

TVM9150PKG

Multiformat 3G/HD/SD Video Waveform Monitor and Audio Signal Analyzer



The Harris® Videotek® TVM9150PKG multiformat video waveform monitor and audio signal analyzer with integral XGA TFT color LCD display is the most advanced and intuitive test instrument available in a half-rack scope package. Versatile and modular, the TVM9150PKG is ideal for all 3G/HD/SD-SDI, analog composite and ASI video and audio applications. A 3D Analysis option allows the TVM9150PKG to support a variety of 3D television formats with multiple picture modes.

Users can display and evaluate up to four input sources, in up to four formats, simultaneously. One hundred percent digital signal processing enables precision presentation of waveform, vector, gamut, audio, picture, timing and data analyzer screens, each of which can be viewed in any quadrant. With full-screen, multiple pictures, thumbnails and powerful MULTI mode, complete display flexibility is a reality.

TVM9150 packages are predefined module groupings designed to quickly deliver the monitoring solution you need. The unit can be rackmounted or used in the field, and integrates seamlessly into any broadcast, post-production, telecine, satellite or cable facility, making the TVM9150 the ultimate choice for quality control, troubleshooting and compliance-check applications. Select among 3 Gb/s, HD/SD-SDI, SD-SDI, analog composite and ASI video monitoring with advanced physical jitter, 3D analysis, Dolby®, advanced audio and lip sync monitoring options to build a system customized to your requirements.

FEATURES

- Dual, auto-detecting SDI input for 3 Gb/s, HD or SD
- Dual, auto-detecting NTSC/PAL analog composite option
- Single-input ASI monitoring option
- 3D analysis upgrade with multiple 3D formats and displays
- Standards: SMPTE 424M, SMPTE 292M, SMPTE 259M-C, NTSC/PAL
- Multiple reference inputs
- Simultaneous display of up to four different inputs
- Customizable display functions, including screen location and multiple displays
- Patented video relative timing display
- Patented gamut display
- Pixel locator/data word analyzer
- Multiple-picture thumbnail
- A/B parade and overlay
- 608, 708 closed-caption detect, alarm, display
- Teletext detect, alarm, display
- OP-47 HD subtitle display
- Comprehensive alarm set with peak level report
- 16 direct-access user presets
- Integral high-brightness XGA TFT color LCD display
- Illuminated controls and indicators
- DVI-I output
- USB port for control and data transfer
- 10/100Base-T Ethernet, SNMP agent
- Web server
- SpyderWeb II remote control and logging software
- GPI control

Selectable Options

- Video Inputs
 - Dual HD/SD-SDI
 - Dual HD/SD-SDI with eye pattern
 - Dual HD/SD-SDI with eye pattern and jitter waveform and spectrum display
 - 3D analysis
 - Dual 3G/HD/SD-SDI with RGB dual link
 - Dual ASI
 - Dual composite analog
- Audio
 - Metering and monitoring of up to eight channels of analog, AES/EBU and embedded audio
 - Dolby® Digital, Dolby Surround EX, Dolby E, Dolby Pro-Logic® I formats
 - Dolby decoded outputs
 - Loudness metering and alarm
 - Multiple audio Lissajous displays

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PRODUCT DETAILS

The VTM Series is loaded with features designed to enhance the user experience. The TVM9150PKG has impressive features, including illuminated controls; a modular platform for easy upgrades; HD/SD-SDI auto-detect; passive looping inputs that accept 1080i, 1080p and 720p formats at popular frame rates, including SD-525/625; real-time alarms (with time stamp, adjustable limits and peak value report); frame capture/transfer; EIA 608 and 708 closed caption; Teletext; OP-47 HD subtitles; XDS; and alarm status and metadata displays.

Options include dual HD/SD-SDI eye pattern with jitter display, 3D analysis, dual 3G/HD/SD-SDI, dual HD/SD-SDI, dual SD-SDI, dual ASI and dual analog composite inputs, RGB Dual Link, advanced audio analysis with CineSound® Surround display and comprehensive Dolby decoding. The SD-SDI and SD-SDI eye pattern inputs can be field-upgraded to HD/SD with the purchase of an unlock key.



