**Description**

Precision DDS function generator modules that offer high quality sine and square waves up to 25MHz (7029 & 7029A) and 50MHz (7031 & 7031A). Further features include noise generation, complex waveshapes, true pulse generator mode with variable rise and fall times, and 128K word arbitrary waveforms.

Extensive internal and external modulation capabilities include AM, FM, PM, PWM & FSK using any waveshape including noise. Full remote control facilities are available using USB connection on the rear of the CalBench console or connection internally to the control centre modules (upon request). Arbitrary waveforms can be saved and loaded via a front mounted USB flash drive socket.

The 7029 and 7031 are dedicated single channel generators, the 7029A and 7031A are dual channel versions that have two identical full performance channels.

These modules are suitable for testing applications, research and development, and diagnostics. Each one provides a simple operation solution to signal generation on the CalBench.

**Features**

- 0.001mHz to 25MHz (7029 & 7029A) / 50MHz (7031 & 7031A); 1μHz resolution
- 7029/7031: Single Channel / 7029A/7031A: Two Channel
- Arbitrary waveforms of up to 128K points at up to 125MS/s
- True pulse generator with variable delay and variable rise/fall
- Comprehensive internal & external digital modulations including AM, FM, PM, PWM & FSK
- Standard waveforms: sine, square, ramp, pulse, sin(x)/x, noise, exponential & logarithmic
- Waveform storage using USB flash drives
- Large graphic LCD with simultaneous text & waveform display
- Waveform Manager Plus for Windows software included
- Programmable via USB interface (internal to control centre)
Features in Detail

High Waveform Frequencies

Exceptional frequency precision
The frequency of these waveforms can be set with up to 14 digits or one micro
hertz of resolution. The DDS based frequency generation system uses a TCXO
timebase oscillator with a stability of 1ppm.

Waveform Quality
The 7031 and 7029 generate high purity sine waves with low harmonic distortion
and low phase noise. Square waves have a rise time of below 8ns (13ns on 7029)
and low overshoot. Variable symmetry can be used up to 25MHz.

Triangle and Ramp
High quality triangle and variable symmetry ramp waveforms are available up to
500kHz (7031) or 250kHz (7029). These waveforms are also available at higher
frequencies via the arbitrary function but without symmetry adjustment and with
reduced waveform quality as the frequency increases.

VLF generation
The high resolution of the DDS system means that very low frequencies can be
set. For example, a frequency of around 1mHz could be set with a resolution of
0.1% and a stability of 1ppm.

Full Pulse Generator capabilities

Both models incorporate a pulse generator mode which provides wide range pulse
width and delay independent of period. Rise and fall times (edge speeds) are also
fully variable.

Wide-range repetition rate
On the 7031, the pulse period can be set between 80ns and 2000 secs. (0.5MHz to
12.5MHz) with a resolution of 14 digits or 1µHz. On the 7029, the minimum pulse
period is 16ns (0.25MHz).

Fully variable pulse Width and Delay
Pulse width and pulse delay can be independently set to a resolution of 10ns.
Minimum pulse width is 20ns and duty cycles can be as low as one in two billion.

Independently variable Rise and Fall
The generators offer very fast edge speeds of better than 8ns on the 7031 or 13ns
on the 7029, but the edges can be slowed down to simulate slower pulses. Rise
and fall times are independently variable in the range 5ns to 40us (10ns to 40us on
the 7029), or can be linked so that both edge speeds are the same.

Trigger, Burst and Gate
As with all other waveforms, pulses can be triggered from an external trigger input
(or manual trigger, the internal trigger generator or a Bus command). Burst mode
creates a burst of between one and a million pulses in response to each active
edge of the trigger. Gated cause pulses to be generated only when the gate signal
is true. The gate source can be external or internal exactly as the trigger signal.

Arbitrary Waveforms

Both generators offer DDS generated arbitrary waveforms capability. A number
of standard waveforms are included, and up to four user defined arbitrary
waveforms can be stored in the instrument at any one time.

14 bits, 128k words, 125MS/s
Waveforms have a vertical resolution of 14 bits (16,384 amplitude levels). Waveforms can be created using between 2 and 131,072 points (128k).

