Multiformat Video Generator

TG700

Features & Benefits

Multiformat Analog and Digital Test Signal Generation

Ideal Channel Configuration and Performance to Support Reference Generator Needs

Modular Expandable Platform

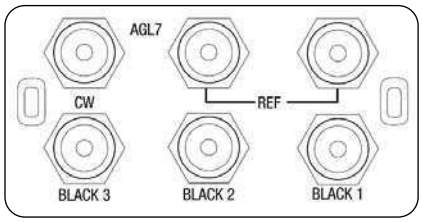
Applications

Reference Generator and Test Signal Generator for Post-production and Broadcast Facilities

Test Signal Generator for Research and Development

Equipment Design and Maintenance

The TG700 is a multiformat, analog and digital, precision signal generation platform. Designed with the changing needs of the video industry in mind, the TG700 offers sync pulse generation and test signal generation for a wide array of analog, serial digital, and digital high definition formats. The TG700 Multiformat Video Generator has a modular architecture that offers the flexibility to meet the single format and growing multiformat needs of the video professional. The TG700 mainframe allows up to four of the following modules to be fitted in the mainframe.

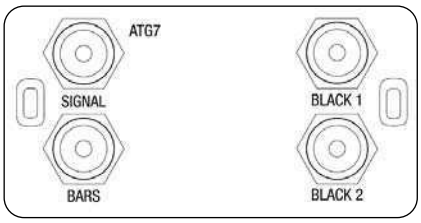


The TG700 has a high stability reference. The AGL7 Analog Genlock Module adds the capacity to lock to a variety of signals, which makes the TG700 an ideal solution as the master house reference or slave reference for broadcast and production/post-production applications. Three black outputs are available and are selectable for HDTV tri-level or NTSC or PAL. Additionally, the AGL7 can lock to a variety of formats to include NTSC/PAL black and HDTV tri-level as well as 1, 3.58, 4.43, 5, and 10 MHz CW.

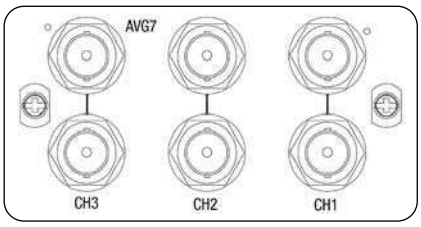
Tektronix
Enabling Innovation

Multiformat Video Generator

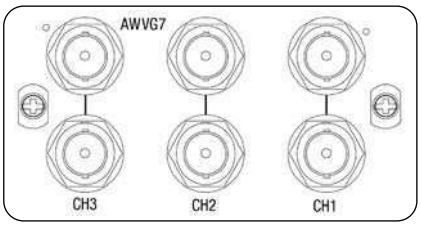
▶ TG700



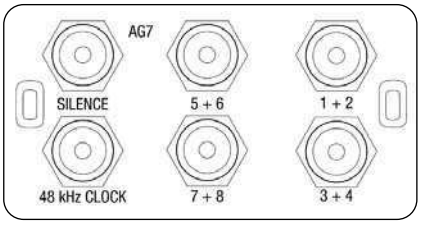
The ATG7 Composite Analog Test Generator supports PAL, NTSC, and NTSC NoSetup. It provides one test signal output, one color bar test signal output, and two black outputs. The black outputs can independently generate H, V, Blackburst, and subcarrier.



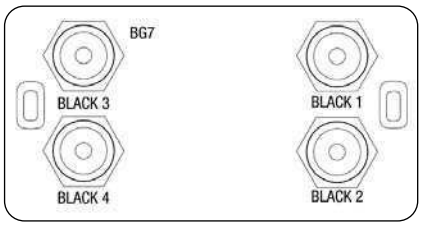
The AVG7 is an Analog Video Generator for 525/625 interlace formats supporting component (Y'P'bP'r, G,B,R, Y/C), 525 Beta, and composite (PAL, NTSC, NTSC NoSetup). It provides two identical component outputs, two identical Y/C and Composite, or six identical composite outputs.