Q-SEE technology allows complete display versatility

The TVM9150PKG features Harris Corporation's patented Q-SEE™ display technology, which enables users to configure their screen for any specific need. Whether the desire is for full screen, quadrant with picture thumbnail or the convenient MULTI mode, Q-SEE can make it happen. Choose from waveform, vector, gamut, audio, picture and timing displays, and place each in any quadrant on the screen.

The TVM9150PKG can be quickly and easily configured, with direct access to display functions, selectable screen location and context-sensitive pop-up menus, as well as the industry's most intuitive navigation system. Complete presentation changes can be instantly applied with any of the 16 front-panel preset selections.

TVM-VTM-3D Analysis Option

The newest advances in 3D testing are available in the TVM9150PKG. The new VPR 50 board enables the display of up to four 3D pictures or a combination of multiple 3D pictures and/or waveforms, including the ability to display separate left-eye and right-eye pictures and waveforms simultaneously. 3D testing capability requires the TVM-VTM-3D option (for those owners of the TVM9100PKG or TVM9140PKG, the upgrade path is with the TVM-50F).



TVM9150 with four different pictures of 3D input

The 3D Analysis option includes the following picture modes: Split, L-R (left minus right), Mosaic, Mix, and Anaglyph.

The **Split picture display** is useful for locating vertical misalignment of a stereo camera pair and focus differences between left and right inputs. The split location is adjustable across the picture, allowing the user to select the overlap location for determining the best place for alignment.



Split picture display

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The **L-R picture display** is generated by subtracting the luma value of the right source from the luma value of the left. The result of the subtraction is pure gray if the left and right images perfectly line up. This function is useful in aligning the 3D camera rig on a test chart, as small differences are easily discernible.



L-R picture display

The **Mix picture display** feature shows a 50/50 mix of the A and B inputs. This mode is useful for seeing both left and right views superimposed on each other, and therefore instantly highlights the parts of the scene that have greater 3D depth than others. This view is achieved by performing a 50 percent mix of the red, green and blue components of the left and right image pairs.



Mix picture display

The **Mosaic picture display** is useful for catching differences in color/brightness of the left and right sources. For example, on a surface containing a basic, constant color — such as a wall, a field or the sky — if the two cameras are matched for color brightness, contrast, etc., the mosaic pattern is not visible; if the cameras are not matched, the mosaic pattern is easily visible. Also, adjacent mosaic “boxes” will look more mismatched for parts of a scene containing greater 3D depth. The unit has a vertical and horizontal adjustment for the mosaic block size, allowing the user to select the optimum block size for making deterministic evaluation of the signal.



Mosaic picture display



Anaglyph picture display

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SPECIFICATIONS

Specifications are subject to change without notice.

VIDEO

HD/SD-SDI Input Module (TVM-VTM-SDI-H)

Two dual-standard inputs accepting: SD SMPTE 259M-C formats or HD SMPTE 292M formats, including: 525/59.94, 625/50, 1080i/60, 1080i/59.94, 1080i/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080p/30sF, 1080p/29.97sF, 1080p/25sF, 1080p/24sF, 1080p/23.98sF, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/24 and 720p/23.98

Data Rate	270 Mb/s, 1.485 Gb/s, auto-detect
Connectors	4 BNCs, Hi-Z passive looping
Level	800 mV, nominal
Input EQ	270 Mb/s: 250 m of 8281 1.485 Gb/s: 100 m of 8281
Return Loss	≤-15 dB, 5 MHz to 1.485 GHz
SDI Monitor Output	Follows the selected digital input
Data Rate	270 Mb/s and 1.485 Gb/s
Connector	BNC
Level	800 mV, nominal

SD-SDI Input Module (TVM-VTM-SDI-S)

Two SMPTE 259M-C inputs, auto-detect 525/59.94, 625/50
Input Impedance Hi-Z, looping
Input EQ Up to 250 m, Belden 8281 at 270 Mb/s
Return Loss ≤-25 dB 5 to 270 MHz