Burst mode creates a burst of between one and a million pulses in

Storage of Instrument Set-ups
Up to nine complete set-ups of the instrument can be stored within its own non-
volatile memory. Up to 1000 further set-ups can be stored on each flash drive.

USB Flash Drive Interface

Both instruments incorporate a front mounted USB socket for connection of flash
memory disk drives which can store up to 1,000 waveforms and 1,000 set-ups.

Unlimited Waveform Storage
These drives can be used both to store waveforms permanently and to transfer
waveforms from or to a PC. Arbitrary waveform storage within the instrument
is limited to four waveforms. Each flash drive can store up to 1000 waveforms
which can be accessed using the instruments file handling utilities.

PRBS Waveforms

A PRBS (Pseudo-Random Bit Sequence) is a binary waveform with a sequence
that is almost impossible to predict. PRBS waveforms are used within secure
communications systems.

A PRBS is generated by a linear-feedback shift register with taps that generate a
feedback signal via an exclusive-OR gate. The number of stages determines the
sequence length (2N-1) whilst the clock frequency determines the bit rate. The
sequence length can be set to 7, 9, 11, 15, 20, or 23, resulting in sequence lengths
from 127 to 8,388,607 bits at rates between 1µbps to 50Mbps. Edges have variable rise and fall as per pulse waveforms.

The PRBS waveform can be used as both a carrier and a modulator.
**Features in Detail**

### Digital Modulation, Internal & External

Both generators offer a comprehensive set of digitally based modulations. The internal modulation source can use any of the standard or arbitrary waveforms currently within the generator (including noise) thus removing the need for an external modulation source. A modulating frequency between 1μHz and 20kHz can be specified. An external modulation input enables any external waveform source to be used when required. The external bandwidth is DC to 20kHz.

**AM, FM and PM**

Sine, square, ramp or arbitrary waveforms can be modulated using amplitude, frequency or phase modulation. Amplitude depth is variable from 0.0% to 120.0%, frequency deviation from zero to Fmax/2, and phase deviation from -360.0 to +360.0 degrees.

**PWM**

Pulse width modulation is available for the pulse function using any standard or arbitrary waveform including noise. Pulse width deviation is variable between 0% and 100%.

**Sum**

Sum modulation adds the modulating waveform to the carrier. It can be used with Sine, Ramp and Arbitrary carrier waveforms along with any modulating waveform.

**FSK and BPSK**

Frequency shift keying between any two frequencies is available for sine, square, ramp or arbitrary waveforms using the internal trigger generator or an external trigger signal. The internal trigger generator is variable between 2MHz and 1MHz with nine digit resolution.

BPSK (Binary Phase Shift Keying) is similar to FSK but it is the carrier’s phase, rather than its frequency, that switches between two values. It has advantages in terms of bandwidth used.

**PRBS**

A PRBS waveform can be used as a modulating waveform at bit rates between 1ubps to 1Mbps.

**Noise Generation**

Models can generate gaussian white noise to a -3dB bandwidth of 20MHz. The noise generation algorithm achieves a high crest factor (peak to rms ratio) of 5.27.

Adding Noise to a waveform

Noise can be added to any waveform except pulse. The amount of noise added can be specified as 0% to 50% of the amplitude of the carrier waveform.

Modulating with Noise

Noise can be used as the modulating waveform for AM, FM, PM or PWM modulations using any carrier waveforms allowable for that modulation type.

**Remote Control**

All functions of the generators can be controlled from the USB interface. Arbitrary waveform data can also be loaded. An IVI driver for Windows is supplied. As well as the rear mounted USB device interface connector, a front mounted USB Host interface connector allows USB Flash memory to be connected.

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**Sweep and Burst**

Sweep, Burst and Gated modes of operation are available using either an external trigger signal or the internal trigger generator.