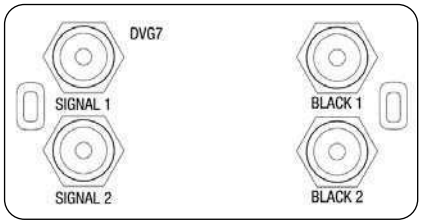
The AWVG7 is an Analog Wideband Video Generator that supports a variety of HD analog component formats (Y'P'bP'r or GBR). The module provides two identical component outputs with a bandwidth of 30 MHz. Up to two AWVG7 Analog Wideband Video Generators can be placed in a single TG700 mainframe.



The AG7 provides eight channels (four AES/EBU pairs) of audio signal generation. It also provides two channels (1 AES/EBU pair) of silence as well as a 48 kHz clock output.

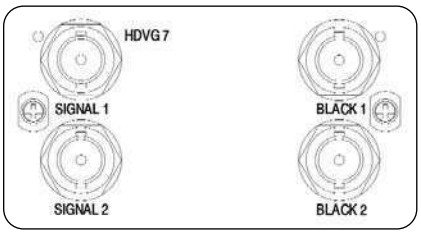


The BG7 is an analog black generator with four independently selectable outputs. The BG7 Black Generator supports NTSC and PAL black burst as well as HDTV tri-level sync. With Option CB, two of the outputs can also generate various analog NTSC and PAL color bar test signals.



▶ *DVG7 (shown with Option BK).*

The DVG7 is a multiformat test signal generator. The DVG7 Digital Video Generator supports 525 and 625 component digital at 270 Mb/s and NTSC composite digital at 143.181818 Mb/s. The DVG7 Digital Video Generator has two identical test signal outputs. With Option BK, two additional identical serial digital black signal outputs are available.



▶ *HDVG7 (shown with Option BK).*

The HDVG7 is a high-accuracy, multiformat, high-definition test signal module that provides up to two identical 1.485 Gb/s serial digital video test signal outputs in a broad variety of formats. With Option BK, two additional identical serial black signal outputs are available. Up to two HDVG7 HDTV Digital Video Generators can be placed in a single TG700 mainframe.

The digital modules DVG7 and HDVG7 support AV timing mode and up to 16 channels of 20- or 24-Bit audio sampled at 48 kHz embedded on the test signal outputs. The user can independently set frequency and level for each channel.

Option FP allows generation of full frame test and custom patterns for the AVG7, AWVG7, DVG7, and HDVG7 modules. Simple full frame patterns are available on V3.1 (or higher than V3.1) CD-ROM.

▶ Characteristics

TG700, Mainframe

Internal Reference Frequency – 13.5 MHz.

Long Term Stability – Less than 1 ppm/year.

Number of Slots for Modules – 4.

Power Supply Slot – 1.

Network Interface – 10Base-T Ethernet.

AGL7, Analog Genlock Module

PAL-M and PAL-N are not supported by AGL7.

Reference Input

Loopthrough Input –
Input connector: 75 Ω x2.
Input signal: NTSC/PAL black burst or HDTV tri-level sync.
Amplitude range: Standard ±6 dB.
S/N ratio: >40 dB.
SCH phase: 0 ±40º.

Return Loss – ≥30 dB 5 MHz to 30 MHz.

Burst Lock/Sync Lock Stability –
±3 dB amplitude change: <1 ns.
Jitter with burst lock: <0.5º.
Jitter with sync lock: <1 ns.

CW Input

Input Impedance – 75 Ω, internal term.
Input signal: CW (continuous wave).
Amplitude: 2 V (1 to 2.25) V_{p-p}.
Frequency: NTSC/PAL FSC, 1/5/10 MHz.
Return loss: >30 dB to 30 MHz.

CW Lock Stability –
Over the amplitude range: <1 ns.
Jitter: <1 ns (typ. 1º) with CW input S/N >50 dB.

Genlock Time Adjustment –
Range: Anywhere in the color frame.
Resolution: <0.5º of NTSC/PAL subcarrier.
1 ns with tri-level sync input.

Color Framing – Keeps accuracy even with ±45º SCH error of input reference input.

Black Input Signal –
Black 1: NTSC/PAL black burst output.
Black 2,3: NTSC/PAL black burst output or tri-level HDTV sync.