3G/HD/SD-SDI Input Module (TVM-VTM-3GB)

Two dual-standard inputs accepting: 3 Gb/s SMPTE 424M inputs, SD SMPTE 259M-C formats or HD SMPTE 292M formats, including: 525/59.94, 625/50, 1080i/60, 1080i/59.94, 1080i/50, 1080p/60, 1080p/59.94, 1080p/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080p/30sF, 1080p/29.97sF, 1080p/25sF, 1080p/24sF, 1080p/23.98sF, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/24 and 720p/23.98

Data Rate	270 Mb/s, 1.485 Gb/s, 2.97 Gb/s, auto-detect
Input Impedance	75 ohms, active looping
Input EQ	Up to 250 m, Belden 8281 at 270 Mb/s, 100 m, Belden 8281 at 1.485 Gb/s or 100 m, Belden 1694A at 2.97 Gb/s
Return Loss	≤-25 dB, 5 to 270 MHz; ≤-15 dB, 270 MHz to 1.5 GHz; ≤-10 dB, 1.5 to 2.97 GHz
Connector	BNC

ASI Input Module (TVM-VTM-ASI)

Two dual-standard inputs accepting: DVB-ASI or SMPTE 310M signals, auto-detect. Monitoring of ATSC PSIP or DVB PSI tables. ETSI TR 101-290 priority 1, 2 and 3 alarms including buffer errors

Input Data Rate	DVB-ASI: 270 Mb/s, maximum payload 120 Mb/s SMPTE 310M: 19.393 Mb/s, or 38.785 Mb/s
Input Connectors	4 BNCs, Hi-Z passive looping
Input Level	800 mV, nominal
Input EQ	250 m, Belden 8281
Return Loss	≤-15 dB, 5 to 270 MHz
Monitor Output	Follows the selected digital input
Output Level	800 mV, nominal
Output Data Rate	DVB-ASI: 270 Mb/s SMPTE 310M: 19.393 Mb/s, or 38.785 Mb/s
Output Connector	BNC

ATSC Display Tables	PAT (Program Association Table) INFO (from the Program and System Information Protocol (PSIP)) PMT (Program Map Table) MGT (Master Guide Table) VCT (Virtual Channel Table) RRT (Region Rating Table) STT (System Time Table) EIT (Event Information Table) EPG (Electronic Program Guide) BW (Bandwidth)
DVB Display Tables	PAT (Program Association Table) INFO (from the Program and Information Table (SI)) PMT (Program Map Table) EIT (Event Information Table) CAT (Conditional Access Table) NIT (Network Information Table) SDT (Service Description Table) BW (Bandwidth)

Jitter Evaluation Input Module (TVM-VTM-JEM)

Two dual inputs accepting SD SMPTE 259M-C formats or HD SMPTE 292M formats

Data Rate	270 Mb/s, 1.485 Gb/s, auto-detect
Connectors	4 BNCs, Hi-Z active-looping
Level	800 mV, nominal
Input EQ	270 Mb/s: 250 m, Belden 8281 1.485 Gb/s: 80 m, Belden 8281
Return Loss	≤-15 dB 5 MHz to 1.485 GHz
SDI Monitoring Output	Follows the selected digital input
Output Data Rate	270 Mb/s and 1.485 Gb/s
Output Connector	BNC
Output Level	800 mV, nominal
Jitter Demod	Displays pk-pk jitter as a bar graph and numeric readout, jitter waveform or frequency spectrum
Bar Graph	0 to 1 UI or 0 to 0.2 UI with numeric readout
Filter	10 Hz ±2 Hz 1 kHz ±5% 10 kHz ±5% 100 kHz ±5%
Waveform	Synchronized with video 1 H, 2 H, 1 V or 2 V sweep rate Line-select may be applied
Frequency Plot	Displays a frequency histogram from the filter setting up to a maximum frequency of 1 or 5 MHz
Eye Parameter Measurement	Amplitude, rise time, fall time
Measurement Bandwidth	250 kHz to 2250 MHz -3 to 1 dB relative to 750 MHz
Filters	10 Hz ±2 Hz 100 Hz ±10 Hz 1 kHz ±100 Hz
Amplitude	±2% with a displayed waveform of 800 mV
Overshoots	±2% with a displayed overshoot of 10% 20% maximum
Rise and Fall Time	Within 2% of the displayed rise/fall time

