Extron® Electronics
INTERFACING, SWITCHING AND DISTRIBUTION

User's Manual

IN1401

RGB Video Scaler

68-1018-01
Rev. B
1 05

Precautions

Safety Instructions • English

This symbol is intended to alert the user of important operating and maintenance (servicing) instructions in the literature provided with the equipment.

This symbol is intended to alert the user of the presence of uninsulated dangerous voltage within the product's enclosure that may present a risk of electric shock.

Caution

Read Instructions • Read and understand all safety and operating instructions before using the equipment.

Retain Instructions • The safety instructions should be kept for future reference.

Follow Warnings • Follow all warnings and instructions marked on the equipment or in the user information.

Avoid Attachments • Do not use tools or attachments that are not recommended by the equipment manufacturer because they may be hazardous.

Warning

Power sources • This equipment should be operated only from the power source indicated on the product. This equipment is intended to be used with a main power system with a grounded (neutral) conductor. The third (grounding) pin is a safety feature, do not attempt to bypass or disable it.

Power disconnection • To remove power from the equipment safely, remove all power cords from the rear of the equipment, or the desktop power module (if detachable), or from the power source receptacle (wall plug).

Power cord protection • Power cords should be routed so that they are not likely to be stepped on or pinched by items placed upon or against them.

Servicing • Refer all servicing to qualified service personnel. There are no user-serviceable parts inside. To prevent the risk of shock, do not attempt to service this equipment yourself because opening or removing covers may expose you to dangerous voltage or other hazards.

Slots and openings • If the equipment has slots or holes in the enclosure, these are provided to prevent overheating of sensitive components inside. These openings must never be blocked by other objects.

Lithium battery • There is a danger of explosion if battery is incorrectly replaced. Replace it only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Consignes de Sécurité • Français

Ce symbole sert à avertir l'utilisateur que la documentation fournie avec le matériel contient des instructions importantes concernant l'exploitation et la maintenance (réparation).

Ce symbole sert à avertir l'utilisateur de la présence dans le boîtier de l'appareil de tensions dangereuses non isolées posant des risques d'électrocution.

Attention

Lire les instructions• Prendre connaissance de toutes les consignes de sécurité et d'exploitation avant d'utiliser le matériel.

Conserver les instructions• Ranger les consignes de sécurité afin de pouvoir les consulter à l'avenir.

Respecter les avertissements • Observer tous les avertissements et consignes marqués sur le matériel ou présentés dans la documentation utilisateur.

Eviter les pièces de fixation • Ne pas utiliser de pièces de fixation ni d'outils non recommandés par le fabricant du matériel car cela risquerait de poser certains dangers.

Avertissement

Alimentations• Ne faire fonctionner ce matériel qu'avec la source d'alimentation indiquée sur l'appareil. Ce matériel doit être utilisé avec une alimentation principale comportant un fil de terre (neutre). Le troisième contact (de mise à la terre) constitue un dispositif de sécurité : n'essayez pas de la contourner ni de la désactiver.

Déconnexion de l'alimentation• Pour mettre le matériel hors tension sans danger, déconnectez tous les cordons d'alimentation de l'arrière de l'appareil ou du module d'alimentation de bureau (s'il est amovible) ou encore de la prise secteur.

Protection du cordon d'alimentation • Acheminer les cordons d'alimentation de manière à ce que personne ne risque de marcher dessus et à ce qu'ils ne soient pas écrasés ou pincés par des objets.

Réparation-maintenance • Faire exécuter toutes les interventions de réparation-maintenance par un technicien qualifié. Aucun des éléments internes ne peut être réparé par l'utilisateur. Afin d'éviter tout danger d'électrocution, l'utilisateur ne doit pas essayer de procéder lui-même à ces opérations car l'ouverture ou le retrait des couvercles risquent de l'exposer à de hautes tensions et autres dangers.

Fentes et orifices • Si le boîtier de l'appareil comporte des fentes ou des orifices, ceux-ci servent à empêcher les composants internes sensibles de surchauffer. Ces ouvertures ne doivent jamais être bloquées par des objets.

Lithium Batterie • Il a danger d'explosion s'll y a remplacment incorrect de la batterie. Remplacer uniquement avec une batterie du meme type ou d'un ype equivalent recommande par le constructeur. Mettre au reut les batteries usagees conformement aux instructions du fabricant.

Sicherheitsanleitungen • Deutsch

Dieses Symbol soll dem Benutzer in der im Lieferumfang enthaltenen Dokumentation besonders wichtige Hinweise zur Bedienung und Wartung (Instandhaltung) geben.

Dieses Symbol soll den Benutzer darauf aufmerksam machen, daß im Inneren des Gehäuses dieses Produktes gefährliche Spannungen, die nicht isoliert sind und die einen elektrischen Schock verursachen können, herrschen.

Achtung

Lesen der Anleitungen • Bevor Sie das Gerät zum ersten Mal verwenden, sollten Sie alle Sicherheits-und Bedienungsanleitungen genau durchlesen und verstehen.

Aufbewahren der Anleitungen • Die Hinweise zur elektrischen Sicherheit des Produktes sollten Sie aufbewahren, damit Sie im Bedarfsfall darauf zurückgreifen können.

Befolgen der Warnhinweise • Befolgen Sie alle Warnhinweise und Anleitungen auf dem Gerät oder in der Benutzerdokumentation.

Keine Zusatzgeräte • Verwenden Sie keine Werkzeuge oder Zusatzgeräte, die nicht ausdrücklich vom Hersteller empfohlen wurden, da diese eine Gefahrenquelle darstellen können.

Vorsicht

Stromquellen • Dieses Gerät sollte nur über die auf dem Produkt angegebene Stromquelle betrieben werden. Dieses Gerät wurde für eine Verwendung mit einer Hauptstromleitung mit einem geerdeten (neutralen) Leiter konzipiert. Der dritte Kontakt ist für einen Erdanschluß, und stellt eine Sicherheitsfunktion dar. Diese sollte nicht umgangen oder außer Betrieb gesetzt werden.