Output Format –
Combination of the following:
1. NTSC/PAL black burst x3 (1 black burst is an independent, black burst x2 are distributed outputs).
2. NTSC/PAL black burst x2, HDTV tri-level sync x1 (all black burst and HDTV tri-level sync are independent).
3. NTSC/PAL black burst x1, HDTV tri-level sync x2 (HDTV tri-level sync x2 are distributed from the same source).

NTSC/PAL Black Burst Output

Output Standard – EBU N14, SMPTE RP 154.

Amplitude Accuracy – Black burst std. ±2%.

Burst Frequency – NTSC/PAL FSC ±1 Hz.

SCH Phase – <±5º.

HDTV Tri-level Sync Output

Matching Standard – SMPTE 240M, 274M, 296M, RP211.

Amplitude Accuracy – Std. HDTV tri-level ±2%.

Output Signal Timing Adjustment

NTSC/PAL Black Burst Output –
Range: Anywhere in the color frame.
Resolution: <0.5º of NTSC/PAL subcarrier.

HDTV Tri-level Sync –
Range: Anywhere in the frame.
Resolution: <1 ns.

Output Impedance – 75 Ω.

Return Loss – >30 dB to 30 MHz.

AG7, Audio Generator

Audio Test Signal Output

Standard – ANSI S4.40 (AES3), AES3-ID.

Output Channels – 8 channels (4 AES/EBU pairs).

Output Impedance – 75 Ω, unbalanced.

Output Connector – BNC x4.

Output Amplitude – 1 V ±0.2 V.
Frequency (Hz):
50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1600, 2000, 2400, 3000, 3200, 4000, 4800, 5000, 6000, 8000, 9600, 10000, 12000, 15000, 16000, 20000.
Level: –60 to 0 dBFS, 1 dB step.

Sampling Frequency – 48 kHz (lock on video signal).

Quantization – Linear PCM, 20- or 24-Bits (2's complement).

Transfer Coding – Bi-phase mark.

Silence Output

Standard – ANSI S4.40 (AES3), AES3-ID.

Channel – 2 channels (one AES/EBU pair).

Output Impedance – 75 Ω, unbalanced.

Output Connector – BNC x1.

Output Amplitude – 1 ±0.2 V.

Frequency, Level – No signal.

Sampling Frequency – 48 kHz (lock on video signal).

Quantization – Linear PCM, 20- or 24-Bits (2's complement).

Transfer Coding – Bi-phase mark.

ATG7, Analog Test Signal Generator

PAL-M and PAL-N are not supported by ATG7.

Signal Output

NTSC/NTSC No Setup Test Signals –
100%/75% Color Bars.
SMPTE Color Bars.
0% (NTSC only)/10%/40%/50%/100% Flat Field.
Black Burst.
Black Burst with Field Reference.
Field Square Wave.
10/5 Step, Ramp.
Modulated 5 step.
Modulated Ramp.
Modulated Pedestal.
Shallow Ramp.
Convergence.
2/4 Level Pedestal & Pluge.
100%/75% Red Field.
Gray/White Window.
Safe Area.
Monitor Setup.
100%/60% Multiburst.
Multipulse.
100%/60% Sweep
Chroma Frequency Response.
Window 2T Pulse & Bar.
Sin(x)/x.
FCC Composite/Multiburst.
NTC7 Composite/Combination.
Test Matrix SNG Color Bars and 0%-100% Bounce.
APL High/Low, APL Bounce.

PAL Test Signals –
100%/75% Color Bars.
100%/75% Color Bars Over Red.
40%/50%/100% Flat Field.
Black Burst.
Black Burst with No Field Reference.
Field Square Wave.
5/10 Step.
Ramp.
Modulated 5/10 Step.
Modulated Ramp.
Modulated Pedestal.
Shallow Ramp.
Convergence.
2/4 Level Pedestal & Pluge.
100%/75% Red Field.
Gray/White Window.
Safe Area.
Monitor Setup Matrix.
100% Multiburst.
Multipulse.
100%/75% Sweep.
Window 2T Pulse & Bar.
Sin(x)/x.
CCIR 17/18/330/331.
UK ITS 1/2.
UK 1 Line ITS.
ITS Matrix and 0%-100% Bounce.
APL High/Low, APL Bounce.
ID Text – Max 18 characters. One Row (character 14x11 pixels).
Text and Position is embedded to each signal.