Analog Input Module (TVM-VTM-ACV-2)

2 NTSC/PAL composite video, auto-detect	
Signal Level	1 V pk-pk
Input Impedance	Hi-Z, looping
Return Loss	≤-45 dB 100 kHz to 5 MHz
DC Restore Clamp Time	Back Porch

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DC Restorer Level Shift Due to Presence or Absence of Burst	≤1 IRE/ Unit
DC Restorer Level Shift with Change from 50% APL to 1	
0% APL or to 90% APL	≤1 IRE/ Unit
DC Restorer 60 Hz Attenuation	
Slow	≤5%
Fast	≥90%
Maximum Input Amplitude	(AC+DC) +2.5 to -1.5 VDC restorer off, ±3.0 VDC restorer on

Reference

Analog blackburst, NTSC/PAL composite video, tri-level sync auto-detect (per SMPTE 274M)	
Levels	286 mV pk-pk ±6 dB (blackburst NTSC) 300 mV pk-pk ±6 dB (PAL sync and burst) 600 mV pk-pk ±3 dB (tri level Sync)
Impedance	Selectable Hi-Z looping or 75 ohms Terminating
Return Loss	≤-40 dB, 100 kHz to 5 MHz
Connectors	BNC

DVI-I Output

Digital Levels	Per DDWG DVI rev1
R, G, B Levels	Selectable 0.7 or 1 V pk-pk, nominal
Pixel Rate	65 Mp/s
R, G, B Impedance	75 ohms
Horizontal Sync	Negative TTL pulse @ 48,363 Hz ±1%
Vertical Sync	Negative TTL pulse @ 60.004 Hz ±1%
Display Accuracy	±1% waveform ±1° vector ±37 ns timing digital ±300 ns timing analog
Connector	29-pin DVI-I, female

Audio Options

Inputs (Analog)	8 monophonic or four stereo channels, balanced or unbalanced
Maximum Input Level	+24 dBu
Input Connector	37-pin D-sub, male
Impedance	>20k ohms
Inputs (Digital)	16 embedded audio channels. 4 or 8 AES/EBU serial digital pairs, (option dependent) Optional Dolby® E or AC-3 stream
Input Connectors	4 or 8, BNC, female
Impedance	75 ohms
Outputs (Analog)	8 monophonic or 4 stereo channels, balanced or unbalanced, follows selected audio input. Dolby® inputs produce a 2-channel mix down and/or full 8-channel decode
Output Level	24 dBu max +6 to -50 dB adjustable For digital audio, -20 dBFS produces a +4 dBu analog output level
Output Connector	37-pin D-sub, male, shared with inputs
Impedance	10 ohms unbalanced or 20 ohms balanced, nominal
Signal To Noise: Outputs (Digital)	100 dB (relative to signal level out of +24 dBu), typical 4 AES/EBU and one Dolby® Digital, Dolby® E, or AES stream embedded in the selected digital video source
Output Connector	4 BNC, female shared with input

Impedance	75 ohms
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Control

GPI	9 total with 4 input and 5 preset recall selections, or individually user configured
GPO	2 alarms, user-configured
Connector	26-pin HD (high-density) D-sub, female
Input Impedance	10 k ohms returned to 5 VDC
Alarm Output	Relay closure
Maximum Relay Current	350 mA @30 VDC
External Router Control	1 RJ11 female, for use with Videotek RS-12A router for input expansion
Peripheral Interface	USB 1.1 supporting storage devices, and keyboard
Connector	USB 1.1, Type A, female
Communications	Ethernet port - 10/100Base-T
Connector	RJ45 Ethernet female

Timecode

Input	LTC, Ancillary Time Code (HD only), DVITC extracted from SD inputs
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Display

