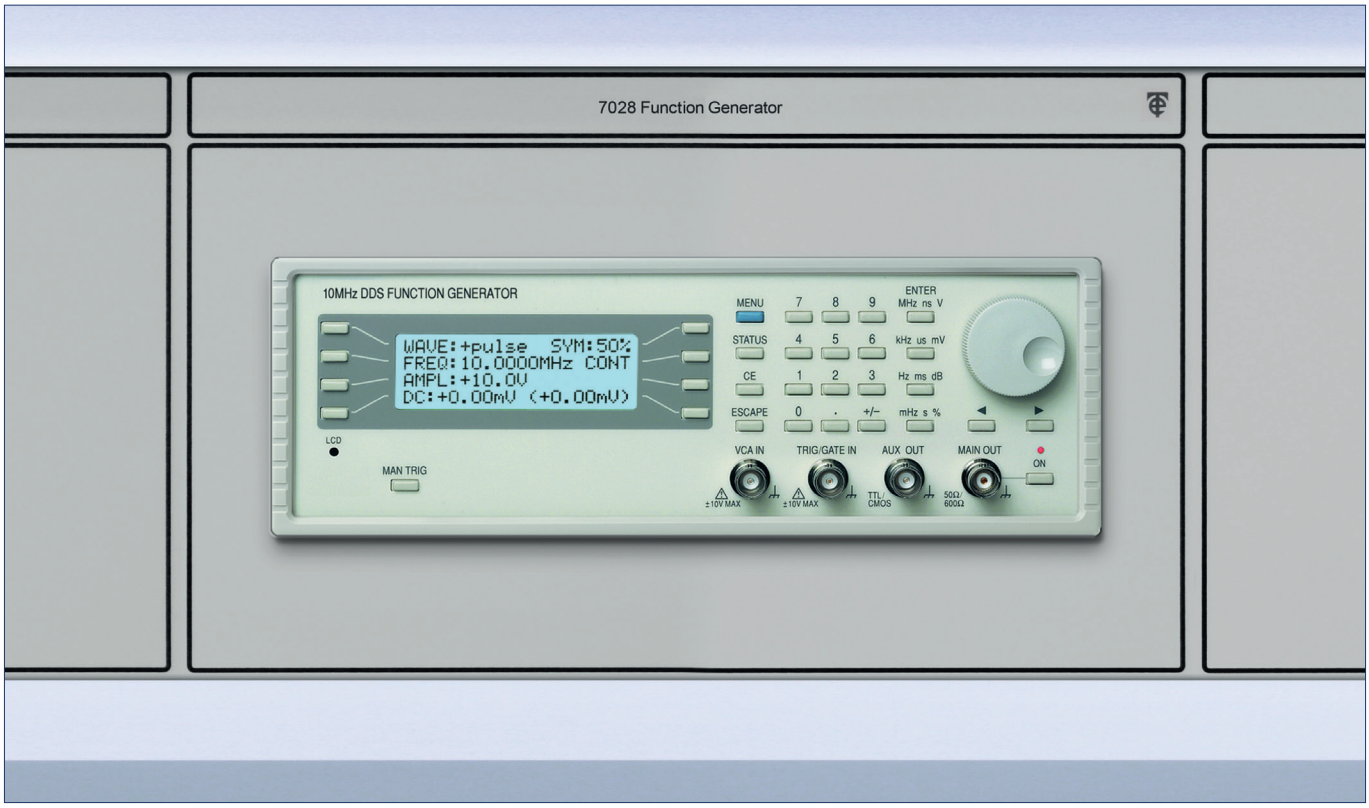
Time Electronics
7028 DDS Function Generator Module



Description

High measurement accuracy: DDS (direct digital synthesis) is a technique for generating waveforms digitally using a phase accumulator, a look-up table and a DAC. The accuracy and stability of the resulting waveforms is related to that of the crystal master clock. When correctly engineered, the DDS generator offers not only exceptional accuracy and stability but also high spectral purity, low phase noise and excellent frequency agility.

