QuadScan Elite
User's Manual

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1   Introduction

Thank you for purchasing the Focus Enhancements QuadScan Elite Video Scaler. The QuadScan product family is a series of products intended to scale standard analog NTSC or PAL television sources such as DVD players, satellite, or cable TV to high resolution progressive RGB output display devices.

The QuadScan Elite is a cost-effective high-resolution Video Scaler & Quadrupler providing high quality video enhancement at a fraction of the cost. Functioning as a video scaler, QuadScan Elite enables output to high-resolution displays from 640x480 to 1365x1024 to support the new high-resolution and digital displays (LCD, DLP, D-ILA, plasma, etc.).

Functioning as a line tripler or quadrupler, the QuadScan Elite eliminates visible scan lines and flicker from standard video. The resulting picture, with its improved detail and color quality, is ideally suited for professional presentation and home theater applications.

In addition to scaling incoming video to the optimum resolution of the display device, the QuadScan Elite provides two other functions in significantly improving the displayed quality of television. First, the video is de-interlaced for presentation on a non-interlaced device, removing the effects of interlaced flicker. Second, the video is "motion compensated", automatically detecting the input source (i.e. still video, motion video, or film) and processing the video for minimal motion artifacts.

The QuadScan Elite is intended for use with two major types of users: Professional AV Users and Home Theater Users. Professional AV users will be able to control all of the QuadScan Elite functions from popular control environments via RS-232/422. Home Theater Users will be able to access powerful video enhancement features previously found only in devices costing $10,000 and up.

This manual serves two purposes: 1) Quick Start Procedure, and 2) Reference Guide. If you are familiar with video systems or you just want a quick start, you may want to skip ahead to either Section 2.1; QuadScan Desktop Version Installation, or Section 2.2; QuadScan Rackmount Version Installation for specific information on installing your QuadScan Elite.

1.1 The QuadScan Elite Family

The QuadScan Elite product family consists of one common technology implemented on a common circuit board. Different packaging is added to the base product to provide specific options.

1.1.1 Desktop or Rackmount

The Desktop model is a standalone unit that ships with either a 12-15VDC wall mount or the desktop universal power supplies, 110 VAC @ 60 Hz to 220 VAC @ 50 Hz, (shipped with QuadScan Elite Desktop International orders). Desktop universal power supplies terminate in an IEC-320 connector (the same connector that you see on the back of PC computers). You must supply the IEC-320 to wall outlet cable.

QuadScan Elite is also available in a standard EIA 19" Rackmount configuration. The QuadScan Elite RM (Rackmount) occupies 1 standard rack height (1RU). The unit is shipped with Rackmount brackets (ears) in the package. All QuadScan Elite Rackmount models are capable of accepting power in the range of 95V to 250V, 47Hz. To 63 Hz. You must supply the IEC-320 to wall outlet cable for countries requiring other than the 3-prong plug configuration.

1.1.2 Standard Packaging for QuadScan Elite Desktop

The following is a list of components that are shipped as a part of the standard QuadScan Elite Desktop Packaging:

1 QuadScan Elite desktop unit
1 110 VAC @ 60 Hz, Wall Mount Transformer
1 BNC Male to BNC Male composite Video Cable
1 S-VHS (Y/C) Male to S-VHS (Y/C) Male Cable (4 pin Mini-DIN)
4 RCA Female to Male BNC Connector Adapters
1 QuadScan Elite IR Remote; 2 AAA batteries included
1 QuadScan Elite Manual

In addition to the above components, the user may order other cables, components and spare parts for special applications. A list of these items and their part numbers appears in Section 1.4 Product Ordering Options.

1.1.3 Standard Packaging for QuadScan Elite Desktop International

The following is a list of components that are shipped as a part of the standard QuadScan Elite Desktop International Packaging:

1 QuadScan Elite desktop unit
1 IEC-320 International power supply
1 BNC Male – BNC Male Cable
1 S-VHS Male to S-VHS Male Cable (4 pin Mini-DIN)
4 RCA Female to Male BNC Connector Adapters
1 QuadScan Elite IR Remote Control; 2 AAA batteries included
1 QuadScan Elite Manual

In addition to the above components, the user may order other cables, components and spare parts for special applications. A list of these items and their part numbers appears in Section 1.4 Product Ordering Options.

1.1.4   Standard Packaging for QuadScan Elite Rackmount

The following is a list of components that are shipped as a part of the standard QuadScan Elite Rackmount Packaging:

1 QuadScan Elite Rackmount unit
1 Pair Rack mount brackets
6 bracket mounting screws
1 BNC Male – BNC Male Cable
1 S-VHS Male to S-VHS Male Cable (4 pin Mini-DIN)
4 RCA Female to Male BNC Connector Adapters
1 QuadScan Elite IR Remote Control; 2 AAA batteries included
4 Rubber feet
1 QuadScan Elite Manual

In addition to the above components, the user may order other cables, components and spare parts for special applications. A list of these items and their part numbers appears in Section 1.4.

1.1.5   RS-232/422 Control

All QuadScan Elite Desktop and Rackmount units are controllable over RS-232/422 . Hardware jumpers determine the choice of communication standard.   The default is RS-232, (See Section 4.4, RS-232/422 Control, for more information.) The ability to control the QuadScan Elite over RS-232/422 requires the additional purchase of an RS-232/422 control cable (SKU 3201-0901). This item can be ordered from your local dealer at the time of your QuadScan Elite purchase or any time later either from your local dealer or directly from Focus Enhancements (See Section 1.4; Product Ordering Option for detail.).

1.2   Operational Specifications

1.2.1   Input Signal Formats

2 channel of NTSC or PAL (automatically recognized) composite   *(2 each BNC Female connectors)*
2 channels of NTSC or PAL (automatically recognized) S-VHS (Y/C) *(2 each 4 pin Mini-DIN Female connectors)*
2 channels of Component (YPbPr) (European or NTSC timing) *(2 each 3 BNC Female connectors)*
1 channel of HD-15 Male VGA pass through connector

NOTE:
THE QUADSCAN ELITE DOES NOT SUPPORT NON-INTERLACED INPUT.

1.2.2   Output Signal Formats

Hi Resolution RGB (RGB H and V appear on pins 1,2,3,13, and 14), HD-15 Female connector

1.2.3   Output Resolutions

Progressive Resolution	Color Space	Aspect Ratio	Mode Title
720 x 480 (NTSC)	RGB	4:3	DBL TV
720 x 576 (PAL)	RGB	4:3	DBL TV
640 x 480	RGB	4:3	VGA
800 x 600	RGB	4:3	SVGA
1024 x 768	RGB	4:3	XGA
720 x 720 (NTSC)	RGB	16:9	TRIPLE TV
720 x 864 (PAL)	RGB	16:9	TRIPLE TV
720 x 960 (NTSC)	RGB	16:9	QUAD TV
720 x 1152 (PAL)	RGB	16:9	QUAD TV
1365 x 1024	RGB	4:3	D-ILA

The HD-15 VGA connector pass through is an analog video pass through of the VGA input connected to the QuadScan Elite VGA IN (HD-15), Male connector. When VGA pass through is selected, the VGA input (Red, Green, Blue, H Sync and V Sync) is passed directly through to the HI-RES OUT HD-15 Female connector. No resolution scaling or signal processing is performed. All HDTV signals from a computer, satellite or other HDTV sources can be passed through this connection unprocessed.

1.2.4   Motion Compensation Modes

Motion Video (from 2 field interlaced video image acquisition)
Film, 3:2 Pulldown (from 24 fps film image acquisition)
Static Video
Automatically detect and process Motion Video, 3:2 Pulldown or Still Video

1.2.5   Signal Routing Capability

The A-Channel of all three types of television inputs (composite, Y/C and Component) may be independently re-routed to the B-channel enabling pass through of the signal to the B connector. (See Section 3.4; Signal Routing, for complete details.)

1.2.6 Control Methods

Front Panel Keyboard
IR Remote (Supplied)
RS-232/422 (cable ordered as an accessory)

1.2.7 Power Consumption

Desktop Unit:

           12-15 VDC   15W

Unit is shipped with a 12-15 Volt DC power supply, center positive, 2.5 mm barrel connector (male side on the unit). At 13 V., the desktop unit consumes a maximum of 1.0 A.

Rackmount **Unit:**

           120 V.   0.25 A.
           240 V.   0.15 A.

1.2.8 Physical Size

Desktop Unit:

           7.5" X 7.25" X 2.0""

Rackmount **Unit:**

           17.0" X 10.0" x 1.75"

1.2.9 Environmental

Desktop & Rackmount Units:

Operating Temperature:	32 to 104 degrees Fahrenheit (0 to 35 degrees Celsius)
Storage Temperature:	- 40 to 167 degrees Fahrenheit (- 40 to 75 degrees Celsius)
Humidity:	0 to 90%, non-condensing

1.3 Product Ordering Options

1.3.1 Ordering Guide

QuadScan Elite Products are named as follows:

Name	SKU	Description
QuadScan Elite	444-5600	Desktop, American
QuadScan Elite-International	444-5526	Desktop, International
QuadScan Elite-RM	444-5622	Rackmount*

* Please note that the QuadScan Elite Rackmount is shipped with a standard 3-prong Power Cord.