**Wide range Frequency Sweep**

Phase continuous sweep is available for all standard and arbitrary waveforms except for pulse. The sweep range is from 1μHz through to the maximum for the chosen carrier waveform. Start and stop frequencies can be set independently. The sweep can be linear or logarithmic, triggered or continuous with a period between 1ms and 500s. The sweep trigger can be manual or internal from the trigger generator or external from the trigger socket or from a remote interface command. A marker is provided that outputs an edge synchronous with any frequency point within the sweep.

**Triggered Burst**

In Burst mode, each active edge of the trigger will produce one burst of the waveform. The number of cycles in a burst can be set between 1 & 1,048,575 (or infinite). The burst starts and ends at a waveform phase angle settable between -360.0 to +360.0 degrees.

**Trigger signal**

The trigger signal can be manual from the front panel key, internal from the internal trigger generator, external from the trigger-in socket, or remote via a bus command. The trigger-in socket has a nominal TTL threshold and can be set to +ve edge or -ve edge triggering. The minimum trigger pulse width is 50ns. The internal trigger generator is variable between 2MHz and 1MHz with 9 digit resolution.

**Gated**

In Gated mode the waveform runs only when the gate signal is true. The start point of the waveform is settable from -360.0 to +360.0 degrees and a the last cycle is completed after the gate signal goes false. All of the options available for triggering are available for gating. The trigger-in socket can be set as high or low for true.

**Locking to Other Sources**

Both the models include external reference and phase locking as standard.

**External Frequency Reference**

The generators use a high quality TCXO crystal as the internal frequency reference providing 1ppm accuracy and stability. If a higher accuracy or stability is required, an external 10MHz reference signal (from an off-air standard for example) can be applied to the Ref. Clock input.

**Phase Locking Two Generators (or more)**

Two generators can be synchronised together to provide outputs at the same frequency (or at harmonics) and with a phase difference. The amplitude and phase of these outputs can also be modulated providing the capability to perform QAM and OPSK respectively. Any waveform other than pulse can be used, and the phase difference is adjustable between -360.0 and +360.0 to a resolution of 0.1 degrees. Skew is better than 5ns. It is also possible to synchronise more than two generators but the resulting precision is not specified.
It is also possible to synchronise more than two generators but the phase difference is adjustable between -360.0 and +360.0 to a resolution of 0.1 degrees. Any waveform other than pulse can be used, and the phase difference provides the capability to perform QAM and QPSK respectively. The amplitude and phase of these outputs can also be modulated by frequency (or at harmonics) and with a phase difference.

**Phase Locking Two Generators (or more)**

Noise can be used as the modulating waveform for AM, FM, PM or Modulating with Noise. The amount of noise added can be specified as 0% to 50% of the amplitude of the carrier waveform. Noise can be added to any waveform except pulse. The amount of noise can therefore be accommodated. This is a highly flexible method which can be used to create arbitrary generator waveforms from signals captured by instruments such as oscilloscopes and network analysers, or from software such as MathCad.

**Coupled Operation**

The frequencies of the two channels can be coupled such that if frequency of one channel is changed the frequency of the other channel also changes either by a fixed ratio or fixed offset. Frequency coupling can be performed if the carrier waveforms on both channels are either Sine, Square, Ramp, Pulse or Arbitrary. Amplitudes (and DC offsets) of the two channels can be coupled such that changing the amplitude and offset on one channel changes the amplitude and offset of both channels.

Outputs of the two channels can be coupled such that switching the output on/off on one channel switches the output on/off of both channels.

**Tracking Operation**

When in tracking mode both channels behave as one channel. If inverse tracking is selected, both channel still behave as one channel except that the output of channel 2 is inverted.

**Relative Phase**

The relative phase can be set from -360 degrees to +360 degrees with 0.1 degree resolution. Pressing the ‘align’ key phase synchronises the two channels with the specified phase offset.

**Cross Channel Trigger**

Either channel can be triggered by the other channel to set up a complex and versatile inter channel trigger scheme. Each channel can have its trigger output waveform set up independently. Trigger Out may be selected to be carrier waveform referenced, modulation waveform referenced, sweep referenced, burst referenced or currently selected trigger of the channel.

