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Tektronix

DG2000 Series Data Pattern Generator



Data Rate to 1.1 Gbps Tests High-speed Logic Devices and Circuits

Data Pattern Depth to 256 K/channel Speeds Characterization

Multiple Output Channels Increases Flexibility
- **DG2040: 2**
- **DG2030: 4 or 8**
- **DG2020A: 12, 24, or 36**

Control of Edge Timing (DG2040) Permits Jitter Simulation in Serial Data Streams

Precise Control of Output Parameters Include:
- **Variable Output Delay**
- **Variable Output Level**
- **Variable Rise and Fall Time Control (DG2030)**
- **Tri-state output control (DG2020A, DG2030)**

Large Display for Easy-to-Use Data Editing

Create Complex Data Patterns with Sophisticated Sequence, Looping, Jump on Event, & Tri-state Output Control

Characterize & Verify ASIC, FPGA, & DACs

Evaluate Media Storage Devices and Components (HDD, FDD, ODD, DVD)

Test Printer Engines or LCD Display Drivers

Construct Logic Verification Systems Utilizing Tektronix Oscilloscopes or Logic Scopes

Use in-conjunction with TLA Logic Analyzer to Provide Digital Stimulus

The DG2000 Series of digital pattern generators provide digital designers with the high performance tools needed to evaluate advanced digital semiconductors and logic circuits. Whatever you call your design process – characterization, debug, validation, or verification – as a digital designer you must have state-of-the-art digital pattern generation as you push the edge of the technology envelope and race to market.

Choose the Best Fit

The DG2000 Series is remarkable for the balanced approach to providing the appropriate class of instrument for a wide variety of digital design applications. Performance ranges from 1.1 Gbits per second to 200 Mbits per second and from 2 to 36 channels. The table illustrates the principal specifications for members of the DG2000 Series.

Critical Timing

The DG2000 Series is the ideal solution for applications where you must characterize device or circuit timing and amplitude margins. The DG2000 Series is perfect for simulating setup and hold violations or conditions of metastability. The DG2000 graphical user interface allows you to quickly create complex data patterns with a few keystrokes on the front panel. Use the advanced sequence editing capability of the DG2000 Series to insert infrequent faults or glitches in your data patterns to verify device or circuit recovery. The DG2000 Series is an invaluable tool, allowing you to simulate missing system functionality while meeting critical market windows. With the introduction of the DG2040, new capabilities are available to control clock and data jitter or modulate pulse edges on a selective basis.

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DG2000 Series Characteristics

OUTPUT DATA

Data Rate –
DG2040: 0.1 bps to 1100 Mbits/s.
DG2030: 0.1 bps to 409.6 Mbits/s.
DG2020A: 0.1 bps to 200 Mbits/s.

Clock Period Jitter –
DG2040: < 30 ps p-p at 1100 MHz. Typical.
DG2030: < 50 ps p-p at 200 MHz. Typical.
DG2020A: < 50 ps p-p at 200 MHz. Typical.

Data Depth –
DG2040: 360 to 256 Kbits (1 increment).
DG2030: 90 to 256 Kbits (1 increment).
DG2020A: 64 to 64 Kbits (1 increment).

Data Width –
DG2040: 2 bits (complementary outputs) via front-panel SMA connectors.
DG2030:
- Standard: 4 bits via front-panel BNC connectors.
- Optional: 8 bits via 4 front-panel, 4 rear-panel BNC connectors.

DG2020A:
- Standard: 12 bits.
- Optional: 24 or 36 bits.

SEQUENCER

Maximum Number of Blocks – 256.

Maximum Number of Sequence Steps –
DG2040: 4000.
DG2030: 4000.
DG2020A: 2048.

Block Repeats Per Line – 1 to 65536 or infinite.

DATA AND CLOCK OUTPUT (DG2040)

Data –
Output:
- Standard: Ch 0 & Ch 1 at front-panel SMA and Clock at rear panel SMA connectors.

