INLINE ®

A WORLD OF A/V SOLUTIONS

SIGNAL CONVERTERS

IN1402 VIDEO SCALER

IN1402

OPERATION MANUAL

High Resolution Video Products • A/V System Integration Tools • Interactive Training Systems

⚠ Installation and Safety Instructions

For Models without a Power Switch:
 The socket outlet shall be installed near the equipment and shall be accessible.

For all Models:
 No serviceable parts inside the unit. Refer service to a qualified technician.

For Models with Internal or External Fuses:
 For continued protection against fire hazard, replace only with same type and rating of fuse.

⚠ Instructions d'installation et de sécurité

Pour les modèles sans interrupteur de courant:
 La prise de courant d'alimentation sera installé près de l'équipement et sera accessible.

Pour tout les modèles:
 Pas de composants à entretenir à l'intérieur. Confiez toute réparation à un technicien qualifié.

Pour les modèles équipés de fusibles internes ou externes:
 Afin d'éviter tout danger d'incendie, ne remplacer qu'avec le même type et la même valeur de fusible.

⚠ Installations- und Sicherheitshinweise

Für Geräte ohne Netzschalter:
 Die Netzsteckdose soll in der Nähe des Gerätes installiert und frei zugänglich sein.

Für alle Geräte:
 Keine Wartung innerhalb des Gerätes notwendig. Reparaturen nur durch einen Fachmann!

Für Geräte mit interner oder externer Sicherung:
 Für dauernden Schutz gegen Feuergefahr darf die Sicherung nur gegen eine andere gleichen Typs und gleicher Nennleistung ausgewechselt werden.

⚠ Instalacion E Instrucciones de Seguridad

Modelos Sin Interruptor:
 La conexión debe ser instalada cerca del equipo y debe ser accesible.

Para Todos Los Modelos:
 Dentro de la unidad , no hay partes para reparar. Llame un tecnico calificado.

Modelos con Fusibles Internos o Externos:
 Para prevenir un incendio, reemplace solo con el mismo tipo de fusible.

CE COMPLIANCE

All products exported to Europe by Inline, Inc. after January 1, 1997 have been tested and found to comply with EU Council Directive 89/336/EEC. These devices conform to the following standards:

 EN50081-1 (1991), EN55022 (1987)
 EN50082-1 (1992 and 1994), EN60950-92

Shielded interconnect cables must be employed with this equipment to ensure compliance with the pertinent Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) standards governing this device.

$$\textsf{C} \textsf{E}$$

FCC COMPLIANCE

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Table of Contents

Product Overview

The **IN1402** is a full featured video scaler that combines quad standard video recording, advanced video scaling / line multiplication and a 3-input video switcher into a single product. The INLINE **IN1402** Video Scaler is recommended for display system applications requiring superb video scaling for composite video and S-Video signals.

FEATURES

Superb Video Scaling Technology - Employing sophisticated video de-interlacing, scaling and filtering techniques, the **IN1402** automatically senses the origin of the video source material and selects the optimum motion compensation formula to eliminate unwanted artifacts in the output image. The **IN1402** employs high bandwidth digital signal processing and high speed digital to analog conversion, combined with effective filtering and sharpness circuitry to maintain and enhance image detail, even at the highest output resolutions.

Advanced Quad Standard Video Decoding - A high quality video decoder in the **IN1402** provides accurate video decoding of composite video and S-Video signals in the NTSC, PAL, SECAM and NTSC 4.43 video standards. The video decoder employs an advanced 3-line adaptive comb filter for composite video input signals.

Pick the Perfect Resolution - The **IN1402** offers several output resolutions to match the optimum or native resolution for most display devices. The **IN1402** provides a progressive scan output signal at standard resolutions, ensuring optimal image quality with a wide range of CRT, LCD, DMD, D-ILA / LCOS and Plasma display devices.

3-Input Video Switcher - The **IN1402** provides multiple inputs and flexible switching capability to accommodate a variety of applications. The unit has inputs for two composite video signals and one S-Video signal.

Memory - The **IN1402** can recall previously stored settings with the push of a single button. All video input and output settings, for each input and each output mode, are stored internally (in memory). Once optimized, all adjustments are automatically recalled every time an input is selected.

On Screen Menus - provide easy control of video adjustments including hue, color, contrast, brightness, gamma, sharpness, image size, image position and edge blanking. Unique image settings can be optimized and stored for each input. Each time an input is selected, all image settings stored for that input are automatically recalled. The on-screen menus also make it easy to verify and adjust advanced settings such as output signal resolution / refresh rate / sync format, RS-232 control options and reset to factory default. **System Info** is a handy menu option that uses the on-screen display to show comprehensive information about the input and output signals and scaler settings.

Image Size, Position and Aspect Ratio Controls - with individual horizontal and vertical image adjustments make it easy to precisely fit the active video image to the display area. Comprehensive aspect ratio controls adjust the vertical and horizontal image size to accommodate various input signal and display device aspect ratios.

RS-232 Serial Control - is provided for all scaler functions including input selection, image adjustments and output settings. The **IN1402**'s comprehensive RS-232 control capacity facilitates complete system integration and effortless control when combined with a third party control system.

Rack Mountable - Two **IN1402** scalers can be mounted side-by-side in a 1U rack space using the optional **IN9080** rack shelf. A single unit can be mounted using the shelf and an **IN9088B** blank plate.

Compatibility

INPUT

The **IN1402** Video Scaler accepts composite video signals (on Inputs 1 &2) and S-Video signals (on Input 3) in the NTSC, PAL, SECAM and NTSC 4.43 video standards. The unit automatically senses the video standard of the input signal and decodes it appropriately.

OUTPUT

The **IN1402** features selectable output resolutions (ranging from 640 x 480 up to 1365 x 1024) to match the optimum or native resolution of virtually any display device. The unit provides a progressive output signal at standard resolutions, ensuring optimal compatibility and exceptional image quality with a wide range of CRT, LCD, DMD, D-ILA / LCOS, and Plasma Display devices.

The output refresh rate is the same as the input signal. Therefore, the output refresh rate 59.94 Hz for NTSC input signals and 50 Hz for PAL and SECAM input signals.

Installation

This section offers step-by-step instructions for installing the **IN1402** Video Scaler. An Application Diagram is provided on the following page.
*Note: Read the instructions carefully before initiating the installation procedure. Make sure that there is no power connected to the **IN1402**, and that the power button is off.*

1. Place / install the **IN1402** at the desired location. Make sure that the unit is seated on a flat surface or is securely installed in a standard 19" equipment rack. Two **IN1402** units may be mounted side-by-side using an optional **IN9080** Rack Shelf. A single unit may be rack-mounted using the **IN9080** Rack Shelf and an **IN9088** Half-Rack Blank Plate.