1.3.2 Available Accessories for the QuadScan Elite

The following list details the available accessory items that are used with the QuadScan Elite.

SKU Number	Description	Included
444-5919	QuadScan Elite IR Remote	Yes
3201-0901	Custom Built, RS-232 Control Cable	No
444-5008	HD15 Male to HD15 Male	No
444-5010	12-15dVDC Wall mount Power Supply	with Desktop
444-5009	Universal Desk top Power Supply	with Desktop International
3212-0802	110 VAC @ 60 Hz 3-prong Power Cord	with Rackmount
3501-0902	4 each RCA Female to BNC Male Adapter	Yes
444-5014	Cable, HD15 F to F, Gender changer	No
444-5906	Cable, HD15 Male to 5 BNC Male	No
444-5914	Cable, 5 BNC Male to 5 BNC Male	No
444-5922	Cable, 1 BNC Male to 1 BNC Male	Yes
444-5923	Cable, S-VHS (Y/C) to S-VHS (Y/C)	Yes
444-5926	Cable, HD15M to HD15F	No

NOTE:
Any of the QuadScan Elite accessories may be ordered directly from Focus Enhancements by calling us a 1-800-338-EDIT (3348), or by visiting our Web Store at www.focusinfo.com

2   Installation

Installation of all QuadScan Elite products is a simple and quick procedure, but is slightly different for each of the following versions.
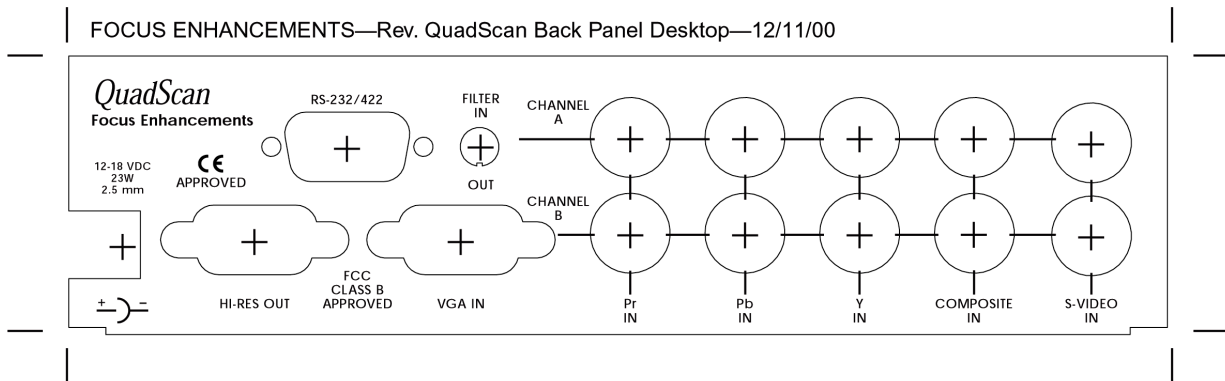
Figure 1 - QuadScan Elite Desktop Back Plate Diagram

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2.1 QuadScan Desktop Version Installation

Follow these steps to install your Desktop QuadScan Elite.

1. Turn all system components off.
2. Select a convenient location for the QuadScan Elite.
3. Plug the QuadScan Elite wall mount power supply into an appropriate outlet or power strip. Plug the 2.5mm connector of the wall mount power supply into the QuadScan Elite.
4. Determine the signal connections on the Projector.

    If the display device has BNC inputs, you will need an HD15 Male to 5 BNC Male Cable (SKU# 444-5906). Connect one end of this cable into the Hi-Res Output of the QuadScan Elite. Connect the 5 wires of the BNC Male connectors (Red, Green, Blue, H Sync and V Sync) to the appropriate BNC Female connectors of the display device.

    If the display device has a cable that terminates in a HD-15 Male connector, this device may be directly connected to the Hi-Res Out connector of the QuadScan Elite using a standard VGA cable, usually supplied with the projector. Connect one end of the HD-15 Male Connector to the Hi-Res Output connector of the QuadScan Elite. Connect the other end of the HD15 Male Cable to the HD-15 Female input of the display device.
5. Determine the required signal connections for the input sources to the QuadScan Elite. In all cases, it is best to connect your selected input source to the QuadScan Elite Channel A connector if a second channel is not required.

Using the Composite (BNC or RCA) input source

If the input source has a BNC connector, you can connect directly to the QuadScan Elite's Channel A or B Composite IN connector with the supplied BNC Male to BNC Male Cable.

If the input source has an RCA connector, attach one of the supplied RCA Female to BNC Male adapters to the QuadScan Elite's channel A or B Composite IN connectors. Connect the input source to the adapter with an RCA Male to RCA Male cable (not supplied).

Using the S-VHS (Y/C) input source

If the input source has a S-VHS (Y/C) connector, you can connect directly to the QuadScan Elite's Channel A or B S-VHS (Y/C) IN connector with the supplied S-VHS (Y/C) Male to S-VHS (Y/C) Male Cable.

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Component input sources will have either RCA or BNC connections

If the component input source has BNC connectors, you will need a 5 BNC Male to 5 BNC Male Cable (SKU # 444-5914), (actually only 3 wires of the 5 wire cable will be required). Connect the Y channel of the component source to the QuadScan Elite Channel A or B Y IN connector. Connect the Pr channel of the component source to the QuadScan Elite Channel A or B R-Y (Pr) IN connector. Connect the B-Y (or Pb) channel of the component source to the QuadScan Elite Channel A or B B-Y (Pb) IN connector.

If the component input source has RCA connectors, attach three of the supplied RCA Female to BNC Male adapters to the channel A or B Y IN, (Pr) IN and (Pb) IN connectors. Connect the component input source to the adapter with an RCA Male to RCA Male cable(s) (not supplied). Connect the Y channel of the component source to the QuadScan Elite Channel A or B Y IN connector. Connect the (Pr) channel of the component source to the QuadScan Elite Channel A or B (Pr) IN connector. Connect the (Pb) channel of the component source to the QuadScan Elite Channel A or B (Pb) IN connector.

If a VGA pass through is desired you will need to connect the optional HD15 Female to HD15 Male Cable.
Connect the VGA device's HD-15 output to the QuadScan Elite's VGA IN connector with this cable.

- Turn all of the system components on
- Make sure the correct input channel (RGB/Sync or Hi-Res) for the Video Projector is selected on the display device
- Turn the input device(s) on
- Turn the VGA pass-through device on.

If the system has been correctly installed, you will see one of the sources appearing on the display device. The QuadScan Elite signal priority scheme is as follows. As configured from the factory, the default resolution is Double TV and the default signal priority scheme is automatic. The signal priority scheme will automatically detect all active signals present on the QuadScan Elite input connectors and automatically select the highest priority signal for processing. The signal priority is:

1. VGA pass through
2. Channel A Component
3. Channel B Component
4. Channel A S-Video
5. Channel B S-Video
6. Channel A Composite
7. Channel B Composite

NOTE:
The QuadScan Elite saves user information including resolution and selected input source. If this is other than a first time installation, the above resolution and signal priority scheme may not be in effect.

The Video Projector should always be optimized for best performance before making any adjustments or changes to the QuadScan Elite Video Scaler. Refer to the manufacturer's User Manual for information on how to best setup the video projector.

2.2 QuadScan Rackmount Version Installation

Follow these steps to install your Rackmount QuadScan Elite.

1. Turn all system components off.
2. Select a convenient location for the QuadScan Elite.
3. If the QuadScan Elite is to be mounted within a 19-inch rack, install the left and right mounting brackets with the supplied screws.
4. Plug the QuadScan Elite into an appropriate outlet or power strip.
5. All other steps are the same as the desktop version.

QuadScan Elite Control Function

All of the powerful features of the QuadScan Elite can be controlled by any one of three methods: Front Panel control, RS-232/422 control, and IR Remote control, as described in section 4 QuadScan Elite Control Methods. All methods are interchangeable and simultaneously active (i.e. A Front Panel button push can be followed by an IR Remote control command).

NOTE:
Not all control features are accessible by the IR remote control. This provision is deliberately intended to prevent the user of an IR remote Control from accidentally changing the resolution to an unsupported resolution, (causing the display to "disappear"), etc.