Stromunterbrechung • Um das Gerät auf sichere Weise vom Netz zu trennen, sollten Sie alle Netzkabel aus der Rückseite des Gerätes, aus der externen Stomversorgung (falls dies möglich ist) oder aus der Wandsteckdose ziehen.

Schutz des Netzkabels • Netzkabel sollten stets so verlegt werden, daß sie nicht im Weg liegen und niemand darauf treten kann oder Objekte darauf- oder unmittelbar dagegengestellt werden können.

Wartung • Alle Wartungsmaßnahmen sollten nur von qualifiziertem Servicepersonal durchgeführt werden. Die internen Komponenten des Gerätes sind wartungsfrei. Zur Vermeidung eines elektrischen Schocks versuchen Sie in keinem Fall, dieses Gerät selbst öffnen, da beim Entfernen der Abdeckungen die Gefahr eines elektrischen Schlags und/oder andere Gefahren bestehen.

Schlitze und Öffnungen • Wenn das Gerät Schlitze oder Löcher im Gehäuse aufweist, dienen diese zur Vermeidung einer Überhitzung der empfindlichen Teile im Inneren. Diese Öffnungen dürfen niemals von anderen Objekten blockiert werden.

Litium-Batterie • Explosionsgefahr, falls die Batterie nicht richtig ersetzt wird. Ersetzen Sie verbrauchte Batterien nur durch den gleichen oder einen vergleichbaren Batterietyp, der auch vom Hersteller empfohlen wird. Entsorgen Sie verbrauchte Batterien bitte gemäß den Herstelleranweisungen.

Instrucciones de seguridad • Español

Este símbolo se utiliza para advertir al usuario sobre instrucciones importantes de operación y mantenimiento (o cambio de partes) que se desean destacar en el contenido de la documentación suministrada con los equipos.

Este símbolo se utiliza para advertir al usuario sobre la presencia de elementos con voltaje peligroso sin protección aislante, que puedan encontrarse dentro de la caja o alojamiento del producto, y que puedan representar riesgo de electrocución.

Precaucion

Leer las instrucciones • Leer y analizar todas las instrucciones de operación y seguridad, antes de usar el equipo.

Conservar las instrucciones • Conservar las instrucciones de seguridad para futura consulta.

Obedecer las advertencias • Todas las advertencias e instrucciones marcadas en el equipo o en la documentación del usuario, deben ser obedecidas.

Evitar el uso de accesorios • No usar herramientas o accesorios que no sean especificamente recomendados por el fabricante, ya que podrian implicar riesgos.

Advertencia

Alimentación eléctrica • Este equipo debe conectarse únicamente a la fuente/tipo de alimentación eléctrica indicada en el mismo. La alimentación eléctrica de este equipo debe provenir de un sistema de distribución general con conductor neutro a tierra. La tercera pata (puesta a tierra) es una medida de seguridad, no puentearia ni eliminaria.

Desconexión de alimentación eléctrica • Para desconectar con seguridad la acometida de alimentación eléctrica al equipo, desenchufar todos los cables de alimentación en el panel trasero del equipo, o desenchufar el módulo de alimentación (si fuera independiente), o desenchufar el cable del receptáculo de la pared.

Protección del cables de alimentación • Los cables de alimentación eléctrica se deben instalar en lugares donde no sean pisados ni apretados por objetos que se puedan apoyar sobre ellos.

Reparaciones/mantenimiento • Solicitar siempre los servicios técnicos de personal calificado. En el interior no hay partes a las que el usuario deba acceder. Para evitar riesgo de electrocución, no intentar personalmente la reparación/mantenimiento de este equipo, ya que al abrir o extraer las tapas puede quedar expuesto a voltajes peligrosos u otros riesgos.

Ranuras y aberturas • Si el equipo posee ranuras o orificios en su caja/alojamiento, es para evitar el sobrecalientamiento de componentes internos sensibles. Estas aberturas nunca se deben obstruir con otros objetos.

Batería de litio • Existe riesgo de explosión si esta batería se coloca en la posición incorrecta. Cambiar esta batería únicamente con el mismo tipo (o su equivalente) recomendado por el fabricante. Desachar las baterías usadas siguiendo las instrucciones del fabricante.

Table of Contents

Product Overview

Description

The IN1401 is an advanced RGB Video Scaler that takes an RGB signal at various scan rates and resolutions and uses sophisticated digital video scaling technology to convert it to a standard VGA video signal.

Features

- **Industrial and process control applications** — The IN1401 can act as a bridge between the installed base of proprietary process control systems and modern data displays. Because the unit accepts a wide range of standard and non-standard analog video signals and converts them to standard VGA resolutions and refresh rates, it also allows obsolete, long-persistence phosphor monitors to be replaced with standard VGA monitors and flat panel displays. The IN1401 also provides enhanced ergonomics by converting 50 and 60 Hz input signals to higher, flicker-free refresh rates.
- **A/V display system applications** — The IN1401 provides an economical way to provide high quality video scaling of NTSC and PAL RGB video signals from high-resolution cameras, visualizers, document cameras and other devices featuring an RGB video output. The IN1401 also provides superb up scaling for 640 x 480, 800 x 600 and 1024 x 768 resolution video signals, making it an excellent companion for LCD and DLP display devices that have marginal on-board video scaling capability. The IN1401 has been optimized for scaling RGB computer video signals, RGB signals from document cameras, and other video signals that do not contain a great deal of fast motion. The IN1402, IN1403, IN1404, and IN1404XT Video Scalers are recommended for applications requiring superb video scaling for composite video, S-video, component video, and RGB video signals containing fast, continuous motion.
- **Comprehensive input adjustment controls** — Provided to optimize the unit when used with proprietary and non-standard input signals. These input signal adjustments include: Total Pixels, Active Pixels, Active Lines, Horizontal and Vertical Blanking, Phase and Scan Type. Once adjustments are made to optimize non-standard input signals, these settings are stored and automatically recalled when the same input signal is encountered again.
- **Blue screen** — Provides a full-screen blue image for set-up and testing purposes. The blue screen output signal (activated via on-screen menu) is always available, even when the input signal is missing or the input settings are incorrectly adjusted. Blue screen is ideal for establishing the desired output resolution, refresh rate and position settings, and to verify the connection to the output display device.
- **On-screen control menus** — Provides intuitive control for input and output signal adjustments as well as advanced settings such as reset to factory defaults.
- **System Info** — A menu option that uses the on-screen display to show comprehensive information about both the input and output signals
- **Selectable output resolution and refresh rate** — The IN1401 offers a wide range of output resolutions to match the optimum or native resolution of virtually any display device.
- **Output signal adjustments** — Included for horizontal and vertical positions, brightness and contrast, and individual gain controls for red, green and blue
- **RS-232 serial control (IN1401-2 Model Only)** — Provided for all scaler functions including input selections, image adjustments and output settings. The IN1401-2's comprehensive RS-232 control capacity facilitates complete system integration and effortless control when combined with a third party control system.