2. Connect the video sources to the **IN1402** input(s). Inputs 1 and 2 accept a composite video signal (on an RCA male and BNC female connector, respectively), while Input 3 accepts an S-Video signal (4-pin mini DIN female).

3. The **IN1402** features a 15-Pin HD female output. VGA display devices can be connected directly to the **IN1402** output port using a standard male-to-male VGA cable. INLINE's **IN8000M Series** VGA cables offer exceptional performance and are available in a variety of lengths.

4. Connect a control system, computer or other source for serial commands to the RS-232 remote connector (if applicable). For more information about remote control of the **IN1402**, see the REMOTE OPERATION Section on page 16.

5. Connect power to the **IN1402** using the **IN9230** IEC power cable (included).

6. Turn on the audiovisual source, the **IN1402,** and the display device.

7. Using the front panel controls or RS-232 commands, adjust and store the parameters for each input source. Refer to the INPUT MENU Section on page 19.

8. Set the Output Resolution to match your display device. Refer to the OUTPUT MENU Section on page 12.

─────── = Video
· · · · · · · = Audio

INPUT DEVICES

VHS Player   DVD Player   Document Camera

TECHNICAL SUPPORT: (800) 882-7117
(714) 921-4100
www.inlineinc.com

90-260VAC; 0.1A; 47-63HZ

TX GND RX

INPUT 1   INPUT 2   INPUT 3   OUTPUT   RS-232   FUSE: 0.25A; 250V; TIME DELAY

CONTROL

Control System

Data Projector   Plasma Display   Presentation Monitor   Data Monitor
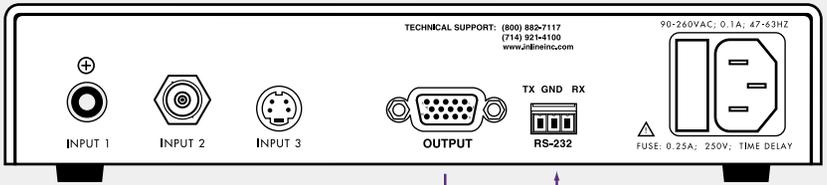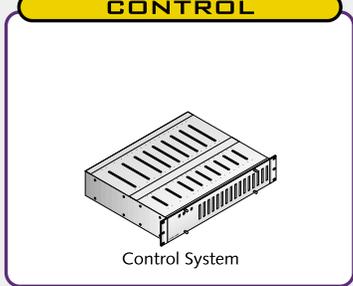
OUTPUT DEVICES
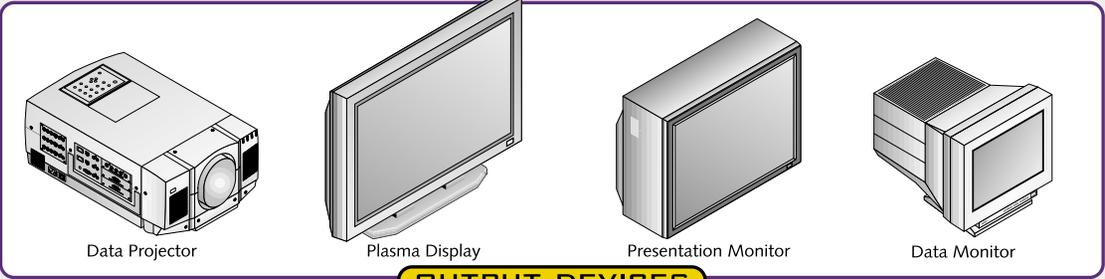
Operation

This section focuses on operating the **IN1402** using the front panel controls and commands. All video adjustments, set-up functions and switching operations can be performed through the front panel or via RS-232 serial controls. RS-232 control information can be found on page 16.

FRONT PANEL CONTROLS

IN1402 FRONT VIEW
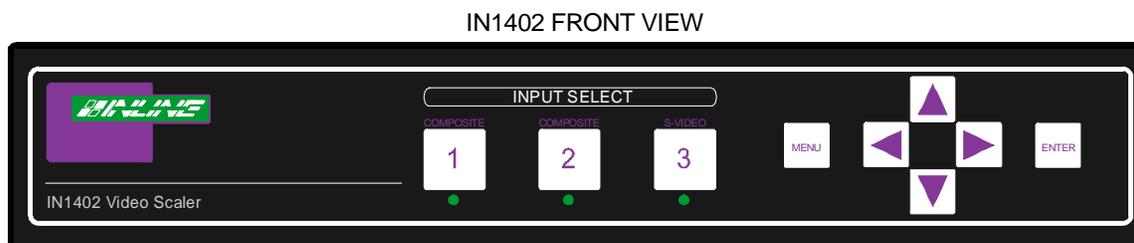
Input Select: The large buttons labeled **INPUT 1**, **INPUT 2** and **INPUT 3** are used to select the desired video source. After turning on the **IN1402**, press and release the desired **INPUT SELECT** Button. A green LED will light underneath the button to indicate the selected input. All video settings for each input are stored internally (in memory) so the adjustment(s) will not have to be repeated after the setting(s) has been optimized. To switch to another input, simply press and release another numbered **INPUT SELECT** Button.

KEY CONCEPT
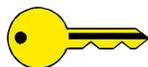
When powered up, the scaler automatically returns to the last configuration, including the last input selected.

Menu Buttons: The remaining buttons on the front panel (**MENU, ⋏, ⋎, ⋗, ⋖** and **ENTER**) are used to access and adjust the on-screen display menu.

ON SCREEN MENU

To access the main menu, press the **MENU** or **ENTER** Button. Use the arrow buttons to maneuver around within the menu display. Press **ENTER** to select and save a command, or press **MENU** to exit (out of the menu). All settings for each input mode are stored internally (in memory) so the adjustments will not have to be repeated after they are optimized.

The MAIN MENU commands and their functions are:

VIDEO	-	Changes input signal video parameters
INPUT	-	Changes input signal-timing parameters
OUTPUT	-	Changes output signal-timing parameters
ADVANCED	-	Displays advanced options

An illustration of the ON SCREEN DISPLAY MENU SYSTEM is provided on the next page.