QuadScan Elite control functions are grouped into one of the following areas:

CONTROL FUNCTION	FACTORY DEFAULT
• Output Screen Aspect Ratio (4:3 A, B, C, 16:9 A, B, C)	4:3A
• Reset and Control Functions (Mode Reset, Full Reset, IR Enable/Disable)	IR ENABLE
• DSP= Display (Motion Processing) (Auto, Still, Film, Motion)	AUTO
• Signal Routing (Channel A to B pass through)	CHANNEL A & B ARE INPUTS
• Output Sync Signal Configuration (3, 4, 5 wire)	5 WIRE
• Output Display Device Configuration (Resolution and implied Aspect Ratio)	DBL TV
• Source Termination (75 Ohm or UN-terminated)	CHANNEL A&B ARE TERMINATED
• Input Source Selection (Auto, VGA, Component, S-Video, Composite)	AUTO
• Input Video Functions (Hue, Saturation, Brightness and Contrast)	H=0, S=128, B=16, C=128
• Output Window Control (Size and Position)	NONE
• Input Source Window Control (Input Size and Position)	NONE
• Input Aspect Ratio Selection (16:9 Anamorphic, 4:3 full screen, 4:3 letterbox)	4:3 Full Screen

Each of the controls has one of three possible types of control parameters associated with it:
♦ Toggle (the function is either on or off),
♦ Multiple Choice (there are several, mutually exclusive options)
♦ Range (the parameter varies over a range of values for a particular function).

If the controlled item is a Toggle (i.e. Channel Termination, etc.), with a position of either On or Off, then the activation of any one of the arrow buttons will toggle the state of the controlled item.

If the controlled item is a Multiple Choice (i.e. Input Source, Output Resolution) with several mutually exclusive positions, then the activation of the Up Arrow or Down Arrow buttons will Increment or Decrement the state of the controlled item to the next state. When the last state is reached, depressing the Up or Down arrow buttons again will advance you to either the first or last controlled item in the list.

If the controlled item is a Range (i.e. Hue, Sat, Input Horizontal and Vertical Size and Position, etc), then the four arrow buttons increase or decrease the value of these quantities. The increase or decrease is proportional to the length of time that the button is pressed.

2.3   Output Screen Aspect Ratio

2.3.1   Output Screen Aspect Ratio (Multiple) (Not Available from IR remote Control)

The Output Screen Aspect Ratio control interacts with the Output Display Device Configuration and Input Aspect Ratio Selection to position the scaled and processed image in the best screen position for the given combination. It is important to remember that the Screen aspect ratio is different from the Display Device aspect ratio. For example, using a D-ILA projection system with a display device resolution of 1365 x 1024, aspect ratio of 4:3, a user may optimize his projection room for 16:9 viewing by focusing the projector on a 16:9 screen. This will effectively reduce the resolution of the projection system to 1365 x 768. The pixels outside the 1365 x 768 viewing area are still active (although black) and may be focused on the floor or the ceiling to achieve the desired maximum viewing area at 16:9. Since the exact position of the 1365 x 768 "active video" window within the 1365 x 1024 raster of the D-ILA is not known, 3 position settings are provided:

Position setting A places the 1365 x 768 active video strip at the top of the 1365 x 1024 raster.
Position setting B places the 1365 x 768 active video strip in the middle of the 1365 x 1024 raster.
Position setting C places the 1365 x 768 active video strip at the bottom of the 1365 x 1024 raster.

When the 16:9 Output Aspect Ratio is selected, the QuadScan Elite will determine the best presentation of the image upon a 16:9 screen based also on the Display Device Resolution and the Input Aspect Ratio selected. Similar action will be performed for 4:3 aspect ratio screens if 4:3 Output Aspect Ratio is chosen. The choices of Output Screen Size are:

Output Aspect Ratio	Front Panel Designation
16:9 Top	16:9A
16:9 Middle	16:9B
16:9 Bottom	16:9C
4:3 Top	4:3A
4:3 Middle	4:3B
4:3 Bottom	4:3C

Since Triple TV and Quadruple TV are 16:9, modes the 4:3 output aspect ratio will be:

4:3 Left	4:3A
4:3 Middle	4:3B
4:3 Right	4:3C

The Output Aspect Ratio Control default is 4:3A. With NTSC sources the Output Aspect Ratio of VGA and DBL TV modes are only 4:3, even though the front panel display allows the selection of a 16:9 mode.
With PAL TV sources, the Output Aspect Ratio of VGA, SVGA and DBL TV modes are only 4:3, even though the front panel display allows the selection of a 16:9 mode.

NOTE:
For a simplified explanation of what the Output Aspect Ratio does and how it relates to the Input Aspect Ratio, see Appendix B, Input Aspect Ratio to Output Aspect Ratio Primer.

2.4   Reset and Control Functions

2.4.1   IR ON/OFF (Toggle) (Not available from IR remote control)

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This control enables/disables IR Remote Control.

2.4.2 Mode Reset

This control resets the current mode to its factory default (See Section 3 QuadScan Elite Control Functions, for the factory default settings). Each "mode" is defined as being an Input Source-Output Resolution combination. (For example, PAL composite input on Channel B scaled to XGA output is one mode). The Mode Reset control affects only the current mode; all others will remain as previously configured by the user.

2.4.3 Full Reset (Not available from IR remote control)

This control resets all of the modes of the QuadScan Elite to their factory default values (See Section 3, QuadScan Elite Control Functions for the factory default settings).

2.5   Motion Processing

2.5.1   Motion Processing (Multiple Choice)

This control determines which type of video motion processing will be applied. The options are:

> **Motion Processing Mode & Front Panel Designation**
> Auto
> Film
> Motion
> Still

Automatic Processing (Auto) analyzes the incoming video program material and selects the most appropriate motion treatment from the three remaining options. **Film Processing** (3:2 Pulldown) is used to compensate for the motion artifacts of video program material from film sources. **Motion Processing** is used to compensate for the motion artifacts of motion video program material originating from 60 Hz. (50 Hz. PAL) video sources. **Still Processing** is used to deliver the highest possible resolution for still video program material (such as the output of a document camera focused on a page). The default Motion Processing is AUTO.

Motion Processing Selection is indicated by "DSP=" followed by the above-mentioned designation on the QuadScan Elite Front Panel Display.

2.6   Signal Routing

2.6.1   Component Y Pb Pr Pass Through (Toggle) (Not available from IR remote control)

This control determines whether the Component television input on Channel A is routed through (passed through), to Channel B or not. If the signal is "passed through", the input on Channel A will appear as an output on Channel B. If the signal is not passed through, Channel B will be configured as a second Component input. The default is that Channel B is configured as an input.

Y Pb Pr Channel B Configuration is indicated by "YUV B = PASS" or "YUV B= INPUT" on the QuadScan Elite Front Panel Display.

2.6.2   S-VHS (Y/C) Pass Through (Toggle) (Not available from IR remote control)

This control determines whether the S-VHS (Y/C) input on Channel A is routed through to Channel B or not.
If the signal is "passed through" S-VHS (Y/C) signal that is input on Channel A will appear as an output on Channel B.
If the signal is not passed through, Channel B will be configured as an input. The default is Channel B configured as an input.

S-VHS (Y/C) Channel B Configuration is indicated by "SVHS B=PASS" or "SVHS B=INPUT" on the QuadScan Elite Front Panel Display.

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2.6.3   Composite Pass Through (Toggle) (Not available from IR remote control)

This control determines whether the Composite input on Channel A is routed through to Channel B or not.
If the signal is "passed through" the Composite signal that is on Channel A will appear as an output on Channel B. If the signal is not passed through, Channel B will be configured as a second input source. The default is Channel B configured as an input.

Composite Channel B Configuration is indicated by "COMP B=PASS" or "COMP B=IN" on the QuadScan Elite Front Panel Display.

2.7   Output Sync Signal Configuration

2.7.1   Output Sync Signal Configuration (Multiple Choice) (Not available from IR remote control)

This control determines where the output video synchronization signals will be placed

Output Sync	Front Panel Designation
Separate H and V (pins 13 and 14)	Osync= 5WIRE
Separate Composite Sync (pin 14)	Osync= 4WIRE
Composite Sync on Green (pin 2)	Osync= 3WIRE

The Default is Separate Sync (H and V) on pins 13 & 14.

2.8   Display Device Configuration

2.8.1   Display Device Configuration (Multiple) (Not available from IR remote control)

The Display Device Configuration operates in conjunction with the Input Aspect Ratio and the Output Screen Aspect Ratio to provide the correct scaling for the particular output. Several resolutions are supported as follows:

Progressive Resolution	Aspect Ratio	Mode Title
720 x 480 (NTSC)	4:3	DBL TV
720 x 576 (PAL)	4:3	DBL TV
800 x 600	4:3	SVGA
1024 x 768	4:3	XGA
720 x 720 (NTSC)	16:9	TRIPLE TV
720 x 864 (PAL)	16:9	TRIPLE TV
720 x 960 (NTSC)	16:9	QUAD TV
720 x 1152 (PAL)	16:9	QUAD TV
1365 x 1024	4:3	D-ILA

The Default is DBL TV (NTSC or PAL)

NOTE:
When using the **D_ILA** (**DI**gital **L**ight **A**mplification), mode with a JVC D_ILA projector you must go into the projector menu and manually select SXGA3 in the source menu. Do not use the AUTO mode setting. (Refer to the JVC projector manual for details on mode settings.)