**Waveform Manager Plus**

Waveform Manager Plus is a Windows based application for creation, editing and management of arbitrary waveforms using a PC. It incorporates a complete suite of tools for waveform creation and editing including standard waveforms, mathematical expressions and freehand drawing. Virtually any waveform can be created using combinations of these tools.

**Mathematical Expression Editor**

The sophisticated mathematical expression editor allows geometric, logarithmic and pulse functions to be combined to create exact representations of complex signals. Different expressions can be used for different sections of a waveform and can be combined with imported waveforms or drawn waveforms where mathematical representation is not possible.

**Import of Other Waveforms**

The program offers direct import from .csv files, the most commonly used format for graphical description. Additionally a Clipboard import function supports any waveform that can be described by a set of Y-axis data points regardless of their format. Any instrument or waveform generating program that can create a list of Y values can therefore be accommodated. This is a highly flexible method which can be used to create arbitrary generator waveforms from signals captured by instruments such as oscilloscopes and network analysers, or from software such as MathCad.

**High Resolution LCD Display and Soft Key Controls**

The 3.6" diagonal panel uses 256 x 112 pixels and provides a large amount of simultaneous information. System connection information is shown on the top line. Below that is a general status screen showing five major parameters. These parameters change depending upon the function being used. Below the status information is the main editing line which shows the parameter currently under control.

**Representative Waveform Display**

The area to the right of the status section shows a representation of the current waveform. This is more than just a fixed display for each waveform, it is calculated from the waveform parameters and gives a live indication when values such as symmetry, rise time or pulse width are changed. Even user defined arbitrary waveforms are shown (subject to the limitations of the display resolution). Modulation waveforms & representations of the modulated carrier are shown simultaneously. Burst count waveforms are shown graphically.

**Soft Key Control**

Six soft keys below the display provide access and control of the parameters for each function. All numeric parameters can be set directly from the numeric keypad, or can be changed using the knob wheel. Period entry can be chosen instead of frequency, and amplitude and offset can be changed to Hi and Lo levels. Frequencies can be entered in any units from Hz to MHz, periods from ns to seconds, and amplitudes in mV or V, ms or pk-pk, or in dBm. The currently selected waveform and major functions are also indicated by illumination of the respective keys.
Technical Specifications

Waveforms

Sine
Frequency range ........................................... 1 μHz to 50 MHz (7029 - 1 μHz to 25 MHz).
Frequency resolution ................................... 1 μHz, 14 digits.
Output level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.
Amplitude flatness (Relative to 1kHz) ........... < 100kHz 0.1dB, < 5 MHz 0.15 dB, < 20 MHz 0.3 dB, < 50 MHz 0.5 dB.
Harmonic distortion ....................................... < 1 Vp-p ± 1Vp-p
DC to 20 kHz ........................................... -65dBc
20 kHz to 100 kHz ..................................... -60dBc
100 kHz to 1 MHz ...................................... -45dBc
1 MHz to 25 MHz ....................................... -45dBc
25 MHz to 50 MHz ...................................... -29dBc
Non-harmonic spur ...................................... < -60 dBc to 1 MHz, <-60 dBc + 6 dB/octave 1 MHz to 50 MHz.
Phase noise ............................................. (10 kHz offset): -115 dBc/Hz, typical.

Square
Frequency range ........................................... 1 μHz to 50 MHz (7029 - 1 μHz to 25 MHz).
Frequency resolution ................................... 1 μHz, 14 digits.
Output level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.
Rise and fall times ..................................... <8 ns (7029 - <13 ns).
Overshoot ............................................... <5 %.
Variable duty cycle .................................... 20 % to 80 % to 10 MHz, 0.1 % resolution, 40 % to 60 % to 25 MHz, 0.1 % resolution, 50 % (fixed) above 25 MHz.
Asymmetry (@ 50 % duty) .............................. 1 % of period + 5 ns.
Jitter (RMS) ............................................. 0.5 ns + 100 ppm of period.

Ramp and Triangle
Frequency range ........................................... 1 μHz to 500 kHz (7029 - 1 μHz to 250 kHz).
Frequency resolution ................................... 1 μHz, 12 digits.
Output level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.
Linearity error ........................................... <0.1 % to 30 kHz.
Note the triangle and sawtooth waveforms are also available from the arbitrary waveform menu enabling repetition rates of up to 10 MHz / 6 MHz. Waveform quality will deteriorate at higher frequencies however.