**IN1402 ON SCREEN
MENU DISPLAY SYSTEM**

Main Menu
Video
Input
Output
Advanced

Video
Brightness
Contrast
Color
Hue
Sharpness
Gamma
Noise Filter
Comb / Trap*
Reset Video

Input
Aspect Ratio
Horiz. Tracking
Reset Input

Output
Resolution
Size
Position
Sync Format
Reset Output

Advanced
Factory Reset
Baud Rate
Delimiters
System Info
Reset RS-232

Comb / Trap
Comb Filter
Trap Filter

Signal Format
Input 1
Input 2
Input 3

Aspect Ratio
Standard
Anamorphic
Wide screen
Widerscreen
Expand

Horiz. Tracking
Very Fast
Fast
Normal
Slow

Resolution
640 x 480
800 x 600
852 x 480
1024 x 768
1152 x 864
1280 x 720
1280 x 1024
1365 x 768
1365 x 1024

Size
H-Size
V-Size

Position
H-Position
V-Position

Sync Format
RGBHV--
RGBHV++
RGBS
RGsB

Factory Reset
Yes
No

Baud Rate
1200
2400
4800
9600
19,200
38,400
57,600

Delimiters
Parentheses ( )
Brackets [ ]
Braces { }
Slashes \ /
Less & Greater < >
Signs ! #

System Info
Input
Standard
Horizontal
Vertical
Output
Horizontal
Vertical
Sync
Version

* Only available on composite video

Menu Commands

KEY CONCEPT
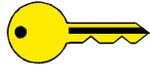
Save It or Loose It!
After you have optimized a setting, <u>save it by pressing the ENTER BUTTON</u>. It is <u>critical</u> that you save the setting before proceeding to another input or another menu function, otherwise your new adjustment will be lost.

VIDEO MENU

The **IN1402** allows users to manually adjust the brightness, contrast, color, hue, sharpness, gamma, noise filter, and comb / trap filter settings.

To access the video adjustment menu via the front panel control buttons, press the desired **INPUT SELECT** Button, press **MENU,** press the ⋎ or ⋏ button (if necessary) to reach the video menu, then press **ENTER**. Use the ⋏ and ⋎ buttons and the **ENTER** key to select the setting you wish to adjust. After selecting a setting, use the ⋗ and ⋖ buttons to make the adjustments. Press and release a button to move by one step in either direction. Press and hold a button to move continuously through the adjustment range. Once you've optimized the setting for the current input, press **ENTER** to save.

The following video adjustment parameters can be controlled via the on-screen menu system (front panel buttons). Remote operation instructions can be found on page 16.

Brightness Setting: Adjusts the input signal brightness.

> Range: 0 to 255   Factory Default Setting: 128
>
> Operation: Press ⋗ button to increase the brightness.
>   Press ⋖ button to decrease the brightness.

Contrast: Adjusts the difference between the input signal's brightest and darkest settings. At the minimum setting the entire picture is displayed at about the same brightness (very grayish). At the maximum setting there is a great difference between the darkest and lightest parts of the screen.

> Range: 0 to 255   Factory Default Setting: 128
>
> Operation: Press ⋗ button to increase the contrast.
>   Press ⋖ button to decrease the contrast.

Color: Adjusts the color saturation of the picture over a wide range. Setting this control to 0 will remove most of the color.

> Range: 0 to 255   Factory Default Setting: 140
>
> Operation: Press ⋗ button to increase the color.
>   Press ⋖ button to decrease the color.

Hue (NTSC Signals Only): Adjusts the picture's color towards red or green.

Range: 0 to 40   Factory Default Setting: 20

Operation: Press ➤ button to increase the green.
Press ◄ button to increase the red.

Sharpness: Uses variable filtering to affect input picture detail and definition.
*Note: Increasing the sharpness setting gives the visual effect that the noise filter setting is decreasing. Although the sharpness and noise filter settings seem to offset each other, they are actually two different adjustments that affect two different sets of circuitry. Operators should adjust both settings until optimal picture quality is achieved.*

Range: 0 to 8   Factory Default Setting: 3

Operation: Press ➤ button to increase the sharpness.
Press ◄ button to decrease the sharpness.

KEY CONCEPT
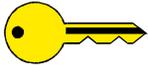
If these settings seem confusing, we recommend that you experiment with the **MENU***,* ➤**,** ➤**,** ➤**,** ◄ *and* **ENTER** *Buttons until you familiarize yourself with the* **IN1402** *front panel control operations. It's a good idea to get comfortable using these buttons to navigate through the on-screen menu system before moving on to other sections of this manual. If you get lost, enter unfamiliar territory or are afraid of making an improper selection, pressing the* **MENU** *Button allows you to leave the menu system safely without making any changes. We also recommend that, unless you're a qualified audiovisual technician, you* ***avoid the Advanced Menu****.*

Gamma: The 30 active gamma correction curves programmed into the **IN1402** are used to compensate for the non-linear response of many display devices. Since Gamma, Brightness and Contrast controls interact with each other, the following order of adjustment is suggested:
1. Set the brightness and contrast controls to factory default positions.
2. Adjust Gamma as desired.
3. Adjust brightness and contrast to fine tune the image.

Range: 1 to 30   Factory Default Setting: 10*

Operation: Press ➤ button to step to higher numbered gamma curves.
Press ◄ button to step to lower numbered gamma curves.
* The factory default setting of 10 refers to a gamma correction curve of 1.0

Noise Filter: Changes the input signal noise filter.
Note: Increasing the noise filter setting gives the effect that the picture sharpness setting is decreasing. Refer to the sharpness setting section at the top of the page.

Range: 0 to 15   Factory Default Setting: 5

Operation: Press ➤ button to increase noise filter.
Press ◄ button to decrease noise filter.

Comb / Trap Filter: Selects either the comb or trap filter (only available with composite video). The comb filter electronically provides excellent Luma / Chroma separation (separates the color from the picture signal). This greatly reduces cross-color interference and hanging dots while maintaining image bandwidth and detail.

The trap filter extracts luminance from the picture. Generally speaking, the trap filter is *usually* the preferred setting when running signals from a VCR (as composite video).* You may wish to compare both settings to determine which is best for your application.

* Neither filter has any effect on S-Video signals.

Reset Video: Reset *all* video settings to factory default (for current input <u>only</u>).

INPUT MENU

To access the input menu via the front panel control buttons, press the desired **INPUT SELECT** Button, press **MENU,** press the ∀ or ⋏ button (if necessary) to reach the input menu, then press **ENTER**. Use the ⋏ and ∀ buttons and the **ENTER** key to select the setting you wish to adjust. Once you've optimized the setting for the current input, press **ENTER** to save.

Aspect Ratio - The aspect ratio controls can be used to vary the relative image width and height. They can be used to accommodate various input signal aspect ratios as well as output device aspect ratios. The output aspect ratio is selected by choosing the appropriate resolution in the output menu (see Output Resolution Section on page 15).

|	
Standard:	For Standard 1.33 input signals (sometimes referred to as full screen).*
Anamorphic:	This setting provides vertical image squeezing to accommodate anamorphically enhanced DVDs.
Wide Screen:	For wide screen 1.78 input signals (letterbox).
Wider Screen:	For wider screen 2.35 input signals (narrow letterbox).
Expand:	Designed for wide screen signals viewed on 4:3 aspect ratio displays. Expand mode crops the image vertically and horizontally so that the black bars above and below the image are removed.