- **Data display "friendly" output** — The IN1401 provides a progressive scan RGBHV output at standard VGA resolutions and refresh rates, ensuring optimal compatibility with a wide range of CRT, LCD, DMD, ILA, D-ILA, HDLA, and plasma display devices.
- **Rack mountable** — Two IN1401 units may be mounted side-by-side using the optional Universal 1U Rack Shelf (Extron part #60-190-01). This shelf can also be used for a single unit or the Basic Rack False Faceplate Kit (Extron part #70-339-01) can be used.

Compatibility

Input

The IN1401 accepts RGBHV, RGBS, and RGSB signals at horizontal scan rates from 24 kHz to 60 kHz. The unit automatically adjusts to different sync formats and a wide variety of input signals including NTSC, PAL, and most standard video scan rates.

Output

The IN1401 output video signal is compatible with a wide range of CRT, LCD, DMD, ILA, D-ILA, HDLA, and plasma display devices.

The IN1401 offers a wide range of output resolutions to match the optimum or native resolution of virtually any display device. The output refresh rate is also selectable as desired. When used with LCD or DMD displays, the 60 Hz output setting is recommended. Higher output refresh rates may be selected for use on CRT type displays in order to reduce flicker and provide enhanced ergonomics. The charts in the Output Modes section indicate the available output resolutions and refresh rates.

Installation

This section offers step-by-step instructions for installing the IN1401 RGB Video Scaler. An application diagram is located on the following page.

NOTE *Read the instructions carefully before initiating the installation procedure. Make sure that there is no power connected to the IN1401, and that the* **POWER** *button is off.*

1. Place or install the IN1401 at the desired location. Make sure that the unit is seated on a flat surface or is securely installed in a Universal 1U Rack Shelf (Extron part #60-190-01). Two IN1401 units may be mounted side-by-side using the optional Universal 1U Rack Shelf (Extron part #60-190-01). This shelf can also be used for a single unit, or the Basic Rack False Faceplate Kit (Extron part #70-339-01) can be used.
2. Connect the IN1401 input (BNC connectors) to a data output device (featuring an RGB video output), using three, four or five BNC cables (for RGsB, RGBS or RGBHV, respectively) or a multi-conductor RGBHV, RGBS or RGB "snake". While making connections, take care to ensure that the red output is connected to the red input, green output to the green input, etc.

NOTE *The IN1401 will not accept S-video or composite video signals.*

3. Connect the monitor, flat panel, or other VGA display device directly to the IN1401 output port using a standard 15-pin HD male-to-male VGA cable.
4. Connect power to the IN1401 using the included IEC power cable.
5. Turn on the video source, the IN1401, and the monitor. The scaler has been factory pre-set to support plug and play operation with most display devices. If it becomes necessary to manually adjust/fine-tune the video image, see *Input Settings* on page 7 to achieve optimum picture quality.

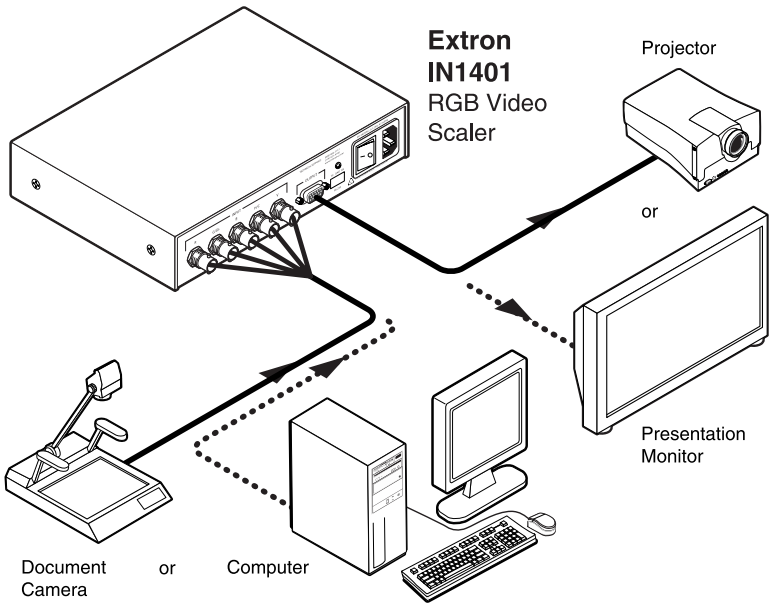

Figure 1 — IN1401 Application Diagram

Operation

On screen menu

This section describes the on-screen menus and their operation. To access the Main Menu, press the **MENU** or **ENTER** button. Use the arrow buttons to maneuver around within the menu display(s). Press **ENTER** to select a command; press **MENU** to exit.

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.

Options: Displays advanced options.

An illustration of the on-screen display menu system is provided on the next page.