Luminance amplitude – ±1% (Measured at 700 mV).

Chrominance-to-Luminance Gain – ±1%.

Frequency Response – ±1% to 5.5 MHz.

Chrominance-to-Luminance Delay – ≤10 ns.

Linearity – ≤1% (Measured at 5 Step Signal).

Differential Gain Error – ≤0.5%.

Differential Phase Error – ≤0.5º.

BARS Output

NTSC/NTSC No Setup Signals –
100%/75% Color Bars.
SMPTE Color Bars.
40% Flat Field.
Black Burst.
Black Burst with Field REF.
Monitor setup, SNG Color Bar.

PAL Signals –
100%/75% Color Bars.
100%/75% Color Bars Over RED.
40% Flat Field.
Black Burst.
Black Burst with No Field REF.
Monitor setup, SNG color bars.

ID Text –
Max 18 characters. One Row (character 14x11 pixels).
Text and Position is embedded to each signal.

Luminance amplitude – ±1% (Measured at 700 mV).

Chrominance-to-Luminance Gain – ±2%.

BLACK 1/2 Outputs

NTSC/NTSC No Setup Signals – Black Burst.
Black Burst with Field Reference.
Timing Pulse (Subcarrier, Composite Sync, H Drive, V Drive, Composite Blanking, and Color Frame ID).

PAL Signals – Black Burst.
Black Burst with Field Reference.
Timing Pulse (Subcarrier, Composite Sync, H Drive, V Drive, Composite Blanking, Color Frame ID, and PAL Pulse).

Timing Pulse Amplitude – –0.5 to 0.5 V (1 V_{p-p}).

SIGNAL, BARS, and BLACK 1/2 (Common)

Standards –
ITU-R BT, 470-6.
SMPTE 170M.

Output Impedance – 75 Ω.

Return Loss – ≥36 dB to 6 MHz.

Burst Amplitude – ±2%.

Sync Amplitude – ±2%.

Blanking Level – 0 mV ±50 mV.

SC/H Phase Accuracy – 0º ±5º.

Timing Offset Range – Full Color Frame.

Timing Offset Resolution – 54 MHz Clock Resolution.

AVG7, Analog Video Generator

Analog Signal Output – Output signal (preinstalled for all formats): 100%, 75% and SMPTE Color Bars, Linearity, Flat Field, Multiburst, Sweep, Monitor, Pulse & Bar and other major test signals.

Formats Supported – NTSC, NTSC No Setup, PAL, 525 R'G'B', 525 Y'P'bP'r, 525 Beta, 625 R'G'B', 625 Y'P'bP'r.

Outputs – 6 identical analog composite outputs, 2 identical component video outs, or 2 identical Y/C and composite out.

Output Impedance – 75 Ω.

Luminance Linearity Error – ≤0.5%.

Luminance Amplitude – ±1% (Measured at 700 mV).

Chrominance-to-Luminance Gain Error – ≤1% (Relative to 100 kHz).

Chrominance-to-Luminance Delay – ≤2.5 ns on a composite output (typical).

Channel-to-Channel Delay – ≤1 ns (Relative to CH1).

Frequency Response – ≤0.5% to 8 MHz at 700 mV (typical).

Differential Gain Error – ≤0.5%.

Differential Phase Error – ≤0.5º.

Timing Adjustment for the Output Signal –
Range: Anywhere in the frame.
Resolution: 0.1 ns.

Return Loss – ≥40 dB to 6 MHz.

AWVG7, Analog Wideband Video Generator

Analog Signal Output – Output Signal (preinstalled for all formats). 100%, 75% and SMPTE Color Bars, Linearity, Multiburst, Sweep, Monitor and other major test signals.

Formats Supported – (all formats are factory preinstalled) Y'P'bP'r or R'G'B' 1080i/50 Hz, 59.94 Hz, 60 Hz.
1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz.
1080psF/23.98 Hz, 24 Hz.
720p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz, 59.94 Hz, 60 Hz.

Outputs – 2 identical analog component video outputs.

Output Impedance – 75 Ω.

Output Amplitude – ≤1% at 700 mV.

Channel to Channel Delay – ≤1 ns relative to CH 1.

