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.
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: \( \leq \pm 10 \text{ppm for 1 year, 18 °C to 28 °C} \)

Wavesaws

- **Squarewave**
  - Range: 1 mHz to 10 MHz
  - Resolution: 6 digits or 1 mHz
  - Linearity error: \( \leq 0.5 \% \text{ to 100 kHz} \)
  - Output Level: 5 mV to 20 V pk-pk from 50 Ω

- **Triangular Wave**
  - Range: 1 mHz to 1 MHz
  - Resolution: 6 digits or 1 mHz
  - Linearity error: \( \leq 0.5 \% \text{ to 100 kHz} \)
  - 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
  - Linearity error: \( \leq 0.5 \% \text{ to 100 kHz} \)
  - Output Level: 5 mV to 20 V pk-pk from 50 Ω

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

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)

Modulation Modes Continued

- **Amplitude Modulation**
  - Carrier frequency: 1 mHz to 10 MHz
  - Carrier waveforms: All

- **Frequency Shift Keying (FSK)**
  - Phase coherent switching between two frequencies at a rate defined by the switching signal.
  - Carrier frequency: 1 Hz to 10 MHz
  - Carrier waveforms: All

- **Switching Rep. 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 between 1 Hz and 10 MHz
- 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)
- **Output Level:** 5 mV to 20 V pk-pk from 50 Ω

Main Output

- **Output Impedance:** 50 Ohms or 600 Ohms switchable
- **Amplitude:** 1 mV to 20 V pk-pk
- **Signal Levels:** +/-10 V from 50/600 Ω. DC offset plus signal
- **DC Offset:** 0 to 10 V from 50/600 Ω. DC offset plus signal
- **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:** Outputs a trigger signal at the start of sweep (for synchronising an oscilloscope or chart recorder).
  - **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:** Typcically 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:** Typcically 6 kΩ

Ordering Information

7028 DDS Function Generator Module 10MHz DDS Function Generator Module

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Due to continuous development, Time Electronics reserves the right to change specifications without prior notice.

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