2.9   Source Termination

2.9.1   VGA Termination (Toggle) (Not available from IR remote control)

 This control engages or disengages the 75-Ohm termination resistors on the RGB lines of the VGA pass through. The default configuration is termination resistors engaged.

VGA Termination is indicated by "VGA TERM" (VGA input Terminated) or "VGA UNTERM" (VGA UN-terminated) on the QuadScan Elite Front Panel Display.
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2.9.2   Channel A Termination (Toggle) (Not available from IR remote control)

This control engages or disengages the 75-Ohm termination resistors simultaneously on the Component, S-Video and Composite input lines of channel A.   The default configuration is termination resistors engaged.

Channel A Termination is indicated by "CH A TERM" (Channel A Input Terminated) or "CH A UNTERM" (Channel A Input UN-terminated) on the QuadScan Elite Front Panel Display.

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2.9.3   Channel B Termination (Toggle) (Not available from IR remote control)

This control engages or disengages the 75-Ohm termination resistors simultaneously on the Component, S-Video and Composite input lines of channel B.   The default configuration is termination resistors engaged. Generally, you would want the terminators engaged if using Channel B as an input, and you would want the terminators disengaged when using channel B in pass through mode.

Channel B Termination is indicated by "CH B TERM" (Channel B input Terminated) or "CH B UNTERM" (Channel B Input UN-terminated) on the QuadScan Elite Front Panel Display.

2.10   Input Source Selection

2.10.1 Input Source Selection (Multiple Choice)

This control selects which input source will be processed and displayed. The options are:

Input Source	Front Panel Designation
Auto	AUTO
VGA Pass Through	PASS VGA
Channel A Component	YUV A
Channel B Component	YUV B
Channel A S-Video	SVHS A
Channel B S-Video	SVHS B
Channel A Composite	COMP A
Channel B Composite	COMP B

When the "Auto" option is selected, the QuadScan Elite will automatically select, process and display the source with the highest priority. The priority scheme is listed above with VGA pass through as the highest priority and Channel B Composite as the lowest. The default source is "AUTO".

Input Source Selection is indicated by "IN=" followed by the channel designation on the QuadScan Elite Front Panel Display. When Auto Mode is selected all input video functions as described in Section 3.9 – Input Video Functions, are also set automatically to factory default and are not available for manual adjustment.

2.11 Input Video Functions

2.11.1 HUE (Range)

This control adjusts the Hue of the selected input source. Hue is not accessible from the front panel when the selected input source is VGA pass through or AUTO. The default value for Hue will produce internal digital values in accordance with ITU656 when a 100% amplitude, and a 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value for Hue will produce an RGB analog output at the HI RES OUT connector with a full-scale range of 0.0 to 0.7 V. when a 100% amplitude, 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value is 0. The range of Hue is -128 to 127 units.

2.11.2 Color Saturation (Range)

This control adjusts the Color Saturation of the selected input source. Color Saturation is not accessible from the front panel when the selected input source is VGA pass through or AUTO. The default value for Saturation will produce internal digital values in accordance with ITU656 when a 100% amplitude, and a 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value for Saturation will produce an RGB analog output at the HI RES OUT connector with a full-scale range of 0.0 to 0.7 V. when a 100% amplitude, 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value is128. The range of Saturation is 0 – 255 units.

2.11.3 Brightness (Range) also known as Black Level

This control adjusts the Brightness (black level) of the selected input source. Brightness is not accessible from the front panel when the selected input source is VGA pass through or AUTO. The default value for Brightness will produce internal digital values in accordance with ITU656 when a 100% amplitude and a 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value for Brightness will produce an RGB analog output at the HI RES OUT connector with a full-scale range of 0.0 to 0.7 V, when a 100% amplitude, 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value is 16. The range of Brightness is 0 – 255 units.

2.11.4 Contrast (Range) also known as White Level

This control adjusts the Contrast (white level) of the selected input source. Contrast is not accessible from the front panel when the selected input source is VGA pass through or AUTO. The default value for Contrast will produce internal digital values in accordance with ITU656 when a 100% amplitude, and a100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value for Contrast will produce an RGB analog output at the HI RES OUT connector with a full-scale range of 0.0 to 0.7 V. when a 100% amplitude, 100% saturation color bar test pattern is applied to the QuadScan Elite composite input. The default value is 128. The range of Contrast is 0 – 255 units.

2.12 Output Window Control

2.12.1 Output Horizontal and Vertical Size (Range) (Not available from IR remote control)

This control enables the user to control the size of the "Output Window" with respect to the raster scan of the display device. Most display devices have a wide range of capability in mapping the boundary of the raster scan to the boundary of the viewable area. This control is provided to enable additional control in the event that the users display device does not provide sufficient range. This control is always operational, however it should be adjusted in conjunction with the Output Horizontal and Vertical Position controls (Section 3.10.2.)

Output Horizontal and Vertical Size on the QuadScan Elite Front Panel Display indicated output Horizontal and Vertical Size.

2.12.2 Output Horizontal and Vertical Position (Range) (Not available from IR remote control)

This control enables the user to position the "Output Window" with respect to the raster scan of the display device. Most display devices have a wide range of capability in mapping the boundary of the raster scan to the boundary of the viewable area. This control is provided to enable additional control in the event that the users display device does not provide sufficient range. This control is always operational, however it should be adjusted in conjunction with the Output Horizontal and Vertical Size controls (Section 3.10.1.)

Output Horizontal and Vertical Position is indicated by OUT HV POS on the QuadScan Elite Front Panel Display.

2.13 Input Source Window Control

2.13.1 Input Horizontal and Vertical Position (Range)

This control enables the user to position the "Input Window" with respect to the input video source. The Input Window is a smaller section of the video input that will be used as the scaling source. The Input Horizontal and Vertical Position works in conjunction with the Input Horizontal and Vertical Size Control. The default Input Position is with the Input Window exactly aligned with the timing boundaries of active video as specified for NTSC and PAL.

Input Horizontal and Vertical Position is indicated by IN HV POS on the QuadScan Elite Front Panel Display.

2.13.2 Input Horizontal and Vertical Size (Range)

This control enables the user to control the size of the "Input Window" with respect to the input source. The Input Window is a smaller section of the source input that will be used as the scaling source. As the Input Size is adjusted, the QuadScan Elite will increase the contents of the Input Window to the full screen size as defined by the Output Display Configuration and Output Screen Aspect Ratio. The Input Horizontal and Vertical Position works in conjunction with the Input Horizontal and Vertical Size. The default Input Size is different between composite/S-Video and component inputs. Component is 480 lines and Composite/S-Video is 464 lines. This is done to eliminate the flagging effect from VCR's.

Input Horizontal and Vertical Size is indicated by IN HV SIZE on the QuadScan Elite Front Panel Display.

2.14 Input Aspect Ratio Selection

2.14.1 Input Aspect Ratio Selection (Multiple Choice)

This Control enables the QuadScan Elite to adapt to different aspect ratios of popularly available video program material. Recorded television material comes in 3 forms:

A)   4:3 full screen aspect ratio
B)   16:9 full screen aspect ratio (often called Anamorphic)
C)   Letterbox format (16:9 aspect ratio strip within a 4:3 aspect ratio screen)

The Input Aspect Ratio Selection operates in conjunction with the Output Display Device Configuration and Output Screen Aspect Ratio to ensure that the QuadScan Elite provides a picture of maximum area upon the output screen.

The Input Aspect Ratio Selection Options are

Input Source	Front Panel Designation
4:3 Full Screen	Input = 4:3
16:9 Full Screen (Anamorphic)	Input=16:9
Letter box	Input=4:3LB

The default is 4:3 Full Screen.

NOTE:
For a simplified explanation of what the Input Aspect Ratio does and how it relates to the Output Aspect Ratio, see Appendix B, Input Aspect Ratio to Output Aspect Ratio Primer.

2.15 Output Filter Select

2.15.1 Output Low Pass Filter

The QuadScan Elite has a "low pass filter" on the video output, that can be selected by setting the FILTER toggle switch either "IN" (Up Position), or "OUT" (Down Position). This low pass filter, when "OUT", allows full bandwidth video out of the "HI_RES OUT" connector. This is the best setting for use with CRT type projectors. When the filter is "IN", this limits the amount of high frequency content that comes out of the connector, and will very slightly soften the video image in the D-ILA, Quad-TV and XGA modes of QuadScan Elite. This is often the best mode for pixilated displays, like LCD and DLP projectors, and can reduce the banding effect sometimes seen in these display devices.

FILTER IN: Best for pixilated displays when in D-ILA, Quad-TV, and XGA output modes.
FILTER OUT: Best for CRT type projectors.

NOTE: The FILTER will have virtually no effect in modes other than D-ILA, Quad-TV and XGA, since the other video output modes have little high frequency content.

2.16 Auto Save parameters

2.16.1 Input Mode/Output Mode Auto Save Parameters

The QuadScan Elite has non-volatile memory (NVRAM) that stores the user settings for the following parameters based on the selected input mode and output resolution.