Frequency Response –
±1% to 20 MHz.
±2% to 28 MHz.
±3% to 30 MHz.

Timing Adjustment for the Output Signal –
Range: Anywhere in the frame.
Resolution: 0.1 ns.

Return Loss – ≥35 dB to 30 MHz.

BG7, Black Generator

PAL-M and PAL-N are not supported by BG7.

Black Output 1/2/3/4

NTSC/PAL black burst and independently selectable HDTV tri-level analog sync.

Black Burst Output

Output Standard – EBU N14, SMPTE RP 154, RP318M-B.

Amplitude Accuracy – Std. Black burst ±2%.

SCH Phase – <±5º.

HDTV Tri-level Sync Output

Standard – SMPTE 240M, 274M, 296M, RP211.

Amplitude Accuracy – Std. HDTV tri-level ±2%.

Timing Adjustment – Each output is independent.

NTSC/PAL Black Burst –
Range: Anywhere in the color frame.
Resolution: Clock resolution 18.5 ns (1/54 µs).

HDTV Tri-level Sync –
Range: Anywhere in the frame.
Resolution: Clock resolution 13.5 ns (1/74.25 µs).

Analog Test Signal (Opt. CB)

Test Signal (black 3/4 output) –
NTSC, NTSC No Setup:
100% Color Bars, 75% Color Bars, SMPTE Color Bars,
40% flat field, SNG Color Bars, Monitor Setup Matrix, 10 field ID.
PAL:
100% Color Bars, 75% Color Bars, 100% Color Bars Over Red, 75% Color Bars Over Red, 40% Flat Field, SNG Color Bars, 4 Level Pluge, Monitor Setup Matrix
Luminance amplitude accuracy: ±1% (video at 100%).
Chroma amplitude accuracy: ±2%.

Output Impedance – 75 Ω.

Return Loss – ≥30 dB to 30 MHz.

Jitter – ≤1 ns.

DVG7, Digital Video Generator

Serial Digital Signal Output – Output signal (preinstalled for all formats):
100%, 75% and SMPTE Color Bars, Linearity, Multiburst, Sweep, Monitor, SDI pathological, Timing, and other major test signals.

Standards – ITU-R BT 601, 656, EBU Tech 3267, SMPTE 125M, 244M, 259M, 272M, RP165, RP178.

Bit Rate – 143 Mb/s, 270 Mb/s.

Resolution – 8- or 10-Bits.

Output Impedance – 75 Ω.

Output Amplitude – 800 mV_{p-p} ±10%.

Overshoot – ≤10%.

Rise/Fall Time – 0.4 to 1.5 ns (20-80%).

DC Offset (AC couple) – 0 ±0.5 V.

Jitter – ≤0.2 UI, above 10 Hz jitter frequency.

Timing Adjustment for the Output Signal –
Range: Anywhere in the frame.
Resolution: Clock resolution (37 or 70 ns).

Return Loss – >15 dB 5-270 MHz.

Embedded Audio Signal

Active Channels – 1 to 16 channels.

Sample Frequency – 48 kHz.

Digital Coding – 20- or 24-Bits.

Signal Alignment – Async. & Sync. (no frame #), Synchronous (frame #).

Audio Tone – Frequency (Hz):
50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1600, 2000, 2400, 3000, 3200, 4000, 4800, 5000, 6000, 8000, 9600, 10000, 12000, 15000, 16000, 20000.

Level – –60 to 0 dBFS, 1 dB steps.

HDVG7, HDTV Digital Video Generator

Serial Digital Signal Output – Output Signal (preinstalled for all formats).
100%, 75% and SMPTE Color Bars, Linearity, Multiburst, Sweep, Monitor, SDI pathological, Timing, and other major test signals.

Serial Digital Test Signal Output, Shared Black Signal – SMPTE 240M, 272M, 292M, 296M.

Bit Rate – 1.485 Gb/s, 1.485/1.001 Gb/s.

Output Format –
1035i/59.94 Hz, 60 Hz.
1080i/50 Hz, 59.94 Hz, 60 Hz.
1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz.
1080psF/23.98 Hz, 24 Hz.
720p/23.98 Hz, 24 Hz, 50 Hz, 59.94 Hz, 60 Hz.

Output Amplitude – 800 mV_{p-p} ±10% (typ.).