KEY CONCEPT
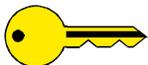
> ** Input aspect ratio selection allows users to adjust / convert the shape of the incoming image. The Standard Aspect Ratio setting provides no conversion when used with 4:3 output (see OUTPUT MODES Section on page 15).*

Most DVDs and VCRs put out a 4:3 signal. The portion of the image area is filled with active video determines its aspect ratio. In the following examples, four different input aspect ratios are shown on the left as they would be displayed in their native 4:3 format. The same signals are shown on the right as they would appear on 4:3 and 16:9 display devices with the scaler set to various aspect ratio settings.

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Example 1:

4:3 Display

Aspect Ratio Setting: Standard

16:9 Display

Example 2:

4:3 Display

Aspect Ratio Setting: Wide Screen
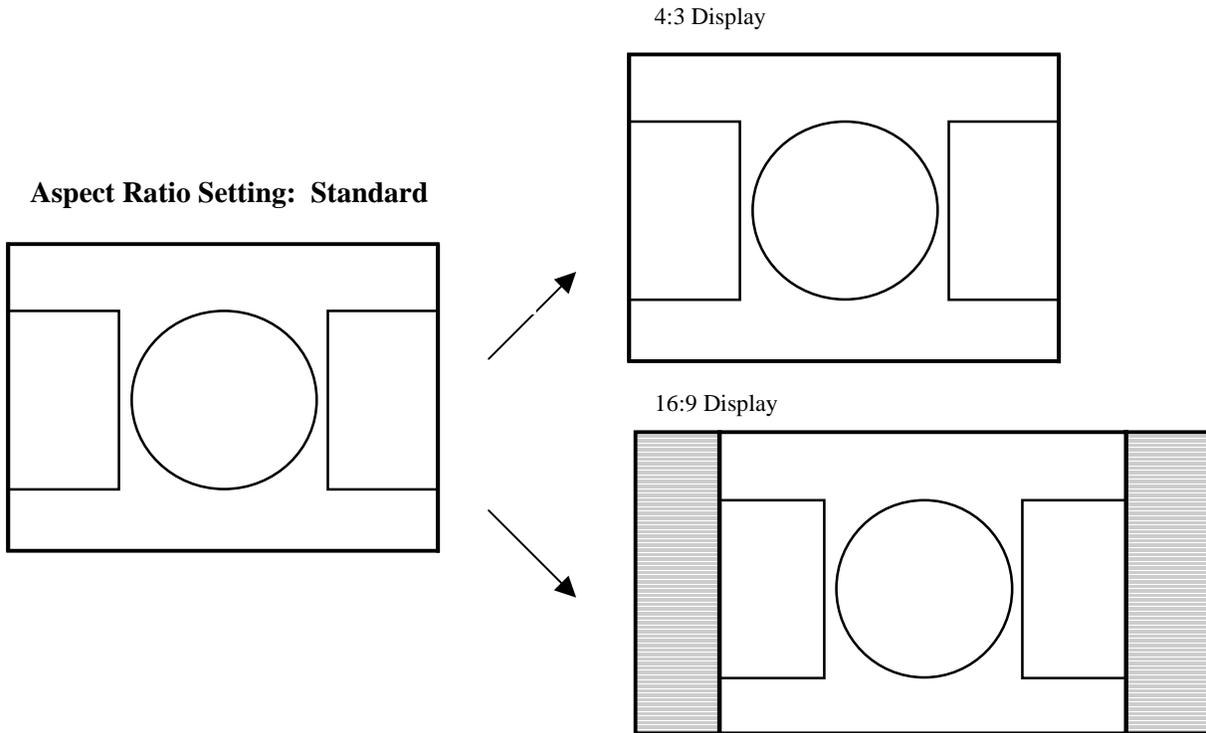
16:9 Display
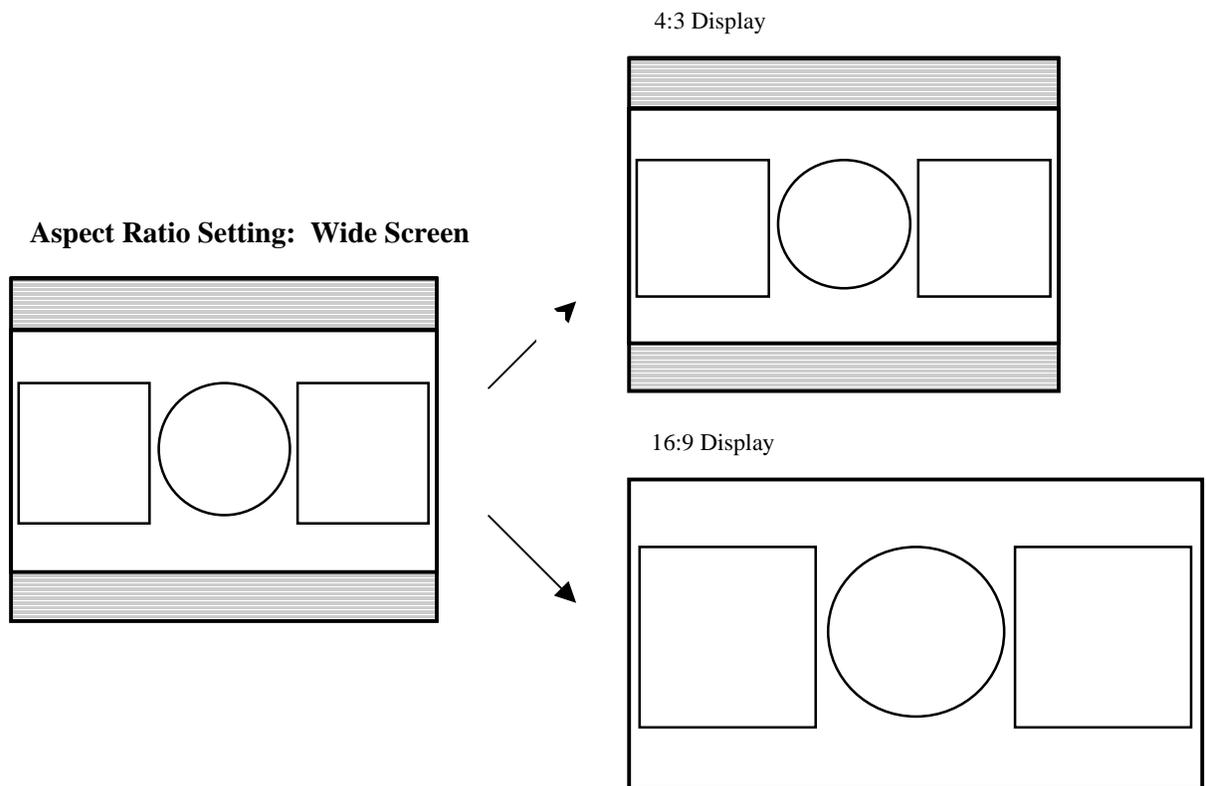
Example 3:

4:3 Display

Aspect Ratio Setting: Anamorphic
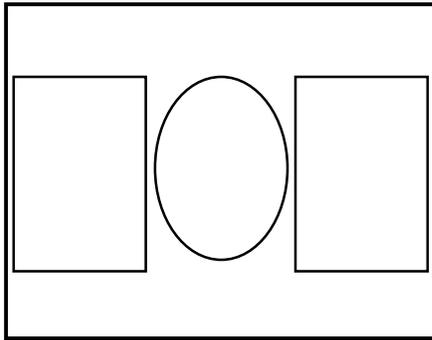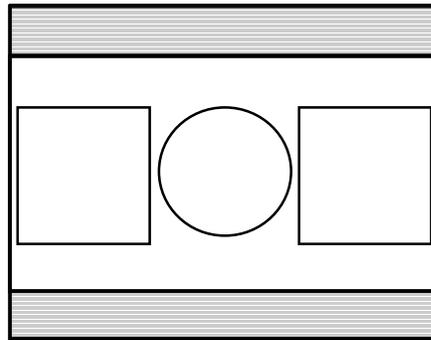
16:9 Display
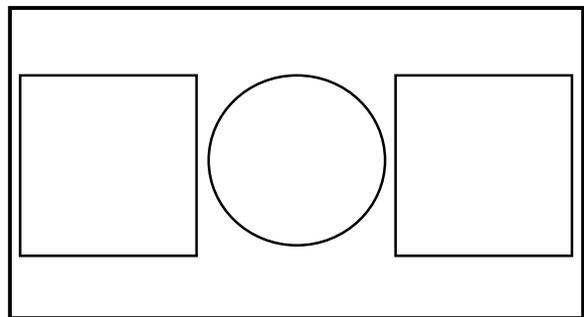
Example 4.

Aspect Ratio Setting: Expand
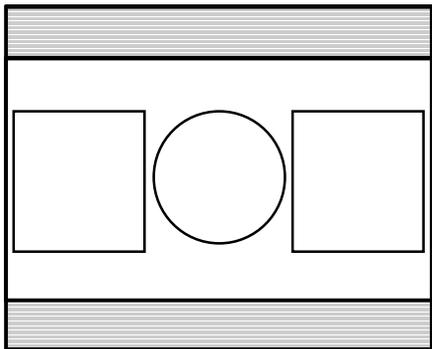
4:3 Display
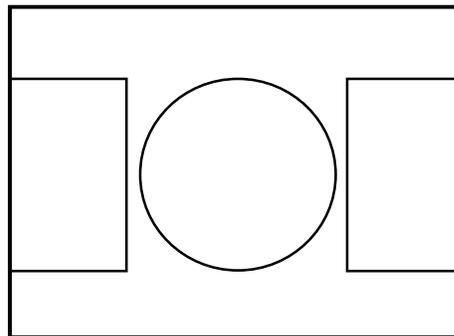
Horizontal Tracking

This control selects the amount of tracking on the horizontal sync to prevent image bending (hooking) along the top of the video image. Various settings are available to compensate for different quality input signals:

Very Fast	For poor quality video signals, such as from a VCR.
Fast	For normal quality video signals, such as from a TV.
Normal	For good quality video signals, such as from a DVD player.
Slow	For high quality video signals, such as broadcast video.

Reset Input: Resets *all* input settings to factory default (for the current input <u>only</u>).

OUTPUT MENU

To access the output menu via the front panel control buttons, press the desired **INPUT SELECT** Button, press **MENU,** press the ⋎ or ⋏ button (if necessary) to reach the output menu, then press **ENTER**. Use the ⋏ and ⋎ buttons and the **ENTER** key to select the setting you wish to adjust. Once you've optimized the setting for the current input, press **ENTER** to save.

Resolution: Because the **IN1402** only scales up, users must choose an output resolution that is greater than or equal to the input size, as well as one that is compatible with their monitor / display device. The available resolution rates are listed on the page 15. Choose the appropriate resolution and aspect ratio for your application.

KEY CONCEPT

> *Of all the settings on the **IN1402**, perhaps the most critical adjustment is the output resolution. Setting the scaler to match the capabilities of your data display device will have an enormous impact on the image quality. To achieve the optimum image on your display device, refer to the instructions on pages 13-14.*

Size: This adjusts the output horizontal and vertical size. It shrinks the size to a percentage of the output resolution selected. The **IN1402** only scales up; therefore, chose an output size that will result in an image that is *greater than or equal to* the input size (don't forget to save). This setting is useful to manually reduce the height of the output signal when an anamorphic input signal is connected. The output size is automatically reset anytime a new input aspect ratio is selected.

Position: Situates the output image on the monitor. The output position is automatically reset anytime a new input aspect ratio is selected.

Sync Format:	**RGBHV--**	RGB with negative horizontal and vertical sync
	RGBHV++	RGB with positive horizontal and vertical sync
	RGBS	RGB with composite sync (with serrations)
	RGsB	RGB with sync on green (with serrations)

Reset Output: Resets *all* output settings to factory default.

ADVANCED MENU

To access the advanced menu via the front panel control buttons, press the desired **INPUT SELECT** Button, press **MENU,** press the ⋎ or ⋏ button (if necessary) to reach the advanced menu, then press **ENTER**. Use the ⋏ and ⋎ buttons and the **ENTER** key to select the setting you wish to adjust. Once you've optimized the setting for the current input, press **ENTER** to save.

Factory Reset: Returns all video and RS-232 settings for all inputs to factory default.

Baud Rate: Allows RS-232 remote users to select the baud rate that matches their remote control device system.

Delimiters: INLINE scalers can be set to recognize six sets of leading and end codes when using an RS-232 remote: parentheses ( ), brackets [ ], braces{ }, slashes \ /, less and greater than < >, and signs !#. Additional RS-232 INLINE products may be connected together with different delimiters, however, only the unit that matches the RS-232 delimiters that are transmitted from the remote controller will respond.