- Input Horizontal and Vertical size and position parameters
- Output Horizontal and Vertical size and position parameters
- Hue, Saturation, Brightness and Contrast parameters
- Input Aspect Ratio
- Output Aspect Ratio

These parameters are saved, based on the selected input channel, and the selected output resolution. With six input channels (excluding VGA), and 7 output resolutions, a total of 42 save sets are available.

After the user adjusts any of the above parameters, the QuadScan Elite will saves the current setting in. Changing to a different input channel or output resolution, will recall the settings previously saved for that channel.

- Performing a "FULL RESET" will clear the contents of the entire NVRAM back to the factory default settings.
- Performing a "MODE RESET" will clear the NVRAM for the currently selected mode only.

NOTE:
Due to the nature of the front panel display, when you change your input channel or output resolution, the front panel display may not show the correct settings stored in memory for Hue, Saturation, Brightness and Contrast parameters, Input or Output Aspect Ratios. The actual values stored in memory are correct, but the front panel display only shows the values from the previously selected input channel or output resolution. If any of the parameters are changed, the front panel and the output display will immediately change to the new changed value.

3 QuadScan Elite Control Methods

Both QuadScan Elite models can be controlled in one of 3 different ways: through the Front Panel, RS-232/422, or Infra Red Remote Control. The following sections detail the use of each of these control mechanisms. In all cases, the state of a particular function of the QuadScan Elite is indicated on the QuadScan Elite Front Panel LED readout. On power-up, the LED display indicates "QUADSCAN".

3.1 Front Panel Control

The QuadScan Elite Front Panel gives the user access to all of the control parameters detailed in section 3.

Figure 2 indicates the placement of the buttons and LED display on the Front Panel of the QuadScan Elite. The controls are arranged such that the user can cycle through a circular list of controllable functions with the **+ (plus)** or **– (minus)** buttons. Using the **+** button advances the controlled item to the next item in the list. Using the **-** button advances the controlled item to the previous item in the list. Depending on the nature of the controlled item, the left and right directional arrow buttons function differently.

If the controlled item is a Toggle (i.e. Channel Termination, etc.) with a position of either On or Off, then the activation of any one of the arrow buttons will toggle the state of the controlled item.

If the controlled item is a Multiple Choice (i.e. Input Source, Output Resolution) with several mutually exclusive positions, then the activation of the Up Arrow or Down Arrow buttons will Increment or Decrement the state of the controlled item to the next state. When the last state is reached, depressing the Up or Down arrow buttons again will advance you to either the first or last controlled item in the list.

If the controlled item is a Range (i.e. Hue, Sat, Input Horizontal and Vertical Size and Position, etc), then the four arrow buttons increase or decrease the value of these quantities. The increase or decrease is proportional to the length of time that the button is pressed.
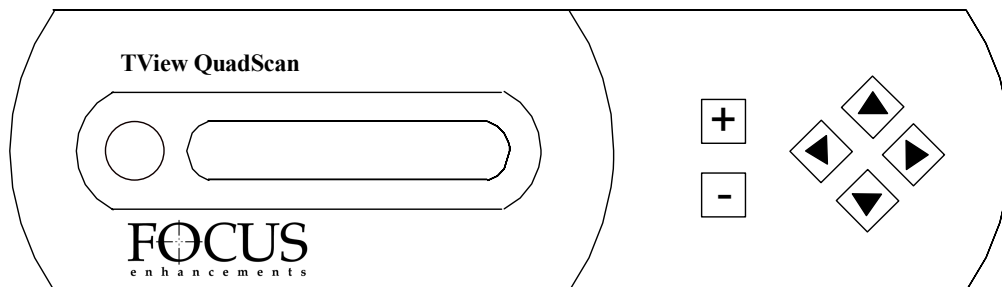

Figure 2 - Position of Front Panel Controls

3.1.1 Locking the Front Panel

The Front Panel may be locked and unlocked using either the Front Panel or by way of the RS-232/422 control.

Locking/Unlocking using the Front Panel buttons:
A special combination of buttons (the Locking Sequence) make it possible to freeze the control input such that the QuadScan Elite will not respond to Control Panel or IR remote or RS-232/422 commands until a second special combination of buttons (the Unlocking Sequence) is entered.

To execute the locking sequence from the Front Panel:
1. Advance the panel menu to "QuadScan Elite"
2. Press the "down" arrow key and while still pressing the "down" arrow key, press the "-"(minus) key.
The LED readout will indicate "LOCKED" and all further input will be ignored until the Unlocking Sequence is entered.

The Unlocking Sequence consists of:
 Press the "down" key and while still pressing the "down" key, press the "+" key.

Locking/Unlocking using RS-232/422 Control:
The Front Panel may be locked or unlocked by way of the RS-232/422 control. In order to utilize this feature, you will need to configure both the computer and the QuadScan Elite for RS-232/422 control. Section 4.3, RS-232/422 Control, gives detailed information on how this may be accomplished.

NOTE:
Locking will persist even after the QuadScan Elite is power cycled.
All input from the IR remote control, Front Panel control, and RS-232/422 control will be ignored (except for the Unlocking commands from the front panel and RS-232/422), until the Front Panel has been unlocked.

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3.2   IR Remote Control

The hand-held IR remote control enables the user to access most of the commonly used functions of the QuadScan Elite. Certain setup functions of the QuadScan Elite may only be accessed via the Front Panel or via RS-232/422 (see Section 3; QuadScan Elite Control Functions, for specifics). This prevents the accidental use of some controls (i.e.: switching to an unsupported output resolution) and keeps the interface simple. The IR remote control interface is shown in Figure 3. The IR remote control is a line of sight device; the IR receiver is mounted inside the QuadScan Elite next to the LED displays. The IR remote control will only operate when it is within the line of sight of the LED's of the QuadScan Elite. The maximum range is about 25 feet.

Several controls are available from the IR unit, Input Horizontal and Vertical Size and Position (Button 1), Input Video Functions (Button 4), , Hue, Saturation, Brightness, and Contrast, selection of the Motion Processing Type, Input Aspect Ratio (Button , and selection of the Input Source.

Pressing the Size/Position button (Button 1) will activate the Input Horizontal Size and Position control menu. The first touch of this button enables the Input Horizontal and Vertical Size and can be adjusted with the positional button of the Remote Control, located at the top of the IR remote control. A second touch of the Size/Position button enables the Horizontal and Vertical Position control menu . The positional button is again used to change the Horizontal and Vertical position of the signal. Subsequent touches of the Size/Position button cycles through these 2 control menus in the indicated order.

Touching the Signal Routing Button (Button 2) activates the selection of the Input Source. The first touch of this button selects the automatic selection of input source according to the priority scheme of Section 3.3.10 (VGA, YUV A, YUV B, S-VHS A, S-VHS B, Composite A, Composite B). The second touch selects VGA pass through (if present or the next highest priority device if no VGA signal is present). Subsequent touches of this button cycle descend through the priority list, starting from the top.

Touching the Motion Processing button (Button 3) activates the selection of the Motion Processing Type. The first touch of this button selects Automatic Motion Detection and Compensation control. The second touch selects Film Processing Mode. The third touch selects the Video Motion Processing Mode. The fourth touch selects Still Video Mode.

Touching the Video Function button (Button 4) activates the Video Functions for Hue, Saturation, Brightness, and Contrast (NOTE: Video Functions are not available for IN = AUTO or PASS VGA). The first touch of the Video Function button enables the Brightness to be adjusted with the positional button of the Remote Control. The second touch of the Video Function button enables the Contrast to be adjusted with the positional button of the Remote Control. The third touch enables the Saturation to be adjusted with the positional button of the Remote Control. The fourth touch enables the Hue to be adjusted with the positional button of the Remote Control. With each press of the Video Function button continues cycling through these 4 functions in the indicated order. Using the positional button of the Remote Control will make individual adjustments to Hue, Saturation, Brightness, and Contrast.

The Selection of the Input Aspect Ratio will be achieved with the Trigger button of the IR Remote (located on the underside of the Remote Control. The first touch of this button selects 4:3 Aspect Ratio Input. The second touch selects Letterbox 4:3 input. The third touch selects 16:9 Aspect Ratio Input. Subsequent touches of this button continue cycling through these 3 functions in the indicated order.

Operation of the IR remote control may be enabled or disabled by the use of Front Panel or RS-232/422 Control. If the IR remote control appears to be ineffective, examine the IR ON/OFF selection using the Front Panel to ensure that the IR Remote is ON.