IN1401 on-screen display menu system

Main Menu
Video
Input
Output
Options

Video
Brightness
Contrast
Color

Color
Red
Green
Blue

Input
Blanking
Active Area
Phase
Total Pixels
Scan Type

Blanking
H-Blanking
V-Blanking

Active Area
Active Pixels
Active Lines

Sync Type
Interlaced
Swap Fields
Invert Sync

Output
Resolution
Refresh Rate
Position
Blue Screen
Sync Polarity

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

Refresh Rate*
56 / 60 / 65 Hz
72 Hz
75 Hz
85 Hz
96 Hz
100 Hz
120 Hz

Position
H-Position
V-Position

Blue Screen
On
Off

Sync Polarity
++
- -

Options
Factory Reset
Auto Detect
System Info.

Factory Reset
Yes
No

Auto Detect
Auto Detect On
Auto Detect Off
User Defined
Redetected Now

Baud Rate**
1200
2400
4800
9600
1920
38400
57600

Delimiter**
Brackets [ ]
Parentheses ( )
Slashes /\
Greater / Less than < >
Signs ! #

System Info
Input
Horizontal
Vertical
Output
Horizontal
Vertical
Version

*Depends on the resolution

**Functional for IN1401-2 only

Video menu

Brightness — Changes the input signal brightness.

Contrast — Changes the input signal contrast.

Color — Changes the input signal gain (contrast) for each individual color. Red, green and blue are available.

Input menu

H-Blanking — The number of pixels per line inside the blanking area that is on the left side of the active area (including the horizontal sync width and the horizontal back porch).

V-Blanking — The number of lines per frame inside the blanking area that is above the active area (including the vertical sync height and the vertical back porch)

Active pixels — The number of pixels per line inside the active input area

Active lines — The number of lines per frame inside the input active area. For interlaced input signals, this number refers to the lines per frame after de-interlacing, not the number of lines per field.

Total pixels — The total number of pixels per line including the blanking on both sides of the input active area (active, horizontal sync width, back porch and front porch). Refer to *Input Settings* on page 7 to determine how to set the total pixels. The total number of lines per frame, including the blanking above and below the active area, is determined by the input signal and cannot be adjusted by the user.

Phase — Adjusts the amount of phase shift applied to the input signal.

Scan type — Three options are available:

- **Interlaced** — for interlaced signals
- **Swap fields** — to switch the interlaced fields (if necessary)
- **Invert Sync** — to switch the sync polarity (if necessary)

Output menu

Resolution — Because the IN1401 only scales up, users must choose an output resolution that is greater than or equal to the input active area, as well as one that is compatible with their monitor. The available resolution rates are listed in *Output modes* on page 12.

Refresh rate — Allows users to choose the refresh rate that is compatible with their display device.

NOTE *Not all resolution and refresh rate combinations are available. Refer to the* Output modes *chart on page 12 for a complete listing.*

Position — Positions the output image on the monitor. Unlike input blanking it does not crop the image or add blank borders.

Blue screen — Adjusts the output image on the monitor. Available anytime (even when the input settings are incorrectly adjusted or the input signal is missed entirely), the blue screen is used to adjust the outer settings (resolution, refresh rate and position) and verify the image on the monitor. The video and input settings have no effect on the blue screen. Once the output settings have been properly adjusted and verified on the monitor, the blue screen may be turned off to adjust the video and input settings.

Options menu

Factory reset — Returns all video, input and output settings to factory default (except the resolution and refresh rate).

Auto detect — Four options are available:

- **Auto detect On —** The default mode at power up that allows the IN1401 to automatically detect new input modes and adjust accordingly.
- **Auto Detect Off** — Prevents the IN1401 from switching back and forth between input modes, or flickering when small input changes occur (such as from a VCR in fast forward or reverse).
- **User Defined** — All input modes have the same user definable settings. However, they are restricted to values close to the input mode detected. If a full range of values is necessary, the user-defined mode may be manually selected.

NOTE *If auto detect cannot determine the input mode, the user defined mode is selected automatically.*

- **Redetected Now** — The IN1401 automatically reconfigures when each new input mode is detected and each new output mode is selected. In the event that the scaler does not detect a change in the input mode, or should the input / output settings become invalid, the Redetect Now option allows users to initiate a new detection sequence and reload the input / output settings.

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

Delimiters — Use the on-screen menu to select the desired command code delimiters. Extron 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 !#**. If desired, several Extron products may be connected together on the same RS-232 serial control line with each device set for a different delimiter pair. Each unit will only respond to codes sent with the appropriate delimiters and will ignore all other codes.

System info — This screen displays the following system information:

- Input active area
- Input vertical refresh rate
- Output resolution
- Output vertical refresh rate
- Input horizontal scan rate
- If input is interlaced
- Output horizontal scan rate
- Program version number

Only the input horizontal scan rate and input vertical refresh rate are measured by the IN1401. If the input signal includes extra pulses (such as equalization or serration pulses), the input vertical refresh rate may indicate a value lower that the actual rate. All other values are simply repeated as defined by the input and output settings. Although the IN1401 detects the input mode and adjusts automatically (for the detected input mode 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 other video parameters such as the input total pixels (see input settings below) or for other video equipment connected to the IN1401.

Input settings

The IN1401 adjusts automatically for different input and output modes. However, in cases where the input signal has slightly different timing or is a non-standard mode, some settings may be adjusted manually. All settings for each input and output mode (including non-standard input modes) are stored internally so the adjustments will not have to be repeated after they are optimized. The input settings are shown in Figure 2 and the formulas and figures listed on the following pages will assist in the adjustment of these settings.