System Info: This screen displays the following system information:

- Input Source
- Input Horizontal Scan Rate
- Output Resolution
- Output Vertical Refresh Rate
- Program Version Number

- Input Signal Standard and Format
- Input Vertical Refresh Rate
- Output Horizontal Scan Rate
- Output Sync Format

Only the input video standard is detected by the **IN1402.** The input horizontal scan rate and input vertical refresh rate only indicate the normal rate for the standard detected. All other values are simply repeated as defined by the input and output settings. Although the **IN1402** detects the input video standard and adjusts automatically (for the detected input video standard and the selected output mode), the system will reflect any changes made to these settings made by the user. This information may be useful for setting video parameters of other video equipment connected to the **IN1402**.

Reset RS-232: Reset *all* RS-232 settings to factory default.

Choosing the Optimal Output Resolution

Of all the settings on the **IN1402**, perhaps the most critical adjustment is the output resolution. Every display device has an optimal or native resolution. This will vary depending on the type of display technology, if the display has a fixed number of display elements (native resolution), the size of the pixels, the size of the display or display screen, and even the distance of the viewer from the display screen. Setting the **IN1402** to the output resolution to match this optimal resolution for your data display will have an enormous impact on the image quality.

Please note that the ideal resolution must also lie within the compatible scan range of the display device. For example, some 27" - 36" presentation monitors are limited to input signals in the 30 - 50 KHz range. If the video scaler's output resolution settings are too high the signal will not be viewable on the display. Before selecting the output resolution, you should check the specifications page in the operation manual for your display device to verify the compatible horizontal scan range. You may also be able to find this information the INLINE PRODUCT CATALOG reference section. The Large Screen Data projector list and Large Data Display list include signal compatibility information for both current and obsolete models of data projectors, retro displays, presentation monitors and plasma displays.

CRT DISPLAYS - SELECTING THE GOLDEN RESOLUTION

While CRT displays do not have a native resolution, they will have a "golden resolution," or sweet spot, for input signal resolution. When the video scaler is set to the golden resolution of the CRT display, this will result in a sharp, detailed image without visible scan lines. If the video scaler is set below the golden resolution, the displayed image will have tiny black lines between

the image lines. If the video scaler is set above the golden resolution, the lines will actually overlap and the image will appear soft and lose detail because there are more lines and pixels than the display can clearly resolve. When experimenting to find the golden resolution for your CRT display device it is best to begin at the output resolution indicated in the chart below. You can then try higher and lower resolutions until you achieve the setting that offers both a solid image and excellent picture detail.

FIXED PIXEL DISPLAYS – SELECTING THE OPTIMAL RESOLUTION

Display devices based on LCD, DLP, LCOS, and plasma display technology have a specific number of display elements, or pixels. This is also referred to as the "native resolution" of the display device. These devices are usually capable of showing higher or lower resolution signals, but can only do this by scaling the image up or down to the native resolution. In order to avoid additional image scaling it is important to know the native resolution of your display device.

Check your operation manual to determine the native resolution of your display device. The video scaler output should be set to match this native resolution.

Display Type	Suggested Optimal / Native Resolution	Comments
15" Data Monitor	800 x 600 / 1024 x 768	
17" Data Monitor	1024 x 768	
19" / 21" Data Monitor	1024 x 768 / 1280 x 1024	
27" – 42" Presentation Monitor	800 x 600 / 1024 x 768	
32" – 38" HDTV Display (16:9)	1024 x 768 / 1280 x 720	
Data Projector or Retro Display with 7" CRTs	800 x 600 / 1024 x 768	
Data Projector or Retro Display with 9" CRTs	1024 x 768 / 1280 x 1024	
DMD / DLP Projectors	800 x 600 / 1024 x 768 / 1280 x 720 / 1280 x 1024	Check Native Resolution of Display. For 848 x 600, set scaler to 800 x 600.
LCOS / D-ILA Projectors	1365 x 1024	
LCD Projectors	800 x 600 / 1024 x 768 / 1280 x 1024 / 1365 x 768	Check Projector's Native Resolution. Very old units may be 640 x 480.
LCD 14" / 15" Flat Panel Display	1024 x 768	
LCD 18" Flat Panel Display	1280 x 1024	
LCD 28" Flat Panel Display	1280 x 768	
Plasma Display 40" (4:3)	640 x 480	
Plasma Display 42" (16:9)	852 x 480 / 1024 x 768 / 1280 x 768	Fujitsu / Sony 42" Plasmas with 1024x1024: Set Scaler to 1024 x 768
Plasma Display 50" / 60" (16:9) (Boxlight / Eizo / LG / Pioneer / Runco / Sharp / Viewsonic)	1280 x 768	
Plasma Display 50" / 60" (16:9) (Fujitsu / JVC / Luce / Marantz / NEC / Panasonic / RCA / Runco / Samsung / Toshiba)	1365 x 768	NEC 50": Set Sync Format to RGBHV++

VGA OUTPUT

The **IN1402** features a 15-Pin HD. VGA display devices can be connected directly to the output port using a standard male-to-male VGA cable. INLINE's **IN8000M Series** VGA cables offer exceptional performance and are available in a variety of lengths.

OUTPUT MODES

The **IN1402** supports the following Output Modes:

Resolution	Mode	Aspect Ratio*
640 x 480	VGA	4:3
800 x 600	SVGA	4:3
852 x 480	HDTV - 480p	16:9
1024 x 768	XGA	4:3
1152 x 864		4:3
1280 x 720	HDTV - 720p	16:9
1280 x 768		16:9
1280 x 1024	SXGA	5:4
1365 x 768	Wide XGA	16:9
1365 x 1024		4:3

* The length versus the height of the output image determines the output aspect ratio.

DEFAULT POWER-UP BUTTONS

Power-On Settings let you adjust key **IN1402** settings without using on-screen menus. This may be particularly helpful if the **IN1402** has been accidentally set for a mode that is incompatible with the display device, preventing the viewing of the on-screen menus. To execute a Power-On setting, simply press and hold the desired front panel button (indicated in the chart below) while connecting the power cable to the **IN1402**.

INPUT 1:	Factory Reset	◄:	800 x 600 @ 60 Hz
INPUT 2:	RGBHV-- Output Sync	◄:	1024 x 768 @ 60 Hz
INPUT 3:	RGBHV++ Output Sync	∀:	1152 x 864 @ 60 Hz
INPUT 2 & 3:	RGBS Output Sync	➤:	1280 x 1024 @ 60 Hz
INPUT 2 & ◄:	RGsB Output Sync	**ENTER:**	Factory Reset
MENU:	640 x 480 @ 60 Hz		

OUTPUT POSITIONING

Output position may be adjusted without entering the main menu sequence. Pressing the arrow keys selects the output position controls any time the menu is not displayed. Afterwards, press **ENTER** to save the output position, or press **MENU** to exit without saving the setting.