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3.2.1 Mode Reset with the IR Remote Control

The IR Remote Control unit's Reset button will execute a QuadScan Elite Mode Reset (See Section; 3.2.2, Mode Reset, for more information.)
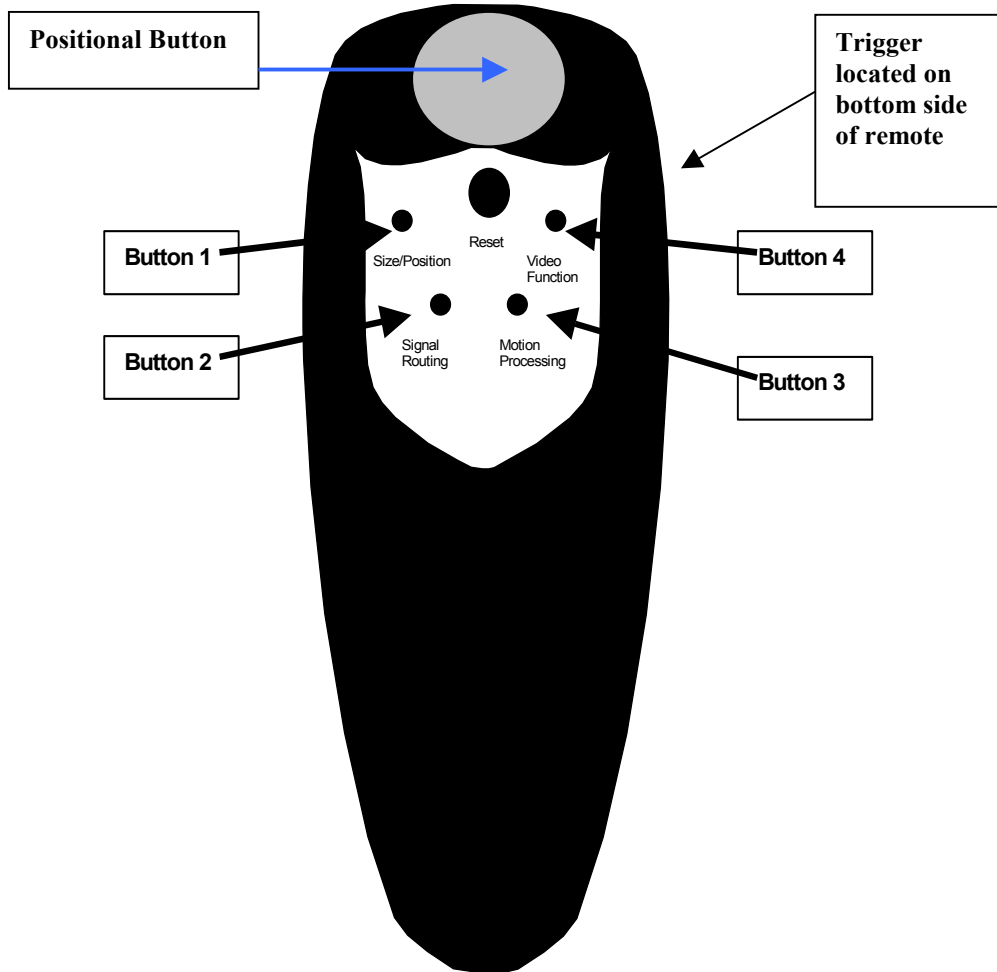
Figure 3 – Remote Control

3.3 RS-232/422 Control

All of the functions detailed in section 3.1 are available from RS-232/422 control. Every QuadScan Elite is operable in both RS-232 and RS-422, but must be correctly set up for each standard. When configured for RS-422, up to 8 QuadScan Elite's may be connected in a single RS-422 wired system. The QuadScan Elite will react to controls that are delivered to a unique address (address 0 through 7), that is programmed into each QuadScan Elite via the Front Panel control.

When configured for RS-232, only a single QuadScan Elite may be attached to the RS-232 link. The default configuration is RS-232.

3.3.1 Configuring the QuadScan Elite for RS-232 or RS-422

Jumper JP3 on the QuadScan Elite Control Interface board selects RS-232 or RS-422. Depending on the configuration of this jumper, the DB-9 communications connector located on the front panel of the QuadScan Elite will accept either RS-232 or RS-422.

Figure 4 indicates the positioning of Jumper JP3. In the case of RS-422, the user has the additional choice of selecting a 120-Ohm termination.
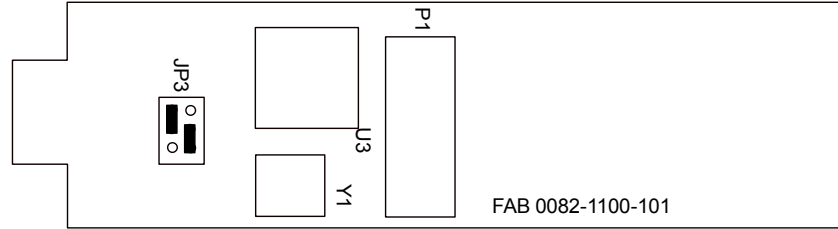
RS-232
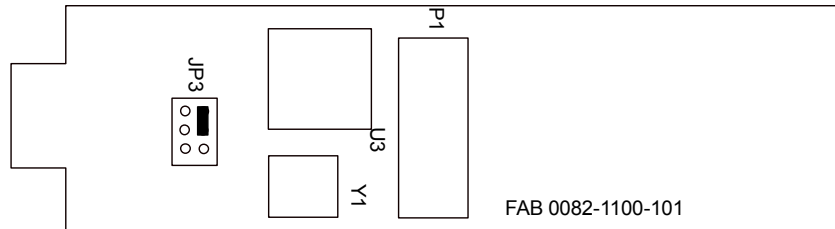
RS-422 (Unterminated)
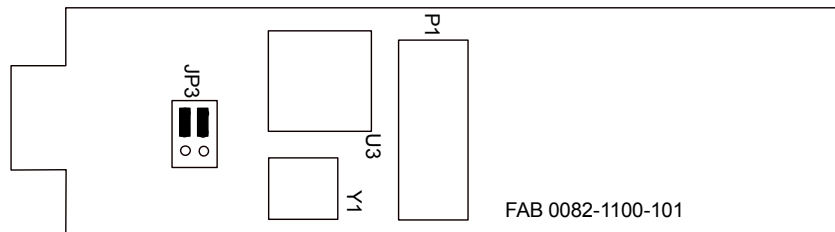
RS-422 (120 Ohm Termination)

Figure 4 – Position of Jumper JP3 for RS-232/422 Control

3.3.2 Connecting the QuadScan Elite to communications devices

Slightly different connections schemes are required for RS-232 and RS-422 operation.

Figure 5 indicates the recommended connections from a DB-9 connector for RS-232 operation. The RS-232 cable (SKU 3201-0901), is a custom designed cable that can be purchased separately through Focus Enhancements. Depending on the way that the controlling port is programmed, other connections may work as well. The QuadScan Elite has no way of handling the RTS/CTS and DSR/DCD signals.
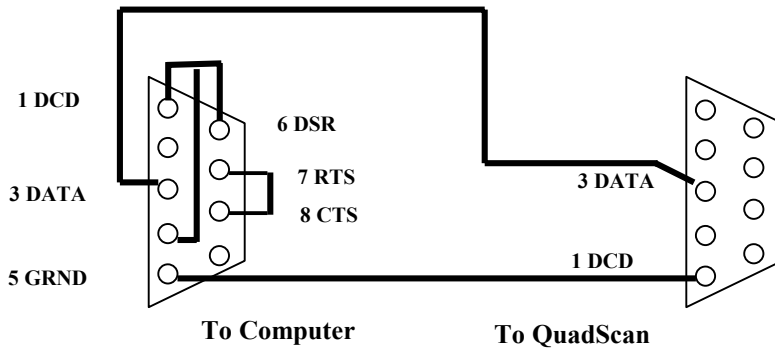
Figure 5 Recommended RS-232 Wiring

Figure 6 indicates the recommended connections from a DB-9 connector for RS-422 operation. In this case, a simple 9 pin to 9-pin cable will work in all cases.

Figure 6 Recommended RS-422 Wiring

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3.3.3 Programming the QuadScan Elite's Address

With RS-422, there may be as many as 8 QuadScan Elite's operating within a system. In order to provide a control mechanism to differentiate each QuadScan Elite, each QuadScan Elite is assigned a unique address using the Front Panel.

Programming the address is a simple procedure.

Front Panel Display must say QUADSCAN
1.   . Press the right arrow button once (RS-232/422 Address Menu)
2.   . Pressing either the up or down arrow buttons will change the address itself.
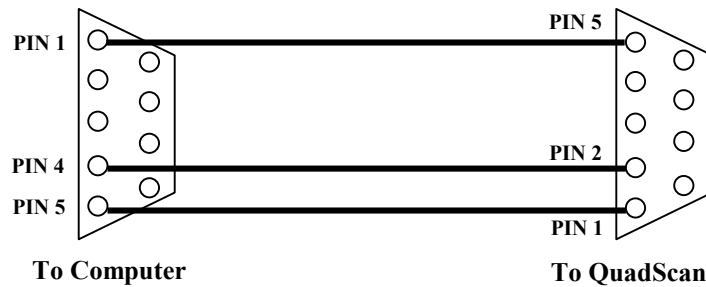3.   . Press the Plus button to lock in the address
4.   . Auto Save feature will automatically save this address.