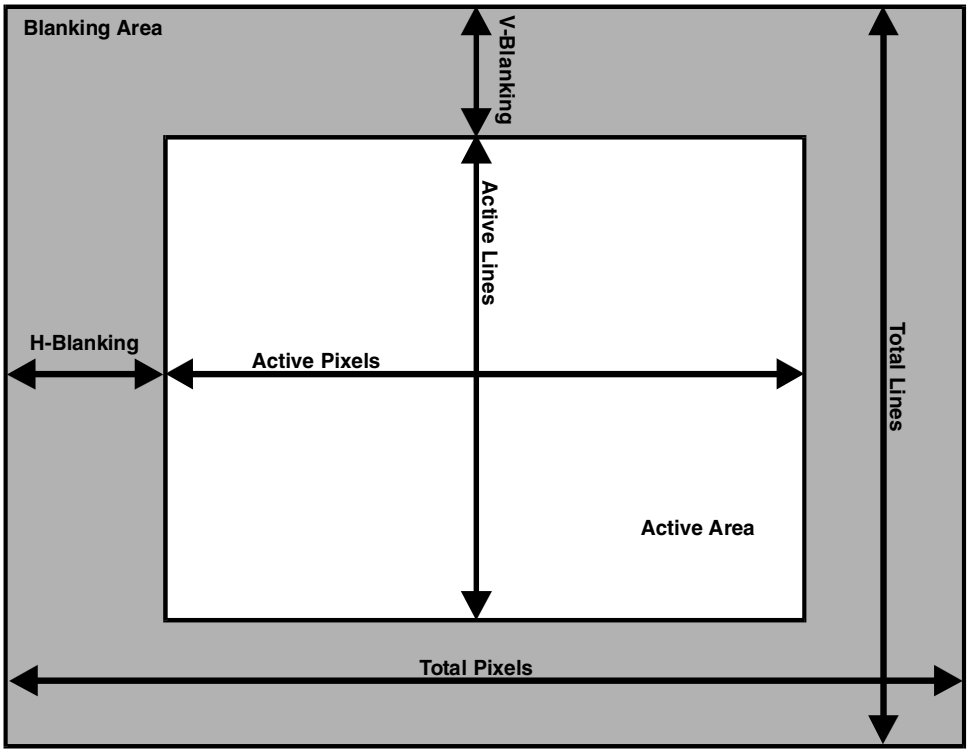

Figure 2 — Input Settings

The input settings control the following:

- H-Blanking: Left edge of image
- Active Pixels: Right edge of image
- Total Pixels: Right edge of image
- V-Blanking: Top edge of image
- Active Lines: Bottom edge of image

Use these controls to match the input video signal, framing the actual active area.

NOTE *Active pixels and total pixels are interactive. Setting one may require re-adjusting the other.*

In Figure 3 on the following page, the input blanking is set incorrectly (as indicated by the dashed lines). If the H-Blanking is set to less than the actual H-Blanking, the IN1401 will look for the active area before it really occurs. This results in a blank border on the left side of the active area, and cropping on the right side of the active area. This makes the image appear to be shifted to the right. Similarly, if the V-Blanking is set less than the actual V-Blanking, the IN1401 will again look for the active area before it really occurs. This results in a blank border on top of the active area, and cropping on the bottom of the active area. This makes the image appear to be shifted down.

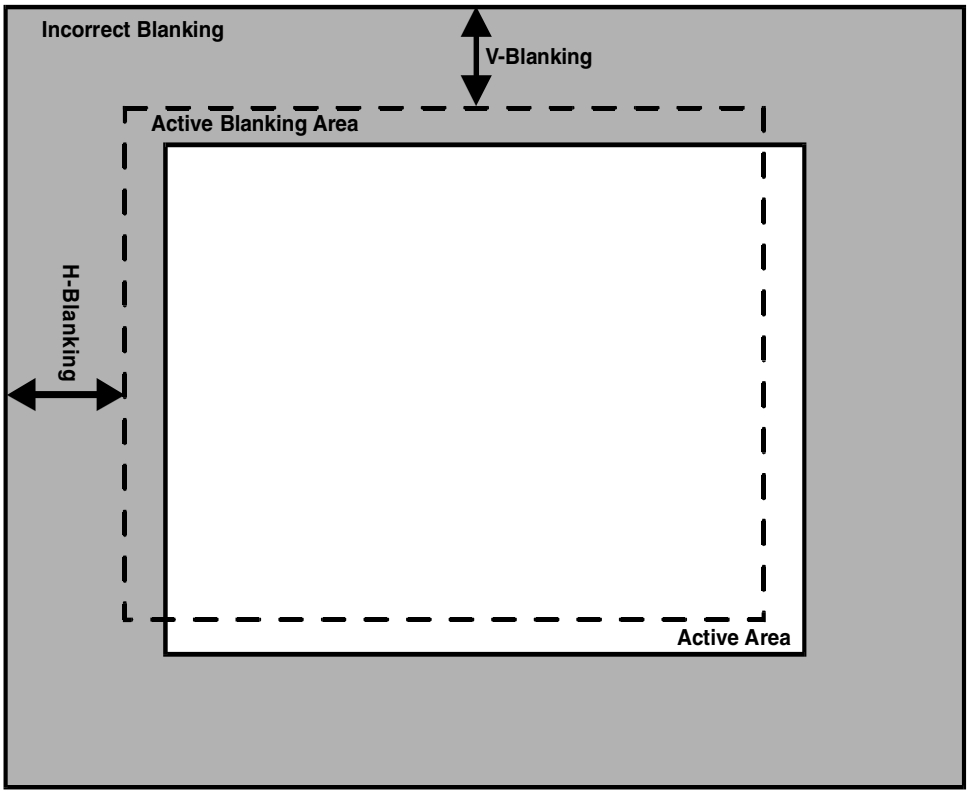

Figure 3 — Incorrect Input Blanking

Do not confuse input blanking with the output position. The input blanking adjusts where the electronic scaling process takes effect, which may add blank borders or crop the active area if set incorrectly. The input blanking and active area should be manually adjusted to match the input video signal, framing the actual active area on the monitor.

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. The blue screen is available to adjust the output image on the monitor. It is available at any time, even when the input settings are incorrectly adjusted or the input signal is missing entirely. Use the blue screen to adjust the output settings (resolution, refresh rate and position) and to verify the image on the monitor. The video and input settings have no effect on the blue screen. Once the output settings have been properly adjusted and verified on the monitor, the blue screen can be turned off, and the video settings may then be adjusted.