The output position simply moves the image on the monitor. It does not add blank borders or crop any part of the image. However, the apparent effect of blank borders and a cropped image may be due to the image being incorrectly positioned on the monitor.

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Remote Operation

RS-232 CONTROL

The **IN1402** RS-232 serial control port accepts serial commands from a control system, computer serial port, or any other device capable of sending out serial ASCII commands at compatible baud rates. A complete listing of RS-232 codes is included on the following pages.

Communication Protocol:

> 8 data bits
> 1 stop bit
> No parity check
> 9600 baud (factory default setting)

Baud Rate Selection:

The **IN1402** has a factory default baud rate of 9600 bps and can communicate at baud rates from 1200 up to 57,600. Baud rates can be selected using the Advanced Menu (see pages 12 & 13). *Note: The baud rate transmitted <u>must</u> match the baud rate selected on the **IN1402**.*

Command Code Structure and Delimiters:

All commands sent to the unit must contain a leading code, the command code, and an ending code. Each command must be completely executed before the unit will accept a new command.

INLINE scalers can be set to recognize six sets of leading and end codes (delimiters) when using an RS-232 remote: parentheses ( ), brackets [ ], braces { }, slashes \ /, less and greater than < >, and signs !#. The factory default serial delimiters are [ ].
*Note: Only the **IN1402** that has the same delimiters as the remote controller will respond.*

A complete command consists of:
> **[**   The leading code
> **CH3**   The command code.
> **]**   The ending code

Example: [CH3] sets the **IN1402** to select channel 3.

Serial Control Cable Wiring:

When controlling only one **IN1402** unit, connect the RS-232 cable as follows:

> Controller Transmit   to   **IN1402** Receive
> Controller Ground   to   **IN1402** Ground
> Controller Receive   to   **IN1402** Transmit

When controlling multiple **IN1402** units, connect the RS-232 cable as follows:

Controller Transmit	to	Each **IN1402** Receive
Controller Ground	to	Each **IN1402** Ground
Controller Receive	to	Only one **IN1402** Transmit

KEY CONCEPT
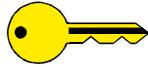
*When controlling multiple units, the Controller Receiver Terminal must connect to only one **IN1402** Transmit Terminal. Multiple **IN1402** Transit Lines may not be connected together; otherwise signal contention from multiple units will result. Therefore, "receive" information is only available from one **IN1402** in this configuration. Each unit must be set to different delimiters.*

IN1402 SERIAL COMMANDS*

COMMAND	DESCRIPTION	COMMAND	DESCRIPTION
ACI3	set baud rate to 1200	CMDCD4	set delimiters to slashes \ /
ACI4	set baud rate to 2400	CMDCD5	set delimiters to signs !#
ACI5	set baud rate to 4800	CMDCD?	return current delimiters
ACI6	set baud rate to 9600**	CON+	increase contrast
ACI7	set baud rate to 19,200	CON-	decrease contrast
ACI8	set baud rate to 38,400	CON@	set contrast to normal** (128)
ACI9	set baud rate to 57,600	CONxxx	set contrast to absolute value (000-255)
ACI?	return current baud rate	CON?	return current contrast
ASP0	set aspect ratio to standard**	CTF0	select comb filter**
ASP1	set aspect ratio to anamorphic	CTF1	select trap filter
ASP2	set aspect ratio to wide screen	CTF?	return current comb / trap filter state
ASP3	set aspect ratio to wider screen	FP	toggle front panel controls
ASP4	set aspect ratio to espand	FP0	disable front panel controls
ASP?	return current aspect ratio	FP1	enable front panel controls**
BRG+	increase brightness	FP?	return current front panel state
BRG-	decrease brightness	GAM+	increase gamma
BRG@	set brightness to normal** (128)	GAM-	decrease gamma
BRGxxx	set brightness to absolute value (000-255)	GAM@	set gamma to normal**(010)
		GAMxxx	set gamma to absolute value (001-030)
BRG?	return current brightness	GAM?	return current gamma
CH1	select channel 1	HTK0	set horizontal tracking to very fast
CH2	select channel 2	HTK1	set horizontal tracking to fast**
CH3	select channel 3	HTK2	set horizontal tracking to normal
CH?	return current channel	HTK3	set horizontal tracking to slow
CMDCD0	set delimiters to brackets [ ]**	HTK?	return current horizontal tracking
CMDCD1	set delimiters to braces { }	HUE+	increase hue
CMDCD2	set delimiters to parentheses ( )	HUE-	decrease hue
CMDCD3	set delimiters to less and greater < >	HUE@	set hue to normal** (020)

COMMAND	DESCRIPTION	COMMAND	DESCRIPTION
HUExxx	set hue to absolute value (000-040)	SCS1	set resolution to 800 x 600
HUE?	return current hue	SCS2	set resolution to 852 x 480
INFO?	return unit version	SCS3	set resolution to 1024 x 768
NOISE+	increase noise filter	SCS4	set resolution to 1152 x 864
NOISE-	decrease noise filter	SCS5	set resolution to 1280 x 720
NOISE@	set noise filter to normal (009)	SCS6	Set resolution to 1280 x 768
NOISExxx	set noise filter to absolute value (000-047)	SCS7	set resolution to 1280 x 1024
		SCS8	set resolution to 1365 x 768
NOISE?	return current noise filter	SCS9	set resolution to 1365 x 1024
PH+	increase horizontal position	SCS?	return current resolution
PH-	decrease horizontal position	SH+	increase horizontal size
PH@	set horizontal position to normal**♦	SH-	decrease horizontal size
PHxxx	set horizontal position to absolute value♦	SH@	set horizontal size to normal**(100)
PH?	return current horizontal position	SHxxx	set horizontal size to absolute value (♦-100)
PV+	increase vertical position	SH?	return horizontal size
PV-	decrease vertical position	SHP+	increase sharpness
PV@	set vertical position to normal** ♦	SHP-	decrease sharpness
PVxxx	set vertical position to absolute value♦	SHP@	set sharpness to normal** (003)
PV?	return current horizontal position	SHPxxx	set sharpness to absolute value (000-008)
RES000	factory reset	SHP?	return current sharpness
RES1	reset video	SV+	increase vertical size
RES3	reset input	SV-	decrease vertical size
RES4	reset output	SV@	set vertical size to normal**(100)
RES5	reset RS-232	SVxxx	set vertical position to absolute value (♦-100)
SAT+	increase color	SV?	return vertical size
SAT-	decrease color	SYNC0	set output sync to RGBHV- -**
SAT@	set color to normal** (140)	SYNC1	set output sync to RGBHV+ +
SATxxx	set color to absolute value (000-255)	SYNC2	set output sync to RGBS
SAT?	return current color	SYNC4	set output sync to RGsB
SCS0	set resolution to 640 x 480**	SYNC?	return current output sync

* This Command List is preliminary. All commands listed in this manual are functional, however, INLINE reserves the right to modify, remove and / or add commands on future product revisions. The commands are *not* case sensitive.