Wide frequency and amplitude range: The 7028 can generate waveforms between 0.001 Hz and 10 MHz with a resolution of six digits and a one year accuracy better than 10 ppm. Amplitude is variable between 5 mV and 20 V pk-pk from a source impedance of 50 Ohm or 600 Ohm. Waveform quality remains excellent over the full amplitude range.

Easy and convenient to use: The 7028 is particularly easy to use. All of the main information is clearly displayed on a backlit LCD with 4 rows of 20 characters. Sub menus are used for the modulation modes and other complex functions. All parameters can be entered directly from the numeric keypad. Alternatively most parameters can be incremented or decremented using the rotary encoder for quasi-analogue control.

Sweep: All waveforms can be swept over their full frequency range (0.1 Hz minimum) at a rate variable between 20 milliseconds and 15 minutes. The sweep is fully phase continuous. Sweep can be linear or logarithmic, single or continuous. Single sweeps can be triggered from the front panel, the trigger input, or the digital interfaces. A sweep marker is provided that is adjustable whilst sweep is running. The markers can provide a visual indication of frequency points on a 'scope or chart recorder.

Gated: The Gated mode turns the output signal On when the gating signal is high and Off when it is low. The gating source can be the front panel key, trigger input socket, or bus interface signal.

AM: External Amplitude Modulation is available for all waveforms via the VCA input.

Features

- 0.001 Hz to 10 MHz frequency range
- 6 digits or 1 mHz resolution
- 1 ppm stability and 10 ppm one year accuracy
- Storage for multiple instrument set-ups
- Internal phase continuous sweep, lin or log
- AM, FSK, gated and tone switching modes
- 5 mV to 20 V pk-pk from 50 or 600 Ω
- Low distortion, high spectral purity sine waves

FSK: Frequency Shift Keying provides phase coherent switching between two selected frequencies at a rate defined by the switching signal source. The switching source can be the front panel key, internal trigger generator or trigger input socket.

Tone Switching: The generator can be set to switch between a number of different frequencies in response to a trigger signal. Up to 16 frequencies can be defined. The tone is output while the trigger signal is true, and stops (after completion of a full cycle) when the trigger signal is false. The next tone is output when the trigger signal goes true again.

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Technical Specifications

Frequency

All waveforms are derived from a crystal clock using Direct Digital Synthesis.

Frequency Range..... 1 mHz to 10 MHz
Resolution ..... 6 digits or 1 mHz
Accuracy ..... < ±10 ppm for 1 year, 18 °C to 28 °C
Temp Coefficient..... Typically < 1 ppm/°C outside of 18 °C to 28 °C

Waveforms

Sinewave
Range..... 1 mHz to 10 MHz
Resolution ..... 6 digits or 1 mHz
Distortion ..... <0.3 % THD to 20 kHz (typically 0.1 %), <-45 dBc to 300 kHz, <-35 dBc to 10 MHz (typically <-40 dBc)
Spurii ..... Non harmonically related spurii <-55 dBc to 1 MHz, <(-55 dBc + 6 dB/octave) 1 MHz to 10 MHz
Output Level..... 5 mV to 20 V pk-pk from 50 Ω

Squarewave
Range..... 1 mHz to 10 MHz
Resolution ..... 6 digits or 1 mHz
Symmetry ..... variable 20 % to 80 % in 1 % steps
Aberrations..... < 5 % + 2 mV
Rise & Fall Times ..... < 22 ns
Output Level..... 5 mV to 20 V pk-pk from 50 Ω

Triangle
Range..... 1 mHz to 1 MHz
Resolution ..... 6 digits or 1 mHz
Linearity error ..... < 0.5 % to 100 kHz
Output Level..... 5 mV to 20 V pk-pk from 50 Ω

Positive and Negative Pulse
Range..... 1 mHz to 10 MHz
Resolution ..... 6 digits or 1 mHz
Symmetry ..... variable 20 % to 80 % in 1 % steps
Aberrations..... < 5 % + 2 mV
Rise & Fall Times ..... < 22 ns
Output Level..... 2.5 mV to 10 V pk-pk from 50 Ω pos or neg only pulses with respect to the DC Offset baseline

Modulation Modes

Continuous
Cycles of the selected waveform are output at the selected frequency.