V_{OH}: –0.875 V to +3.5 V into 50 Ω.
V_{OL}: –1.125 V to +3.25 V into 50 Ω.
Rise/Fall Time (20 to 80%): < 150 ps at 1 V_{p-p} and 10 MHz.
Delay Function:
- Delay channel: Ch 0 or Ch 1.
- Delay time: –1 ns to +2 ns.
- Delay resolution: 10 ps.

DATA AND CLOCK OUTPUT (DG2030)

Data –
Output:
- Standard: Ch 0 to Ch 3 and Clock at front-panel BNC connectors.
- Optional: Ch 4 to Ch 7 at rear-panel BNC connectors.

V_{OH}: –1.25 V to +3.5 V into 50 Ω.
V_{OL}: –1.50 V to +3.25 V into 50 Ω.
Rise/Fall Time (20 to 80%): Variable at amplitude range from 2 V_{p-p} to 5 V_{p-p}.
- Variable Range: 2.1 ns to 4.7 ns at 3.00 V_{p-p} – depends on amplitude setting.
- Value in Fast: 0.25 V_{p-p} to 1 V_{p-p}; 500 ps. 1.7 ns at 3.00 V_{p-p}.

Delay Function:
- Delay channel: Ch 0 to Ch 7.
- Delay time: –5 ns to 18 ns.
- Delay resolution: 20 ps.

Clock –
Amplitude: ±5% of setting ±50 mV at 1 MHz clock.
Rise/Fall Time (20 to 80%): Variable at amplitude range is 2 V_{p-p} to 5 V_{p-p}.
Value in Fast: 0.25 V_{p-p} to 1 V_{p-p}; 500 ps. 1.7 ns at 3.00 V_{p-p}.
Accuracy: ±10% of setting ±500 ps.

AUXILIARY INPUTS

Clock –
Frequency:
- DG2040: 10 MHz ± 0.1 MHz
- DG2030: DC to 409.6 MHz.
- DG2020A: DC to 200 MHz.

Trigger – Front-panel BNC connector.
Level: –5.0 V to +5.0 V.
Resolution: 0.1 V.
Polarity: Positive or negative.
Hold Off:
- DG2040: 100 ns minimum.
- DG2030: 100 ns minimum.
- DG2020A: 500 ns minimum.

Event (DG2040 & DG2030 only) – Rear-panel BNC connector.
Threshold Level: –5.0 V to +5.0 V.
Resolution: 0.1 V.
Polarity: Positive edge.
Minimum Pulse Width: 100 ns.

Inhibit (DG2030 only) – Rear-panel BNC connector.
Mode:
- Off: Always enabled.
- Internal: Controlled by Ch 0 signal.
- External: Controlled by inhibit input signal.
- Both: Controlled by Ch 0 or inhibit input signal.

Threshold Level: –5.0 V to +5.0 V into 1 kΩ.
Resolution: 0.1 V.

AUXILIARY OUTPUTS

SYNC –
DG2040: Rear-panel BNC connector.
DG2030: Rear-panel BNC connector.
DG2020A: Front-panel BNC connector.
Level:
- V_{OH}, 2.5 V into 50 Ω; V_{OL}, 0 V into 50 Ω.

EVENT –
DG2040: Rear-panel BNC connector.
DG2030: Rear-panel BNC connector.
DG2020A: Front-panel BNC connector.
Level:
- DG2040: V_{hi}, 2.5 V into 50 Ω; V_{lo}, 0 V into 50 Ω.
- DG2030: V_{oh}, 2.5 V into 50 Ω; V_{ol}, 0 V into 50 Ω.
- DG2020A: Positive TTL pulse, 50 Ω.

CLOCK –
(DG2020A only)
Rear-panel SMB connector.
Level: 1 V (typical) into 50 Ω.

PROGRAMMABLE INTERFACE

GPIB: ANSI/IEEE488.2-1987.
RS-232C: 19.2 kbps, D-sub 9-Pin connector.