The address circuitry is active even when you are using the RS-232 link (which does not permit multiple QuadScan Elite's or other devices to be connected in a multiple unit configuration).

NOTE:
- It is possible to change the RS-232 address to be anything between 0 and 7. The standard address is 0.
- Performing either a MODE or FULL RESET will not change the RS-232/422 address for any of the QuadScan Elite's.

3.3.4 Sending Communications Commands to the QuadScan Elite

The serial port of the QuadScan Elite accepts serial data at 9600 baud, 8data bits, no parity bit, 1 stop bit. It is essential that the serial communications device that delivers commands to the QuadScan Elite be set up in this fashion. Additionally, a 10ms delay must be inserted between each character sent to allow processing time. Programs like Hyper Terminal allows you to add the delay time. If you are using the Panja, Phast, or AMX controllers you will need to check their users manual to determine how to add the 10ms delay.

NOTE:
The QuadScan Elite does not have bi-directional communication capability. What this means is that there is no direct feedback via the RS-232/422 control as to what commands or functions are being executed on the QuadScan Elite. What will happen is that as each function is sent via the RS-232/422 control, the QuadScan Elite's Front Panel Display will show what function register is being changed along with the range (if sent) for that register.

The QuadScan Elite accepts 8 bit characters as commands. The commands to enable or disable the QuadScan Elite's RS-232/422 are received as strings of ASCII characters. For the purposes of this manual, all ASCII characters will be referred to with the hexadecimal numbering sequence (i. e. the minimum value of a byte is 00, the maximum value of a byte is FF, the value of an upper case A is 0x41).

The Command sequence for communicating with the QuadScan Elite is as follows:
1.   Send the Activation Command
2.   Send the QuadScan Elite Control Commands
3.   Send the De-Activation Command

1)   **Send the Activation Command**

The Activation Command consists of the character string: QSRONx (where x is the address of the QuadScan Elite). The Activation Command (and all other commands) must be followed by a Carriage Return (0x0d) to be accepted.

The following byte string (using hexadecimal values for ASCII characters) indicates a valid Activation Command for a QuadScan Elite previously programmed to be address 3:

0x51	0x53	0x52	0x4f	0x4e	0x03		0x0d	HEX CODES
Q	S	R	O	N	CTRL-C		<CR>	ASCII CODES
81	83	82	79	78	3		13	DECIMAL CODES

If the QuadScan Elite receives any unexpected input before the reception of the Activation Command, it will ignore it. If it receives an unexpected byte during the transmission of the Activation Command, the Activation Command must be re-transmitted (the Activation sequence is reset).

2   **Send the QuadScan Elite Control Commands**

Once the QuadScan Elite has been activated, all of the control commands can be transmitted to the QuadScan Elite. The QuadScan Elite individual commands consist of 2 byte strings. Each 2-byte string is an internal Register Number Byte followed by a Value Byte. The Value Byte has a different meaning and legal range for each register.   Each command (i.e. Register Number Byte, followed by Value Byte) must be followed with a Carriage Return.

The Value Byte provides "absolute information" if the parameter in question is a Toggle or Multiple Choice Item. If the parameter in question is a range item, the Value Byte provides "relative information" incrementing or decrementing the existing value of that parameter by one count.

In addition to the above commands, two additional commands are provided for control information. Writing Value Byte = 01 to register 18 will cause a Full Reset operation to occur. Writing Value Byte = 01 to register 20 will cause the existing parameter set to be written in to NVRAM. The QuadScan Elite will subsequently power up with these saved parameters until writing a 01 to register 18 once again changes the NVRAM.

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The following table indicates the Register Functions, the Register Number, Parameter Type and action of the legal values of the Value Byte.

Register Name	Reg. #	Type	Value Byte Action (hexadecimal Byte)			
Input H and V Position	1	Range	=01 increment H, =02 decrement H, =03 increment V, =04 decrement V			
Input H and V Size	2	Range	=01 increment H, =02 decrement H, =03 increment V, =04 decrement V			
Output H and V Position.	3	Range	=01 increment H, =02 decrement H, =03 increment V, =04 decrement V			
Brightness	4	Range	=00 to 255			
Contrast	5	Range	=00 to 255			
Hue	6	Range	=- 128 to + 128			
Input Source Select	7	Multiple	=01 Auto,	=02 VGA Pass,	=03 YUV A,	=04 YUV B
			=05 S-VHS A,	=06 S-VHS B,	=07 Composite A,	=08 Composite B
Channel A Termination	8	Toggle	=01 Terminate,	=00 UN-Terminate		
Channel B Termination	9	Toggle	=01 Terminate,	=00 UN-Terminate		
VGA Termination	10	Toggle	=01 Terminate,	=00 UN-Terminate		
Output Resolution	11	Multiple	=01 D-ILA,	=02 Triple,	=03 Quadrupled,	=04 XGA
			=05 SVGA,	=06 Doubled,	=07 VGA	
Output Sync Select	12	Multiple	=01 5Wire	=02 4Wire	=03 3Wire	
Composite B Input	13	Toggle	=01 Pass Thru,	=00 Input		
S-VHS B Input	14	Toggle	=01 Pass Thru,	=00 Input		
YUV B Input	15	Toggle	=01 Pass Thru,	=00 Input		
Input Aspect	16	Multiple	=01 4:3	=02 4:3LBox	=03 16:9	
YUV = SMPTE	17	Toggle	=00 SMPTE			
Full Reset	18		=01 Full Reset			
Mode Reset	19		=01 Mode Rest			
Save Settings	20		=01 Save Settings			
Keyboard Locked	21	Toggle	=01 Locked	=00 Unlocked		
Output H and V Size	22	Range	=01 increment H, =02 decrement H, =03 increment V, =04 decrement V			
Motion Processing	23	Multiple	=01 Still,	=02 Motion,	=03 Film,	=04 Auto
Saturation	24	Range	=00 to 255			
IR Remote Enable	25	Toggle	=01 Enabled	=00 Disabled		
Output Aspect	26	Multiple	=01 4:3 Top	=02 4:3 Middle	=03 4:3 Bottom	
			=04 16:9 Top	=05 16:9 Middle	=06 16:9 Bottom	

For example, the following byte sequences perform the indicated functions:

Input Set to Channel A S-VHS

7	5	13	DECIMAL CODES
07	05	0d	HEX CODES
Input Source register	5, therefore S-VHS A	<CR>	

Input Aspect Ratio

16 (decimal)	1	13	DECIMAL CODES
10	01	0d	HEX CODES
Aspect Ratio	1, is therefore 4x3	<CR>	

Decrement Brightness

4	0	13	DECIMAL CODES
04	00	0d	HEX CODES
Brightness register	Decrement by 1	<CR>	

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Delay time between each transmitted character of a command must be 10 ms or greater. Each command will not be completed until the Carriage Return is received. If incorrect register numbers are given at the start of any command, the QuadScan Elite will ignore that byte.

Special caution should be used when using the Save Settings Command (Register 20). Excessive repeated use of this command (i.e. inside an endless loop) would damage the QuadScan Elite Non-Volatile memory.

3)   Send the De-Activation Command
When a QuadScan Elite is used in an RS-422 system with several other QuadScan Elite's it will be necessary to De-Activate the currently selected QuadScan Elite to issue commands to another QuadScan Elite in the system. If you are using a single QuadScan Elite, it will not be necessary to De-Activate the QuadScan Elite.

The De-Activation Command consists of the character string: RQOFFx (where x is the address of the QuadScan Elite). The De-Activation Command must be followed by a Carriage Return (ASCII character value of 13 decimal) to be accepted.

The following byte string (using decimal values for ASCII characters) indicates a valid De-Activation Command for a QuadScan Elite previously programmed to be address 3:

0x52	0x51	0x4f	0x46	0x46	0x03	0x0d	HEX CODES
R	Q	O	F	F	CTRL-C	<CR>	ASCII CODES
82	81	79	70	70	3	13	DECIMAL CODES

If the QuadScan Elite receives any unexpected input before the reception of the De-Activation Command, the command will be ignored. If QuadScan Elite receives an unexpected byte during the transmission of the De-Activation Command, the De-Activation Command must be re-transmitted (the De-Activation sequence is reset).

Appendix A - IR Remote Hexadecimal Codes ---

In the event that you want to use a programmable remote control device here are Hex/Decimal codes for the IR Remote Control buttons.

Button Number	Button Name	Hex/Decimal Code
Button 1	H/V pos/size	0xFEh
Button 2	Input Mode	0xFDh
Button 3	Motion	0xFBh
Button 4	Video Function	0xF7h
Reset	Reset	0xAFh
Trigger	Aspect Ratio	0x5Fh

Appendix B – Input Aspect Ratio to Output Aspect Ratio Primer

WHAT INPUT ASPECT RATIO SETTINGS DO

(4:3 Mode)   If you are playing a DVD, and the DVD player is in "Normal TV" mode, a circle will appear as a circle on a standard TV. In this case, you should have the Input Aspect Ratio set to 4:3.   This preserves a circle as a circle, and does not stretch the image horizontally. You should use 4:3 input mode if the DVD player is in "Normal TV" mode, even if the movie is a wide screen movie.