Pulse
Frequency range ........................................... 500 μHz to 12.5 MHz (7029 - 500 μHz to 6.25 MHz).
Frequency resolution ................................... 1 μHz , 14 digits.
Output level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.
Overshoot ............................................... <5 %.
Rise/Fall times ........................................... <8 ns to 40 μs (7029 - <13 ns to 40 μs).
Resolution ................................................ 0.1 ns for rise/fall time, 100 ns; 1 ns for rise/fall >100 ns and ±2 μs; 10 ns for rise/fall >2 μs and ±40 μs.
Width range ............................................. 20 ns to 2000 s (20 ns minimum for period <40 s) (200 ns minimum for period >40 s and ≤400 s) (2 μs minimum for period >400 s).
Width Resolution ....................................... 10 ns (for period >40 s), 100 ns (for period >40 s and ≤400 s), 1 μs (for period >400 s).
Delay Range ............................................. 0 ns to 2000 s.
Delay Resolution ........................................ 10 ns (for period >40 s), 100 ns (for period >40 s and ≤400 s), 1 μs (for period >400 s).

Arbitrary
In built arbitrary waveforms (Sinc, Exponential Rise, Logarithmic Rise, DC, Positive and Negative Ramps and Square). Additional waveforms are supplied on disc (Cardiac, Gaussian, Exponential Fall, Logarithmic Fall). Up to 4 additional or user defined waveforms may be stored in non-volatile memory. Waveforms can be defined by downloading of waveform data via USB memory stick, remote interfaces, or editing via the modules front panel.
Waveform size .......................................... 2 points to 131072 points (128 k).
Waveform memory size ................................ Up to 4 waveforms of up to 64 k points, or 2 waveforms of up to 128 k points, or 2 of 64 k points plus 1 of 128 k points.
External waveform storage ............................ up to 1,000 waveforms per USB memory stick.
Vertical Resolution .................................... 14 bits.
Frequency Range ....................................... 1 μHz to 10 MHz (7029 - 1 μHz to 6 MHz).
Frequency Resolution ................................... 1 μHz, 14 digits.
Output Level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.
Sampling rate ......................................... 125 MS/s.
Output filter ............................................ Selects between 50 MHz Elliptic or 20 MHz Bessel filter depending on the waveform.

Arbitrary Waveform Creation and Editing
Both generators are supplied with Waveform Manager Plus. This Windows based software provides a sophisticated tool set for the creation, editing and management of arbitrary waveforms. The waveforms can be transferred to the generator either using a USB memory stick, or by the digital interfaces.

Noise
Gaussian white noise can be added to any carrier waveform (except pulse, square and noise itself) note however that noise can be added to the square wave available in the arbitrary menu. The amount of noise added can be specified as 0 % to 50 % of the amplitude of the carrier waveform. Noise can be used as modulating waveform.
Bandwidth (+3 dB) ...................................... 20 MHz typical.
Noise crest factor (Vp/Vrms) ......................... 5.27.
Output Level ............................................. 10 mV p-p to 10 V p-p into 50 Ohms.

Internal Frequency Reference
Oscillator Ageing Rate ............................... 1 ppm first year.
Temperature Stability ..................................<1 ppm over the specified temperature range.
### Technical Specifications (continued)

#### Modulation

**AM**
- Carrier waveforms: Sine, Square, Ramp, Arb.
- Modulation Source: Internal/External.
- Internal modulating frequency: 1 Hz to 20 kHz, 1 Hz resolution
- Amplitude depth: 0.0 % to 120.0 %, 0.1 % resolution

**FM**
- Carrier waveforms: Sine, Square, Ramp, Arb.
- Modulation source: Internal/External.
- Internal modulating frequency: 1 Hz to 20 kHz, 1 Hz resolution
- Frequency deviation: DC to Fmax/2, 1 Hz resolution