General	A quadrant display for viewing an input on up to four different displays as picture, waveform, vector, audio, alarm status, timing, optional eye pattern, simultaneously or individually as a full-screen display of each separately. Additional data analyzer display for pixel analysis. Also view multiple waveform and vectors of the same or different inputs with VTM-OPT 40
Waveform	Composite, YCBCR or RGB, parade/overlay of like formats
Sweep Time Base	1 or 2 H, with x1, x5 and x10 horizontal magnification 1 or 2 V with x1, x5 and x25 horizontal magnification
Waveform Accuracy	≤1%
Waveform Frequency Response	Analog: 25 Hz to 5.75 MHz within ±1% of amplitude at 50 kHz SD: ±0.5% to 5.75 MHz C_B , C_R ±0.5% to 2.50 MHz C_B , C_R HD: ±0.5% to 30 MHz Y ±0.5% to 15 MHz C_B , C_R

Eye (Optional)

Sweep Time Base	Overlay (3 eye) or 10 eye (SD), 20 eye (HD)
Filters	10 Hz, 100 Hz, 1 kHz
Display Accuracy	±1%
Measurement Analog Bandwidth	250 kHz to 2250 MHz, -3 to 1 dB relative to 750 MHz
Jitter Overshoot	≤20% for all frequencies up to 300 kHz
Intrinsic Jitter	<70 ps for HD <150 ps for SD
Intrinsic Wander	<150 ps for HD <300 ps for SD
Jitter	Bar graph showing jitter magnitude
Display Range	0 UI to 1.0 UI
Vector	R - Y vs. B - Y for Analog C_B vs. C_R for HD or SD
Vector Accuracy	≤1°
Gamut	Encoded or RGB gamut displays with upper and lower limit selection
Audio (Optional)	2, 4, 6 or 8 channels displayed simultaneously

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Power Requirements

Power Input 90 to 260 VAC, 50/60 Hz
Power Consumption 180 VA

Mechanical

Dimensions (H x W x D) 1.75 x 19.0 x 19.0 in. (4.5 x 48.3 x 48.3 cm)

Environmental

Operating Temperature 32° to 122° F (0° to 50° C)
Storage Temperature -40° to 149° F (-40° to 65° C)
Humidity 85% maximum (non-condensing)
Operating Altitude 10,000 ft (3,050 m)

Standard Accessories

Operator's manual on CD
GPI/LTC breakout terminal board
DVI to VGA adapter
Rackmount kit
Power cord*

*North America cord supplied unless optional cord selected at time of order

ORDERING INFORMATION

Package Descriptions

TVM9150PKG TVM Series multiformat waveform monitor with a TVM-VTM-SDI-H HD/SD-SDI input module
TVM9150PKG-EH TVM Series multiformat waveform monitor with a TVM-VTM-EYE-H HD/SD-SDI eye pattern input module
TVM9150PKG-EJ TVM Series multiformat waveform monitor with a TVM-VTM-JEM HD/SD-SDI with eye pattern and jitter waveform or jitter spectrum input module
TVM9150PKG-ES TVM Series multiformat waveform monitor with a TVM-VTM-EYE-S SD-SDI eye pattern input module (can be upgraded later to HD/SD with the TVM-VTM-ES2H-F)
TVM9150PKG-3GB TVM Series multiformat waveform monitor with a TVM-VTM-3GB 3G/HD/SD-SDI input module
TVM9150PKG-SD TVM Series multiformat waveform monitor with a TVM-VTM-SDI-S SD-SDI input module (can be upgraded later to HD/SD with the TVM-VTM-S2H-F)

Video Options

TVM-VTM-SDI-H Two passive looping SMPTE 292M (HD-SDI) and SMPTE 259M-C (SD-SDI) inputs, auto detect and monitor output
TVM-VTM-3GB Two passive looping SMPTE 424M (3 Gb/s), SMPTE 292M (HD-SDI) and SMPTE 259M-C (SD-SDI) inputs, auto detect and monitor output
TVM-VTM-EYE-H Two active looping SMPTE 292M (HD-SDI) and SMPTE 259M-C (SD-SDI) inputs, auto detect with eye pattern and monitor output
TVM-VTM-JEM Two active looping SMPTE 292M (HD-SDI) and SMPTE 259M-C (SD-SDI), auto-sensing inputs. Eye pattern display and jitter waveform or spectrum can be viewed individually or together as part of a quad display
TVM-VTM-SDI-S Two passive looping SMPTE 259M-C (SD-SDI) inputs, auto detect and monitor output