P3410 TTL Data Output Pod Characteristics

DATA OUTPUT

Channels – 12.
Connector – 26-Pin header.
V_{OH} – >4.4 V into 1 MΩ.
V_{OL} – >0.1 V into 1 MΩ.
Rise/Fall Time – <5 ns into 1 MΩ, 10 pF (20% to 80%).

DELAYED CHANNELS

Delay Channel – CH 8, CH 9, CH 10, CH 11.
Delay Time – 0 to 20 ns.
Delay Resolution – 0.1 ns.

EVENT INPUT

Threshold Level – TTL.
Delay to Data Output – ≤ 50 ns + 50 clocks.
Set-up Time to Next Block – 47 to 54 clocks.

INHIBIT INPUT

Level – TTL, 1 kΩ.
Delay to Data Output – 18 ns.
Internal Inhibit Delay – 5 ns.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height*1	51	2
Width	150	5.9
Depth	101	4
Weight	**kg**	**lb.**
Net	0.5	1.1

*1Including feet.

P3420 Variable Data Output Pod Characteristics

DATA OUTPUT

Channels – 12
Connector – SMB.
V_{OH} – -2.0 V to +7.0 V into 1 MΩ.
V_{OL} – -3.0 V to +6.0 V into 1 MΩ.
Resolution – 0.1 V.
Maximum Swing – 9.0 V_{p-p}.
Minimum Swing – 0.5 V_{p-p}.
Output Current –
Total Output Current: <500 mA.
Sink: <-30 mA/ch.
Source: >+30 mA/ch.
Rise/Fall Time – <5 ns into 1 MΩ, 10 pF, 5 V_{p-p} swing.

DELAYED CHANNELS

Delay Channel – CH 8, CH 9, CH 10, CH 11.
Delay Time – 0 to 20 ns.
Delay Resolution – 0.1 ns.

EVENT INPUT

Threshold Level – -5.0 V to +5.0 V.
Resolution – 0.1 V.
Delay to Data Output – ≤ 45 ns + 50 clock.
Set-up Time to Next Block – 47 to 54 clocks.

INHIBIT INPUT

Threshold Level – -5.0 V to +5.0 V, 1 kΩ.
Resolution – 0.1 V.
Delay to Data Output – 16 ns.
Internal Inhibit Delay – -2 ns.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height*1	51	2
Width	255	10
Depth	161	6.3
Weight	**kg**	**lb.**
Net	1	2.2

*1Including feet.

DG2000 Series General Characteristics

CERTIFICATION AND COMPLIANCE

EC Declaration of Conformity – Meets intent of Directive 89/336/EEC for electro-magnetic compatibility.
Safety – Designed to meet UL 1244 and CSA 22.2 No. 231 (M-89).

PHYSICAL CHARACTERISTICS

DG2000 Series Main Frame

Dimensions	mm	in.
Height*1	164	6.4
Width*2	362	14.3
Depth*3	491	8.25

*1Including feet.
*2Including handle.
*3Including front cover. 576 mm (22.2 inches) with handle extended.

Weight	kg	lb.
Net	9.7	21.4

WARRANTY

One year parts and labor.

Characteristics shown are typical. Please refer to individual product user manuals for complete specifications.

DG2000 Series Ordering Information

DG2020A Data Generator

Includes: User Manual (071-0053-00), Programmer Manual (071-0054-00), 3.5-in. Performance Check Disk (063-2198-00), GPIB Sample Program (063-2919-00), DG-Link Application Software (063-2920-01), Pod Connection Cable (174-3548-00), Power Cord 125 V/6 A (161-0230-01), ISO-qualified Inspection Passed Certificate. Order P3410 or P3420 Pod separately.

DG2020A Options

Option 01 – Adds a 12-bit digital port for a total of 24 output channels. Includes pod connection cables (174-3458-00). Order P3410 or P3420 pod separately.