**PM**
- Carrier waveforms: Sine, Square, Ramp, Arb.
- Modulation source: Internal/External.
- Internal modulating frequency: 1 Hz to 20 kHz, 1 Hz resolution
- Phase deviation: -360.0 to +360.0 degrees, 0.1 degree resolution

**PDM**
- Carrier waveforms: Sine, Square, Ramp, Arb.
- Source: Internal/External (via TRIG IN)
- Internal modulation: 50 % duty cycle square (2 Hz to 100 Hz)

**FSK**
- Carrier waveforms: Sine, Square, Ramp, Arb.
- Source: Internal (via TRIG IN)
- Internal modulation: 50 % duty cycle square (2 Hz to 100 Hz)

**Triggered Burst**
- Each active edge of the trigger signal will produce one burst of the waveform.
- Carrier waveforms: Sine, Square, Ramp, Arb, Pulse
- Maximum carrier frequency: 10 MHz (finite cycles), 50 MHz (infinite), subject to carrier waveform.
- Number of cycles: 1 to 1048575 and infinite.
- Trigger repetition rate: 2 Hz to 1 MHz internal or 1 MHz external.
- Trigger signal source: Internal from keyboard or trigger generator.
- Trigger start/stop phase: 0 % to 100 % of pulse width, resolution as same as of pulse width

**Gated**
- Waveform will run while the Gate signal is true and stop while false.
- Carrier waveforms: Sine, Square, Ramp, Arb, Pulse, Noise
- Maximum carrier frequency: 10 MHz, subject to carrier waveform.
- Gate start/stop phase: 0 % to 100 % of pulse width, resolution as same as of pulse width

**Sweep**
- Frequency sweep capability is provided for both standard and arbitrary waveforms.
- Carrier waveforms: All standard and arbitrary except pulse.
- Sweep mode: Linear or logarithmic, triggered or continuous.
- Sweep direction: Up, down, up/down or down/up.
- Sweep range: 1 μHz to 50 MHz, subject to carrier waveform.
- Sweep time: 1 ms to 500 s (6 digit resolution).
- Marker: Variable during sweep.
- Sweep trigger source: The sweep may be free run or triggered from the following sources: Internal from keyboard or trigger generator. Externally from TRIG IN input or remote interface.

**Trigger Generator**
- Internal source 2 μHz to 1 MHz square wave adjustable in 1 us steps, 9 digit resolution. Available for external use from the SYNC OUT socket.

#### Outputs

**Main Output**
- Output impedance: 50 Ohms

**Amplitude**
- 20 mV to 20 Vp-p open circuit (10 mV to 10 Vp-p into 50 Ohms).

**Amplitude accuracy**
- 2 % ±1 mV at 1 kHz into 50 Ohm.

**DC Offset accuracy**
- Typically 3 % ±10 mV.

**Resolution**
- 3 digits or 1 mV for both Amplitude and DC Offset.

**Sync Out**
- Multifunction output user definable or automatically selected to be any of the following:
  - Carrier Waveform: The function varies with waveform type as follows:
    - Sine/Ramp/Pulse - A square wave with 50% duty cycle at the waveform frequency.
    - Square - A square wave with same duty cycle as the main output at the waveform frequency.
    - Arbs - A square wave with 50% duty cycle at the waveform frequency. The sync is a TTL high when the first point of the waveform is output.
  - Noise - No sync associated with noise.
  - Modulation Sync: The function varies with modulation type as follows:
    - AM/FM/PM/PWM - A wave square with 50% duty cycle referenced to the internal modulation waveform when modulation source is internal, or a square wave referenced to the carrier waveform when modulation source is external. No sync is associated with noise as the modulation source.
    - FSK - A square wave referenced to the trigger rate. The sync is a TTL high when hop frequency is the output frequency and TTL low when.

**Burst sync**
- A square wave that is a TTL high when the burst begins and a TTL low when burst is completed.

**Trigger**
- Selects the current trigger signal. Useful for synchronizing burst or gated signals.

**Sweep sync**
- Marker Off - A square wave that is a TTL low from the midpoint of the sweep and a TTL high from the end of the sweep.
- Marker On - A square wave that is a TTL low from the marker frequency and a TTL high from the end of the sweep.