Overshoot – ≤10% (typ.).

Rise/Fall Time – ≤270 ps (20-80%) (typ.).

DC Offset (AC coupling) – 0 V ±0.5 V (typ.).

Jitter – ≤135 ps (typ.).

Output Impedance – 75 Ω.

Return Loss –
≥15 dB from 5 MHz to 750 MHz.
≥10 dB from 750 MHz to 1.485 GHz (typ.).

Timing Adjustment for the Output –
Range: Anywhere in the frame.
Resolution: Clock resolution 13.5 ns (1/74.25 MHz).

Embedded Audio Signal –
Active channels: 1-16 channels.
Sample frequency: 48 kHz.
Digital coding: 20- or 24-Bits.
Signal alignment: Async., & Sync. (no frame #), Synchronous (frame #).

Audio Tone – Frequency (Hz):
50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1600, 2000, 2400, 3000, 3200, 4000, 4800, 5000, 6000, 8000, 9600, 10000, 12000, 15000, 16000, 20000.
Level: –60 to 0 dBFS, 1 dB steps.
Sample frequency: 48 kHz.

Environmental

Power Consumption – 100 W (max.).

Temperature – 0 ºC to +50 ºC.

Altitude – 4500 meters (15,000 ft.).

Source Voltage – 100 to 240 V, 48 to 63 Hz.

Physical Characteristics

Dimensions	mm	in.
Height	44	1.73
Width	483	19
Length	559	22
Weight	**kg**	**lbs.**
Net	8.2	18

▶ Ordering Information

TG700

Mainframe*1. Up to four modules can be fitted in the frame. Please specify power cord when ordering.

Opt. FP– Frame picture function (available only for AVG7, AWVG7, DVG7 and HDVG7 modules).

Modules

AGL7

Analog Genlock.

AG7

Audio Generator.

ATG7

Analog Test Generator Module.

AVG7

Component and Composite Analog Video Generator Module.

AWVG7

Analog Wideband Video Generator Module.

BG7

Black Generator.

Opt. CB – Add NTSC/PAL color bar. Option must be added at time of order. Option cannot be added later.

DVG7

Digital Video Generator.

Opt. BK– Add SDI black outputs. Option must be added at time of order. Option cannot be added later.

HDVG7

HDTV Digital Video Generator.

Opt. BK – Add black outputs. Option must be added at time of order. Option cannot be added later.

Warranty

Module Limitations –

Only one AGL7 module may be installed in one TG700 mainframe.

Up to two HDVG7 or two AWVG7 in any combination may be installed in one TG700 mainframe.

1 year parts and labor.

Common Options for All Models

Opt. 88 – Module installation*2.

Opt. D1 – Calibration data report in English/Japanese.

Options CB and BK are installed at the factory and can not be added later.

*1 Order requires one of the modules.

*2 Applies to mainframe and all modules.

Multiformat Video Generator

▶ TG700

Standard Accessories

Manual – User Manual.

Software Package – CD-ROM.

CD-ROM Contents: ARIB STD-B28 standard Multiformat Color Bar library, SMPTE RP219 HD/SD Compatible Color Bar library, TG7 Communication SW, TG7 Setup SW, Logo Gen, Frame Picture Gen, Signal Viewer, Signal DNL, Sample Frame Pictures and Logos.

Rackmount Kit.

Power Cord – 125 V/6A.

Power Cord Options

Opt. A1 – Universal Euro 220 V, 50 Hz.

Opt. A2 – United Kingdom 220 V, 50 Hz.

Opt A3 – Australian 240 V, 50 Hz.

Opt A4 – North American 240 V, 60 Hz.

Opt A5 – Switzerland 220 V, 50 Hz.

Service

Opt. C3 – Calibration Service 3 Years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 Years (with Option C3).

Opt. R3 – Repair Service 3 Years.

Optional Accessories

TG700 Opt. FP Upgrade Kit – Order 040-1698-00.

This kit upgrades any TG700 to 64 MB Flash Memory.

Service Manual – Order 070-A800-52.

Power Supply Module – Order 650-A810-00.

Blank Panel for TG700 – Order 614-A021-00.

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Our most up-to-date product information is available at:
www.tektronix.com

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

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