TVM-VTM-EYE-S Two active looping SMPTE 259M-C (SD-SDI) inputs, auto detect with eye pattern and monitor output
TVM-VTM-ACV-2 Two looping analog composite video inputs for NTSC or PAL format, auto detect
TVM-VTM-ASI Dual DVB-ASI/SMPTE 310 input module with MPEG data analysis. Provides single transport stream program information and bandwidth measurements. Monitors MPEG and ATSC tables for errors and repetition rates. Alarms for ETSI TR-101-290 first, second and third priority errors
TVM-VTM-DLK Expands the dual-link capability of the TVM-VTM-SDI-H, TVM-VTM-EYE-H and TVM-VTM-JEM to include 10-bit RGB (4:4:4) and RGB+A (4:4:4) formats
TVM-VTM-AAP Advanced analysis package that adds data analyzer functions in quadrant or full-screen views to the TVM9100PKG and VTM4100PKG. Included in TVM9140PKG, TVM9150PKG, VTM4140PKG and VTM4150PKG
TVM-VTM-3D Advanced 3D analysis package that adds 3D picture and waveform displays in quadrant or full-screen views to the TVM9150PKG and VTM4150PKG.

Advanced Audio Options

TVM-A3-OPT 2 Advanced audio analysis option; bar graphs and CineSound®; view up to 8 audio channels; includes 4 analog stereo inputs, 4 AES/EBU shared input/output pairs and 16 channels of embedded audio; analog monitoring outputs of up to 8 channels simultaneously
TVM-A3-4004 Audio expansion module; adds 4 AES/EBU input pairs to TVM-A3-OPT 2

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TVM-A3-OPT 3	Advanced audio analysis option; bar graphs and CineSound®; view up to 8 audio channels; includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio; analog monitoring outputs of up to 8 channels simultaneously; custom meter labels
TVM-A3-OPT 3TL	Advanced audio analysis option; bar graphs and CineSound®; view up to 8 audio channels; includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio; analog monitoring outputs of up to 8 channels simultaneously; loudness monitoring and audio true peak metering to ITU-R BS.1770
TVM-A3-OPT 5	Advanced audio analysis option; bar graphs and CineSound®; view up to 8 audio channels; includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio; analog monitoring outputs of up to 8 channels simultaneously; custom meter labels; full decoding of Dolby® D or Dolby® E with up to 8 analog outputs and Dolby® metadata display
TVM-A3-OPT 5TL	Advanced audio analysis option; bar graphs and CineSound®; view up to 8 audio channels; includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio; analog monitoring outputs of up to 8 channels simultaneously; custom meter labels; full decoding of Dolby® D or Dolby® E with up to 8 analog outputs and Dolby® metadata display; loudness monitoring and audio true peak metering to ITU-R BS.1770

TVM-A3-OPT 3T05	Adds Dolby® D or Dolby® E decoding and Dolby® metadata display to TVM-A3-OPT 3 or TVM-A3-OPT 3TL
TVM-A3-OPT V2A	Adds video to audio timing measurement (lip sync) to the TVM-A3-OPT 3TL or TVM-A3-OPT 5TL; requires a source of the V2A test signal

Remote Control Options

RCU-1000	Remote control panel for TVM Series, VTM Series and AVM-717
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Mounting Options

PTC-2	Portable case with handle and folding stand
DRC-2A	Double rackmount case
BLK-1	Blank panel for DRC-2A

Power Options

North America power cord supplied unless otherwise specified at time of order	
EPC	European power cord
EPC-AA	Australia power cord
EPC-UK	United Kingdom power cord