**Output signal level**
- Logic level nominally 3 V.

**Ref Clock Output**
- Buffered version of the 10 MHz clock currently in use (internal or external).

#### Inputs

**Trig In**
- Frequency range: DC - 1 MHz.
- Signal range: Threshold nominally TTL level, max input ±10V.
- Minimum pulse width: Selectable as high/vising or low/falling edge.
- Input impedance: 10 kOhm

**External Modulation Input (for AM, FM, PM, PWM)**
- Voltage range: ±5 V full scale
- Input impedance: 5 kOhm typical
- Bandwidth: DC to 20 kHz
- Ref clock input

**Input for an external 10 MHz reference clock**
- Voltage range: ±1 Vpp – ±5 Vpp
- Maximum voltage: ±5 V
- Minimum voltage: ±1 V
Technical Specifications (continued)

Two Channel Operation

The two channels can be operated independently so as to act as entirely separate generators.
Alternatively the channels can interact as follows:

Coupled Operation

Coupled Frequency ........................................ Frequencies can be coupled such that if frequency of one channel is changed the frequency of the other channel also changes either by a fixed ratio or fixed offset. A pulse waveforms can only be frequency coupled to another pulse waveform, however sine, square, ramp or Arb waveforms can be coupled to any other waveform of that group.

Coupled Level .............................................. Amplitudes (and DC offsets) of the two channels can be coupled such that changing the amplitude and offset on one channel changes the amplitude and offset of both channels.

Coupled On/Off: ................................. Coupling can be set such that switching the output on/off on one channel switches the output on/off of both channels.

Coupling Operation

When in tracking mode both channels behave as one channel.
If inverse tracking is selected, both channel still behave as one channel except that the output of channel 2 is inverted.

Relative Phase

Pressing the ‘align’ key phase synchronises the two channels with the specified phase offset.

Phase Range........................................ -360.0 to +360.0 degrees
Resolution.............................................. 0.1 degree
Skew (typical) ........................................... <1ns

Cross Channel Trigger

Either channel can be triggered by the other channel to set up a complex and versatile inter channel trigger scheme.
Each channel can have its trigger output waveform set up independently. Trigger Out may be selected to be carrier waveform referenced, modulation waveform referenced, sweep referenced, burst referenced or the currently selected trigger of the channel.

Crosstalk

Channel Crosstalk ........................................ Typically better than 80dB

Control and Display

The control of each channel is selected by the Channel Select key.
The display can be assigned either completely to the selected channel, or the upper section can display the main set-up parameters or waveforms for both channels simultaneously.

PHASE SYNC (Phase Synchronising Two Generators)

Two generators can be synchronised together to provide outputs at the same frequency (or harmonics) and with a phase difference.
The amplitude and phase of these outputs can also be modulated providing the capability to perform QAM and QPSK respectively.
In case of 2 channel generators when phase synchronising is performed the two channels of each generator are also synchronised providing four synchronous waveforms.

Carrier Waveforms ........................................ Sine, Square, Ramp, Pulse, Arb
Phase Range........................................ -360.0 to +360.0 degrees
Resolution.............................................. 0.1 degree
Accuracy ....................................................... < ±5ns

General Specifications

Display ............................................ Black on white backlit graphics display - pixel format: 256 x 112
Interface ................................................... Standard USB 2.0 hardware connection. Implemented as virtual-COM port.
USB Flash Drive ........................................ For waveform and setup storage/recall.
Data Entry .................................................. Keyboard selection of mode, waveform etc.; value entry direct by numeric keys or by rotary control.
Stored Settings ........................................... Up to 9 complete instrument set-ups may be stored and recalled from non-volatile memory.
Module Width ........................................... 295mm (primary console fitting only)

Ordering Information

7029 .................................................... 25MHz Function/Arbitrary/Pulse Generator
7031 .................................................... 50MHz Function/Arbitrary/Pulse Generator
7029A ................................................ 25MHz Function/Arbitrary/Pulse Generator, two channel
7031A ................................................ 50MHz Function/Arbitrary/Pulse Generator, two channel