In Figure 4 on the following page, the active area is adjusted incorrectly, as shown by the dashed lines. If the active pixels are set to less than the actual active pixels, the IN1401 will only look for the active area inside this smaller region. This results in an active area containing fewer pixels than are really present. This gives the apparent effect that the picture is stretched horizontally. Similarly, if the active lines are set to less than the actual active lines, the IN1401 will again only look for the active area inside the smaller region. This results in an active area containing fewer lines than are really present, making the image appear to be stretched vertically.

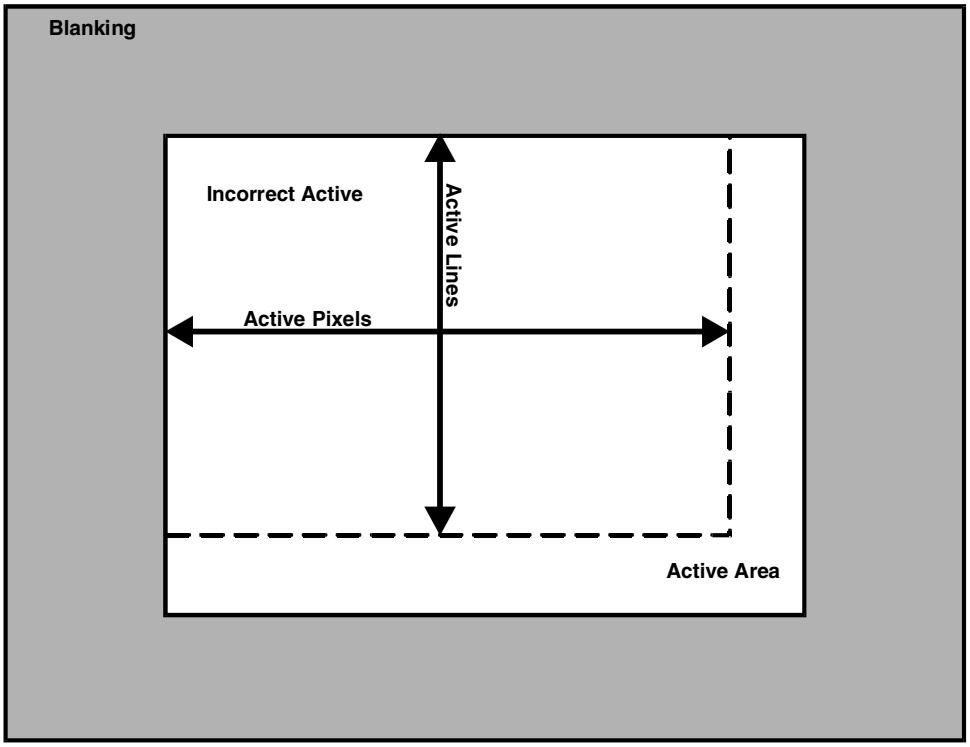

Figure 4 — Incorrect Active Area

Depending on the video source, the following input modes may have the same horizontal scan rate and vertical refresh rate. The differences between these input modes will not be detected. The input aspect ratio will automatically be maintained at the output by inserting blank borders around the image. However, if you want to fill the entire monitor screen, you can set the input aspect ratio by adjusting the active pixels or active lines, according to the input mode. This will stretch the image to fill the entire monitor screen. The total pixels may also be adjusted to match the input mode as shown in the tables below:

Active Pixels	Active Lines	Aspect Ratio	Total Pixels	
640	480	4:3	780	(progressive NTSC)
640	350	64:35	800	
640	400	8:5	800	
640	480	4:3	800	(factory default)
720	350	72:35	900	
720	400	9:5	900	

Table 1 — Input modes for horizontal scan rate = 31.5 kHz and vertical refresh rate = 60 Hz

Active Pixels	Active Lines	Aspect Ratio	Total Pixels	
768	480	8:5	910	NTSC 14.3
720	480	3:2	858	NTSC 13.5
640	480	4:3	780	NTSC 12.3 (default)

Table 2 — Input modes for horizontal scan rate = 15.7 kHz and vertical refresh rate = 60 Hz

In Figure 5, the total pixels are adjusted incorrectly. There are several ways to set the total pixels. It is best to set the total pixels according to the input signal specifications. Otherwise, if the input pixel clock is known, the input total pixels may be calculated using one of the methods shown below:

- Check the on-screen menu. The input horizontal scan rate, as measured by the IN1401, may be found in the Options menu under Systems Info.
- Multiply the input active pixels by 1.3 to approximate the input total pixels.
- Adjust the input total pixels to minimize any faint vertical lines that may be seen within the image, as shown below in Figure 5.

The total pixels may be adjusted to move the lines closer together or further apart. Adjust the total pixels until the lines are furthest apart or until they are completely out of view. If one line still remains, it may be moved out of view using the phase adjustment.

NOTE *The input active pixels and total pixels are interactive. Setting one may require readjustment of the other.*

1. Set input total pixels according to input signal specifications:

- Input total pixels = input pixel clock / input horizontal scan rate.
- Input total pixels ≈ 1.3 x input active pixels.

