ C                                                                                     |
| EMC                                                                                                  | According to EN55011 for radiated and conducted emissions                                                                      |
| Electrical Discharge Immunity                                                                        | According to EN55082                                                                                                           |
| Safety Specifications                                                                                | According to EN61010, CE approved                                                                                              |
| <b>Three Year Warranty</b>                                                                           |                                                                                                                                |
| Accessories                                                                                          |                                                                                                                                |
| Supplied: CD containing user manual & Wave-X software, null modem serial interface cable, power cord |                                                                                                                                |