(16:9 Mode)   If you have the DVD player set to "Wide TV" mode or "Anamorphic mode", a circle will appear as a tall oval on a standard TV. In this case, you should set the QuadScan to have the Input Aspect Ratio set to 16:9. This mode stretches the image horizontally, and changes the tall oval back into a circle on the display device!

(4:3LB Mode)   If you have the QuadScan Elite in the 16:9 Output Aspect Ratio Mode, a DVD movie that is wide screen (black bars on the top and bottom when displayed on a standard TV), and you don't like the black bars on the top and bottom of the displayed image, then you should set the QuadScan Elite's Input Aspect Ratio to 4:3LB mode. This will expand the image vertically and horizontally to eliminate the black bars on the top and bottom, as well as the left and right side, filling the screen.

WHAT OUTPUT ASPECT RATIO ACTUALLY DOES

Display devices today have either a 4:3 aspect ratio or a 16:9 aspect ratio. A typical LCD or DLP projector is made from a 4:3 display element, and will want to display a 4:3 image at its maximum resolution. CRT projectors can be adjusted to be either 4:3 or 16:9 output. There are also 16:9 native CRT direct view monitors and some rear view projection displays that are inherently 16:9 as well.

If you had a native 4:3 display device (let's say an XGA projector, 1024x768), you could project it on a 4:3 screen, and it would display its full resolution on that screen, (See Example A). If you took the same 4:3 display device and projected it on a 16:9 screen, you would lose a portion of the display resolution off the top and bottom of the screen (making this area black). You would only be viewing a portion of that XGA resolution (1024x576 to be exact). The remaining 192 lines (768-576=192 lines) would need to display black data so that you are not projecting an image on your wall above and below the screen, (See Example B). This portion of the original resolution of the display is lost! A wide screen movie would look great, but a 4:3 image would need to be centered in the 16:9 screen to look right. It will have lost a lot of its resolution, since now only a small central box of the original 1024x768 display resolution can be used to display the image. This box is now 768x576. See Example C.
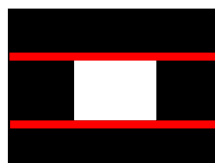
| **Example A** | **Example B** | **Example C** | **Example D** |

If your display device is native 16:9, and you are projecting on a 16:9 screen, the QuadScan should be set for 16:9 output. A wide screen movie should fill the screen assuming that the movie is also 16:9 or 1.78:1 . If the movie is wider, for example 2.35:1, you will see some black area on the top and bottom of the screen due to the image being wider and shorter than 16:9. If you are viewing a 4:3 image, you will see black bars on the right and left sides of the image, because a 4:3 image is not wide enough to fill the screen. See Example D.

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Triple and Quad TV output modes are inherently 16:9 output modes. These two modes assume that the display device and the screen size are 16:9, and for this reason, the Output Aspect Ratio settings are always 16:9, regardless of the front panel indication.

- With an NTSC input signal, VGA, and DBL TV modes will always have a 4:3 aspect ratio, regardless of the front panel indication.
- With a PAL input signal, VGA, DBL TV and SVGA modes will always have a 4:3 aspect ratio, regardless of the front panel indication.
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The reason for this stems from the QuadScan being an "up-scaler" device, not a "down-scaler". The QuadScan can output the same number or more lines than it inputs from the source, but cannot output less lines than it inputs. For example, for an 800x600 SVGA display trying to run in 16:9 mode would actually only output 450 active video lines. For NTSC, we reduce the number of captured lines from 480 down to 450 and can display the 450 without scaling. In PAL mode, we normally capture 576 lines, which is too many lines over 450 to truncate and display. Therefore, 800x600 SVGA does not display 16:9 mode in PAL.

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The following table illustrates how THE INPUT ASPECT RATIO interacts with the OUTPUT ASPECT RATIO to position the final output image on the screen.

INPUT ASPECT RATIO SET TO 4:3

VGA MODE: 4:3A - FULL SCREEN   16:9A - FULL SCREEN
                                     4:3B - FULL SCREEN   16:9B - FULL SCREEN
                                     4:3C - FULL SCREEN   16:9C - FULL SCREEN

DBL TV MODE: 4:3A - FULL SCREEN   16:9A - FULL SCREEN
                                     4:3B - FULL SCREEN   16:9B - FULL SCREEN
                                     4:3C - FULL SCREEN   16:9C - FULL SCREEN

SVGA MODE: 4:3A - FULL SCREEN   16:9A - TOP SCREEN
                                     4:3B - FULL SCREEN   16:9B - MIDDLE SCREEN
                                     4:3C - FULL SCREEN   16:9C - BOTTOM SCREEN

XGA MODE: 4:3A - FULL SCREEN   16:9A - TOP SCREEN
                                     4:3B - FULL SCREEN   16:9B - MIDDLE SCREEN
                                     4:3C - FULL SCREEN   16:9C - BOTTOM SCREEN

TPL TV MODE: 4:3A - LEFT SCREEN   16:9A - LEFT SCREEN
                                     4:3B - MIDDLE SCREEN 16:9B - MIDDLE SCREEN
                                     4:3C - RIGHT SCREEN 16:9C - RIGHT SCREEN

QUAD TV MODE: 4:3A - LEFT SCREEN   16:9A - LEFT SCREEN
                                     4:3B - MIDDLE SCREEN 16:9B - MIDDLE SCREEN
                                     4:3C - RIGHT SCREEN 16:9C - RIGHT SCREEN

D-ILA MODE: 4:3A   FULL SCREEN   16:9A - TOP SCREEN
                                     4:3B - FULL SCREEN   16:9B - MIDDLE SCREEN
                                     4:3C - FULL SCREEN   16:9C - BOTTOM SCREEN

INPUT ASPECT RATIO SET TO 16:9

VGA MODE: 4:3A - FULL SCREEN   16:9A - FULL SCREEN
                    4:3B - FULL SCREEN   16:9B - FULL SCREEN
                    4:3C - FULL SCREEN   16:9C - FULL SCREEN

DBL TV MODE: 4:3A - FULL SCREEN   16:9A - FULL SCREEN
                    4:3B - FULL SCREEN   16:9B - FULL SCREEN
                    4:3C - FULL SCREEN   16:9C - FULL SCREEN

SVGA MODE: 4:3A - TOP SCREEN   16:9A - TOP SCREEN
                    4:3B - MIDDLE SCREEN   16:9B - MIDDLE SCREEN
                    4:3C - BOTTOM SCREEN   16:9C - BOTTOM SCREEN

XGA MODE: 4:3A - TOP SCREEN   16:9A - TOP SCREEN
                    4:3B - MIDDLE SCREEN   16:9B - MIDDLE SCREEN
                    4:3C - BOTTOM SCREEN   16:9C - BOTTOM SCREEN

TPL TV MODE: 4:3A - LEFT SCREEN   16:9A - FULL SCREEN
                    4:3B - MIDDLE SCREEN   16:9B - FULL SCREEN
                    4:3C - RIGHT SCREEN   16:9C - FULL SCREEN

QUAD TV MODE: 4:3A - LEFT SCREEN   16:9A - FULL SCREEN
                    4:3B - MIDDLE SCREEN   16:9B - FULL SCREEN
                    4:3C - RIGHT SCREEN   16:9C - FULL SCREEN

D-ILA MODE: 4:3A - TOP SCREEN   16:9A - TOP SCREEN
                    4:3B - MIDDLE SCREEN   16:9B - MIDDLE SCREEN
                    4:3C - BOTTOM SCREEN   16:9C - BOTTOM SCREEN

SPECIAL CASE FOR SVGA WITH PAL INPUT (BOTH 4:3 AND 16:9)

SVGA MODE: 4:3A - FULL SCREEN   16:9A - FULL SCREEN
                    4:3B - FULL SCREEN   16:9B - FULL SCREEN
                    4:3C - FULL SCREEN   16:9C - FULL SCREEN

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Appendix C - Limited Warranty

FOCUS Enhancements, Inc. warrants this product against defects in materials and workmanship for a period of THREE (3) YEARS from the date of original purchase.

If you discover a defect, FOCUS Enhancements, Inc. will, at its sole option, repair or exchange the product at no charge to you, provided you contact FOCUS Enhancements, Inc. Technical Support to obtain a Return Material Authorization (RMA) Number and instructions on where and how to obtain repair. Note that a copy of the bill of sale bearing the FOCUS Enhancements, Inc. serial numbers, as proof of date of original purchase is required for each product returned for warranty service. Before returning product, remove all non-FOCUS Enhancements, Inc. FOCUS Enhancements, Inc. cannot be liable for the return or care of any non-FOCUS Enhancements, Inc. products, nor accept responsibility for loss or damage of product in transit.

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