** Default values when factory reset is performed.

♦ Normal and available values depend on the current output mode.

Specifications

IN1402 Video Scaler	
Input	
Connections	Composite Video: (1) BNC female & (1) RCA female
	S-Video: (1) 4-Pin Mini DIN female for Y/C
Signal	Video / Luma: 0.7 Vp-p typical, 75 Ohm impedance
	Chroma: 0.3 Vp-p typical, 75 Ohm impedance
Standards Supported	NTSC / PAL / SECAM / NTSC 4.43
Output	
Connectors	RGBHV: (1) 15-Pin HD female
RGB Video	0.7 Vp-p typical, 75 Ohm impedance
Sync Format	Selectable: RGBHV (default), RGBS, RGsB
Resolution	640 x 480 to 1365 x 1024
Vertical Refresh Rate	Output Refresh Rate is Same as Input Signal Rate: NTSC Input: 59.94 Hz / PAL Input: 50 Hz
General	
RS-232 Control	1200 to 57,600 baud, N, 8, 1; 3-Pin Phoenix
Power Supply	Internal Switch Mode: 90 to 260 VAC; 47 to 63 Hz
Power Consumption	25 Watts
Shipping Weight	4 lbs. / 2 Kg
Product Weight	2 lbs. / 0.9 Kg
Dimensions	1.65" x 8.5" x 7.3" / 4.2 cm x 21.6 cm x 18.5 cm
Regulatory Approvals	UL1950, CAN/CSA-22.2 No. 950, Third Edition CE: EN55022 (1987), EN50081-1 (1991), EN50082-1 (1992 AND 1994). EN60950-92

Included Accessories
IN9230 IEC Power Cable
Operations Manual

Optional Accessories
VGA Monitor Adapter and Extension Cables
IN8000 Series - 15-pin HD male to 15-pin HD female, lengths from 3' to 250'   **IN8000M Series -** 15-pin HD male to 15-pin HD male, lengths from 3' to 150'
S-Video Cables
IN8600 Series - S-Video cables, 4-pin mini DIN (M-M), lengths from 6' to 25'
RCA Cables
IN9101 - Video Adaptor Cable, BNC male to RCA male, 6'
BNC Cables
IN7200-1 Series - Ultra High Resolution 1-BNC Cable, available in a variety of lengths
Mounting Hardware
IN9080 - Rack Shelf - Mounts 1 or 2 IN1402 in 1U Rack Space   **IN9088B -** Half-Rack Blank Panel - Fills Space when Rack Mounting one IN1402

Troubleshooting

Problem: **There is no image on the display device.**

> **Solution 1:** Make sure that the **IN9230** IEC power cable is securely plugged into the unit and the A/C source.
>
> **Solution 2:** Make sure the A/C source is live.
>
> **Solution 3:** Verify that the power switch is turned on for the video source, the **IN1402** and the monitor / display device.
>
> **Solution 4:** Verify the connection to the output display device. Even with no input signal, the **IN1402** menu can be displayed. Press MENU or ENTER to gain access to the menu screen.
>
> **Solution 5:** Select an output resolution compatible with the display device being used. Use the default power-up buttons to select an output mode without the menu present.
>
> **Solution 6:** The output resolution must not be less that the input (the **IN1402** can only scale up). Select an output resolution that is greater than or equal to the input size.
>
> **Solution 7:** The display device may not accept certain sync formats. Verify the display device sync capability and select the **IN1402** output sync using the power-up default buttons.

Problem: **The image on the display device is scrambled.**

> **Solution:** Select an output resolution compatible with the display device being used. Use the default power-up buttons to select an output mode without the menu present.

Problem: **The image on the display device is cropped to the left side.**

> **Solution 1:** Increase the output H-Position to line up the image on the display device.
>
> **Solution 2:** Adjust the monitor position or size controls to fit the image on the display device.

Problem: **The image on the display device is cropped on the right side.**

> **Solution 1:** Reduce the output H-Position to line up the image on the display device.
>
> **Solution 2:** Adjust the monitor position or size controls to fit the image on the display device.

Problem: **The image on the display device is cropped on the top.**

> **Solution 1:** Increase the output V-Position to line up the image on the display device.
>
> **Solution 2:** Adjust the monitor position or size controls to fit the image on the display device.

Problem: The image on the display device is cropped on the bottom.

    Solution 1: Reduce the output V-Position to line up the image on the display device.

    Solution 2: Adjust the monitor position or size control to fit the image on the display device.

Problem: The picture on the display device has hooking along the top.

    Solution 1: Increase the input horizontal tracking to compensate for poor quality video signals, such as from a VCR.

    Solution 2: The display device may need different sync serrations. Choose a different output sync from the sync format menu.

Problem: The image on the display device is the wrong shape.

Solution: The input aspect ratio is set incorrectly. Adjust the input aspect ratio to match the input video signal.

Problem: The image on the display device appears fuzzy.

    Solution 1: Adjust the video sharpness until the image regains its detail.

    Solution 2: Adjust the video noise filter until the image is sharp.

    Solution 3: Change the comb or trap filter setting (only applicable in composite video mode).

Problem: The output resolution will not decrease.

    Solution 1: The **IN1402** can _only_ scale up. Resolutions that would result in scaling down are **not available.**

Problem: The desired input aspect ratio cannot be selected.

    Solution 1: The **IN1402** can _only_ scale up. Increase the output resolution until the desired aspect ratio is available.

    Solution 2: Manually decrease the image size by using the output menu.

    Solution 3: Select a different available aspect ratio.

Problem: The output size will not decrease.

    Solution: The **IN1402** will _only_ scale up. Increase the output resolution, and then reduce the size of the output image.

If problems persist, call INLINE Technical Services at (714) 450-1800 for further assistance.

Warranty

- INLINE warrants the equipment it manufactures to be free from defects in materials and workmanship.

- If equipment fails because of such defects and INLINE is notified within three (3) years from the date of shipment, INLINE will, at its option, repair or replace the equipment at its plant, provided that the equipment has not been subjected to mechanical, electrical, or other abuse or modifications.

- Equipment that fails under conditions other than those covered will be repaired at the current price of parts and labor in effect at the time of repair. Such repairs are warranted for ninety (90) days from the day of re-shipment to the Buyer.

- **This warranty is in lieu of all other warranties expressed or implied, including without limitation, any implied warranty or merchantability or fitness for any particular purpose, all of which are expressly disclaimed.**

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