Option 02 – Adds two 12-bit digital ports for a total of 36 output channels. Includes two pod connection cables (174-3458-00). Order P3410 or P3420 pod separately.

Option 1R – Rack mount. Floppy drive moved to front panel.

Option A1 – 220 V, EURO plug power cord, product set to 50 Hz.

Option A2 – 240 V, UK plug power cord, product set to 50 Hz.

Option A3 – 240 V, AUST plug power cord, product set to 50 Hz.

Option A4 – 240 V, N. America plug power cord, product set to 60 Hz.

Option A5 – 220 V, SWISS plug power cord, product set to 50 Hz.

Option C3 – Three year calibration service.

Option D1 – Calibration Data Report.

Option D3 – Calibration Data Report. Requires option C3.

Option R3 – Repair Warranty; Extended to three years.

P3410 TTL-level Pod with 12 Output Channels

Includes: Pin Header-to-Pin Header Output Cable Set (012-1502-00) for 12 Output Channels, ISO Qualified Inspection Passed Certificate.

P3420 Variable-level Pod with 12 Output Channels

Includes: SMB-to-Pin Header Output Cable Set (012-1504-00) for 12 output channels, ISO Qualified Inspection Passed Certificate.

P3410 and P3420 Options

Option D1- Calibration Data Report.

Option R3- Repair Warranty; Extended to three years.

Option R5- Repair Warranty; Extended to five years.

DG2030 Data Generator

Includes: User Manual (071-0059-01), Programmer Manual (071-0057-01), 3.5-in. Performance Check Disk (063-2922-00), GPIB Sample Program Disk (063-2921-01), DG-Link Application Software (063-2920-01), Power Cord 125 V/6 A (161-0230-01), ISO Qualified Inspection Passed Certificate.

DG2030 Options

Option 01 – Eight-channel output. Adds four-channel output from rear panel.

Option 1R – Rack mount. Floppy Drive access moved to front panel.

Option A1 – 220 V, EURO plug power cord, product set to 50 Hz.

Option A2 – 240 V, UK plug power cord, product set to 50 Hz.

Option A3 – 240 V, AUST plug power cord, product set to 50 Hz.

Option A4 – 240 V, N. America plug power cord, product set to 60 Hz.

Option A5 – 220 V, SWISS plug power cord, product set to 50 Hz.

Option C3 – Three year calibration service.

Option D1 – Calibration Data Report.

Option D3 – Calibration Data Report. Requires option C3.

Option R3 – Repair Warranty; Extended to three years.

DG2040 Data Generator

Includes: User Manual (071-0257-00), Programmer Manual (071-0258-00), 3.5-in. Performance Check Disk (063-3121-00), GPIB Sample Program Disk (063-3122-00), DG-Link Application Software (063-2920-01), Power Cord 125 V/6 A (161-0230-01), ISO Qualified Inspection Passed Certificate.

DG2040 Options

Option 1R – Rack mount. Floppy Drive access moved to front panel.

Option A1 – 220 V, EURO plug power cord, product set to 50 Hz.

Option A2 – 240 V, UK plug power cord, product set to 50 Hz.

Option A3 – 240 V, AUST plug power cord, product set to 50 Hz.

Option A4 – 240 V, N. America plug power cord, product set to 60 Hz.

Option A5 – 220 V, SWISS plug power cord, product set to 50 Hz.

Option C3 – Three year calibration service.

Option D1 – Calibration Data Report.

Option D3 – Calibration Data Report. Requires option C3.

Option R3 – Repair Warranty; Extended to three years.

DG2020A/DG2030/DG2040 Optional Accessories

DG2020A Service Manual – 071-0055-00.

DG2030 Service Manual – 071-0058-01.

DG2040 Service Manual – 071-0259-00.

For further information, contact Tektronix:

Worldwide Web: for the most up-to-date product information visit our web site at: www.tektronix.com

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ISO 9001

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