Gated
Non phase-coherent signal keying - output is On while Gate signal is high and Off while low.

Carrier frequency ..... From 0.1 Hz to 10 MHz
Carrier waveforms..... All
Trigger rep. rate..... DC to 100 kHz external, dc to 5 kHz internal
Gate source ..... Front panel MAN TRIG key, Internal Gate Generator, TRIG/GATE input

Sweep
Carrier waveforms..... All
Sweep Mode..... Linear or logarithmic, single or continuous
Sweep Width..... 0.2 Hz to 10 MHz. Phase continuous. Independent setting of the start and stop frequency
Sweep Time ..... 50 ms to 999 s (3 digit resolution)
Markers ..... Marker variable during sweep. Available at the AUX OUT socket
Sweep Trigger source..... The sweep may be free run or triggered from: front panel MAN TRIG key, TRIG/GATE input

Modulation Modes Continued

Amplitude Modulation
Carrier frequency..... 1 mHz to 10 MHz
Carrier waveforms ..... All
Modulation source ..... VCA IN socket

Frequency Shift Keying (FSK)
Phase coherent switching between two frequencies at a rate defined by the switching signal source.

Carrier frequency..... 1 Hz to 10 MHz
Carrier waveforms ..... All
Switch repetition rate..... dc to 5 kHz (internal), dc to 1 MHz (external)
Switching signal source ..... Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input

Tone
The tone is output while the trigger signal is true, and stops (after completion of a full cycle) when the trigger signal is false. The next tone is output when the trigger signal goes true again.

Carrier waveforms ..... All
Frequency list ..... Up to 16 frequencies between1Hz and 10MHz
Min. switching time..... 1ms per tone
Switching source..... Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input.

Internal Trigger/Gate Generator
Period ..... 0.2ms to 999s (resolution 0.2 ms)
Waveform ..... Square wave (1:1 duty cycle)

Main Output

Output Impedance ..... 50 Ohms or 600 Ohms switchable
Amplitude..... 5mV-20V pk-pk open circuit + (2.5mV-10V into 50Ω)
Output can be specified as V-HiZ (open circuit value) or V (potential difference) in pk-pk, RMS or dBm. Note that in positive or negative Pulse modes the amplitude range is 2.5 mV to 10 V pk-pk O/C.
Accuracy ..... ±3 % ± 1 mV at 1 kHz into 50 Ω/600 Ω
Flatness..... ±0.2 dB - 500kHz; ±1 dB - 10MHz; ± 2 dB - 20MHz
DC Offset..... ±10 V from 50/600 Ω. DC offset plus signal peak limited to ±10 V. Accuracy ±3 % ±10 mV.
Resolution ..... 3 digits for both amplitude and offset

Auxiliary Output

Multi-function output user definable to be any of the following:

Waveform Sync ..... Outputs a 50 % duty cycle squarewave at the main waveform frequency.
Trigger Out..... Outputs the current trigger signal.
Sweep Sync..... Output a trigger signal at the start of sweep (for synchronising an oscilloscope or chart recorder). Can additionally output a sweep marker.
Signal Levels..... Logic levels of < 0.8 V and > 3 V. Sweep Sync is a 3 level waveform, low at start of sweep, high at end of sweep, with a narrow 1 V pulse at the marker point.

Inputs

Ext Trig/Gate
Frequency Range..... DC to 1 MHz for FSK; DC to 100 kHz for Gate; DC to 2.5 kHz for Tone and Sweep
Signal Range..... Nominal TTL level threshold; max input ±10 V
Min. Pulse Width ..... 100 ns for Gate/FSK; 0.2 ms for Sweep and Tone
Input Impedance ..... Typically 10 k Ohms

VCA In
Frequency Range..... DC to 100 kHz
Signal Range..... 2.5 V for 100 % level change at max output
Input Impedance ..... Typically 6 kΩ

General Specifications

Display ..... 20 character x 4 row alphanumeric LCD
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 in battery-backed memory.
Module Width..... 295 mm (primary console fitting only)

Ordering Information

7028..... 10MHz DDS Function Generator Module

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