2. Set input total pixels to minimize faint vertical lines (see Figure 5).

3. After the input active pixels have been set correctly, adjust total pixels for the correct active width.

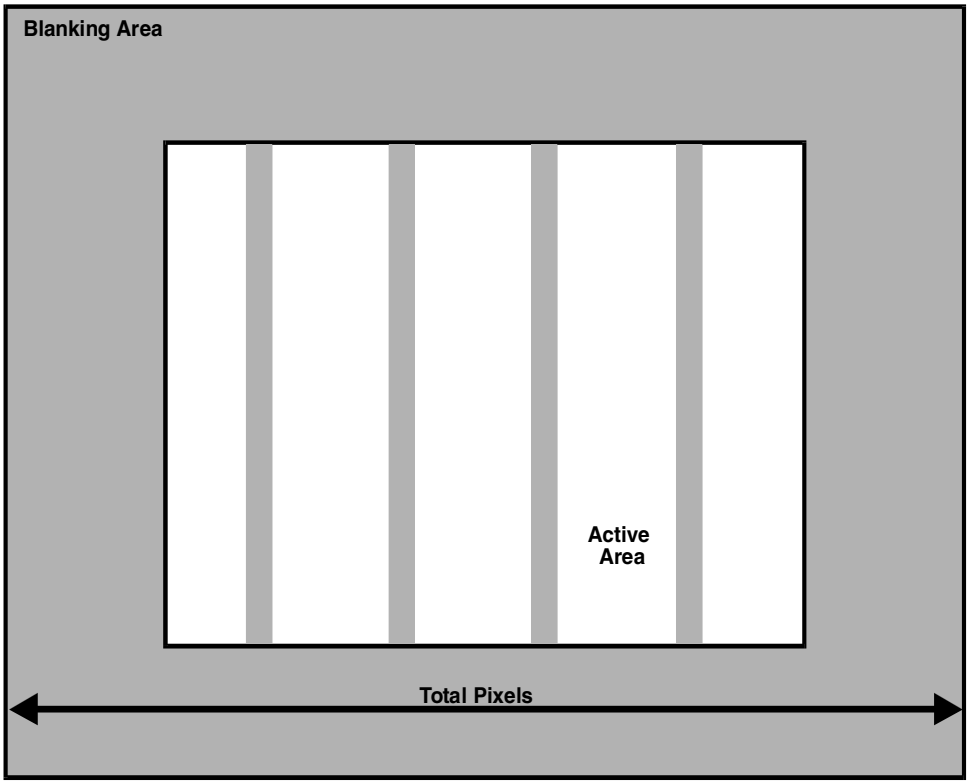

Figure 5 — Incorrect Total Pixels

Very slow input signals

If the input signal is very slow (pixel clock is less than 12 MHz), the IN1401 may display a poor image, as it is designed for signals above 12 MHz. To improve the quality of the image, increase the sampling rate by doubling the number of active and total pixels via the on-screen menu. The number of active lines remains the same. For example:

Parameter	Actual Input Signal	IN1401 Settings
Active Pixels	380	760
Active Lines	286	286
Total Pixels	482	964
Pixel Clock	7.512 MHz	15.024 MHz

Output modes

The IN1401 supports the following Output Modes:

			Refresh rate (Hz)								
Resolution	Mode	Aspect Ratio*	*56*	60	65	72	75	85	96	100	120
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									

Default power-up buttons

An output mode or a factory reset may be selected without the use of the IN1401 menu. This is particularly useful if the monitor does not display an image or if the image is scrambled. Simply hold down the front panel button while turning on the IN1401. To select both an output mode and factory reset, hold down both buttons simultaneously while turning the scaler on.

MENU: 640 x 480 @ 60 Hz
LEFT: 800 x 600 @ 60 Hz
UP: 1024 x 768 @ 60 Hz
DOWN: 1152 x 864 @ 60 Hz
RIGHT: 1280 x 1024 @ 60 Hz
ENTER: Factory Reset

Output positioning

The output may be adjusted without entering the main menu sequence. Pressing the arrow keys selects the output position controls if the menu is not on. Afterwards, press **ENTER** to save the output position, or press **MENU** to exit without saving the output position.

Low power sleep mode

If no input signal is detected, the IN1401 enters low power sleep mode. In this mode, the processor is still active and will continue to monitor the input for any video signal. Upon connection to the video signal, the IN1401 will automatically return to its normal mode of operation. The IN1401 menu may be displayed and adjusted without any video signal connected. If the IN1401 is in its low power

mode, press **MENU** or **ENTER** to turn on the unit and start the menu. All controls are available. The background will be blue if no signal is present and cannot be turned off until a signal is connected. Upon exiting the menu, the IN1401 will again return to its low power mode if no signal is present.

Maximum input and output modes

There are six factors that limit the input and output modes of the IN1401:

1. Input Active Pixels ≤ Output Active Pixels
2. Input active lines ≤ Output Active Lines
3. Input Pixel Clock ≤ 95 MHz (After De-Interlacing)
4. Intermediate Pixel Clock ≤ 95 MHz (After Frame Rate Conversion)
5. Output Pixel Clock ≤ 135 MHz (After Image Scaling)
6. (Input Pixel Clock + 95) / 1.8 ≤ 95 (Bandwidth Formula)

Limitations of settings

The following criteria must be met for *all* signals. Any attempt to adjust the settings beyond these criteria results in an invalid video signal and will not be allowed. If any setting does not move to the desired value, verify the equations below and refer to the list of problems / solutions in *Troubleshooting* on page 18 to find the alternate setting required.

- Input Total Pixels > Input H-Blanking + Input Active Pixels
- Input Active Pixels < Input Total Pixels - Input H-Blanking
- Input Active Pixels ≤ Output Active Pixels
- input active lines < Input Total Lines - Input V-Blanking
- input active lines ≤ Output Active Lines
- Input H-Blanking < Input Total Pixels - Input Active Pixels
- Input V-Blanking < Input Total Lines - input active lines

In addition to the above limitations, the predefined input modes only have a full range of 256 units. If a setting beyond +/- 128 units from the default value is desired, the user-defined mode may be selected.

NOTE *All of the limits listed above apply to the user-defined mode.*

Remote Operation (IN1401-2 only)

RS-232 control

The IN1401-2 model has an RS-232 serial control port that 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.

Baud Rate and Protocol:

- 1200-57600 baud
- 9600 baud (default)
- 8 data bits
- 1 stop bit
- no parity

Baud Rate Selection:

The IN1401 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 by selecting Options on the Main Menu.

NOTE *The baud rate transmitted must match the baud rate selected on the IN1401.*

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.

Extron 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 IN1401 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] commands the IN1401 to select channel 3.

Serial Control Cable Wiring:

When controlling only one IN1401 unit, connect the RS-232 cable as follows:

- Controller Transmit to IN1401 Receive
- Controller Ground to IN1401 Ground
- Controller Receive to IN1401 Transmit

When controlling multiple IN1401 units, connect the RS-232 cable as follows:

- Controller Transmit to Each IN1401 Receive
- Controller Ground to Each IN1401 Ground
- Controller Receive to Only one IN1401 Transmit

When controlling multiple units, the Controller Receiver Terminal must connect to only one IN1401 Transmit Terminal. Multiple IN1401 Transit Lines may not be connected together; otherwise signal contention from multiple units will result. Therefore, "receive" information is only available from one IN1401 in this configuration. Each unit must be set to different delimiters.

IN1401 serial commands

Command	Description
ACI3	set baud rate to 1200
ACI4	set baud rate to 2400
ACI5	set baud rate to 4800
ACI6	set baud rate to 9600**
ACI7	set baud rate to 19,200
ACI8	set baud rate to 38,400
ACI9	set baud rate to 57,600
ACI?	return baud rate
AL+	increase active lines

Command	Description
AL-	decrease active lines
AL@	set active lines to normal**•
ALxxx	set active lines to absolute value•
AL?	return active lines
AP+	increase active pixels by 2
AP-	decrease active pixels by 2
AP@	set active pixels to normal**•
APxxx	set active pixels to absolute value•
AP?	return active pixels
BH+	increase input horizontal blanking
BH-	decrease input horizontal blanking
BH@	set input horizontal blanking to normal**•
BHxxx	set input horizontal blanking to absolute value•
BH?	return input horizontal blanking
BLU+	increase blue gain
BLU-	decrease blue gain
BLU@	set blue gain to normal** (128)
BLUxxx	set blue gain to absolute value (0-255)
BLU?	return blue gain
BLS0	blue screen ON
BLS1	blue screen OFF
BV+	increase input vertical blanking
BV-	decrease input vertical blanking
BV@	set input vertical blanking to normal**•
BVxxx	set input vertical blanking to absolute value•
BV?	return input vertical blanking
BRG+	increase brightness
BRG-	decrease brightness
BRG@	set brightness to normal** (128)
BRGxxx	set brightness to absolute value (000-255)
BRG?	return current brightness
CMDCD0	set delimiters to brackets [ ]**
CMDCD1	set delimiters to braces { }
CMDCD2	set delimiters to parentheses ( )
CMDCD3	set delimiters to slashes \ /
CMDCD4	set delimiters to less and greater < >

Command	Description
CMDCD5	set delimiters to signs !#
CMDCD?	return delimiters
CON+	increase contrast
CON-	decrease contrast
CON@	set contrast to normal** (128)
CONxxx	set contrast to absolute value (000-255)
CON?	return current contrast
DOWN	front panel down button
ENTER	front panel enter key
GRN+	increase green gain
GRN-	decrease green gain
GRN@	set green gain to normal**(128)
GRNxxx	set green gain to absolute value (0-255)
GRN?	return green gain
IM0	set input mode to auto detect ON**
IM1	set input mode to auto detect OFF
IM2	set input mode to user defined
IM3	redetect input mode now
IM?	return input mode state
INFO?	return unit version
LEFT	front panel left key.
MENU	front panel menu key
PH+	increase horizontal position
PH-	decrease horizontal position
PH@	set horizontal position to normal**•
PHxxx	set horizontal position to absolute value•
PH?	return current horizontal position
PHS+	increase phase
PHS-	decrease phase
PHS@	set phase to normal**•
PHSxxx	set phase to absolute value
PHS?	return phase
PV+	increase vertical position
PV-	decrease vertical position
PV@	set vertical position to normal** •
PVxxx	set vertical position to absolute value•

Command	Description
PV?	return current horizontal position
RED+	increase red gain
RED-	decrease red gain
RED@	set red gain to normal** (128)
REDxxx	set red gain to absolute value (0-255)
RED?	return red gain
REF0	set refresh rate to 60Hz**
REF1	set refresh rate to 72Hz
REF2	set refresh rate to 75Hz
REF3	set refresh rate to 85Hz
REF4	set refresh rate to 96Hz
REF5	set refresh rate to 100 Hz
REF6	set refresh rate to 120Hz
REF?	return refresh rate
RES000	factory reset
RIGHT	front panel right key.
SCS0	set resolution to 640 x 480
SCS1	set resolution to 800 x 600
SCS2	set resolution to 852 x 480
SCS3	set resolution to 1024 x 768
SCS4	set resolution to 1152 x 864
SCS5	set resolution to 1280 x 720
SCS6	set resolution to 1280 x 768
SCS7	set resolution to 1280 x 1024
SCS8	set resolution to 1365 x 768
SCS9	set resolution to 1365 x 1024
SCS?	return current resolution
ST0	toggle interlaced (1=on)
ST1	toggle swapped fields (10=on)
ST2	toggle invert sync (100=on)
ST?	return scan type (add above numbers)
UP	front panel up key.

* The commands are *not* case sensitive.

** Default values when factory reset is performed.

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

Troubleshooting

Problem: There is no image on the monitor.

- **Solution 1:** Make sure that the 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 IN1401 and the monitor.
- **Solution 4:** Verify the connection to the output display device. Even with no input signal, the IN1401 menu can be displayed. Press **MENU** or **ENTER** to gain access to the menu screen.
- **Solution 5:** Select an output resolution and refresh rate compatible with the monitor being used. Use the default power-up buttons to select an Output Mode without the menu present, then turn on the Blue Screen to verify these settings.
- **Solution 6:** The input/output settings may be incorrect. Although the unit should not allow invalid settings, they may need to be reloaded. If the menu is available, select Options, Auto Detect and Redetect Now to reload these settings.
- **Solution 7:** The output resolution may be less that the input (the IN1401 can only scale up). Select an output resolution that is greater than or equal to the Input Active Area.

Problem: The image on the monitor is scrambled.

- **Solution:** Select an output resolution and refresh rate compatible with the monitor being used. Use the default power-up buttons to select an Output Mode without the menu present, then turn on the Blue Screen to verify these settings.

Problem: The image on the monitor is stretched horizontally.

- **Solution 1:** The Input Total Pixels may be set too high. Reduce the Input Total Pixels to match the input signal. Refer to *Input Settings* on page 7 for information on how to make the necessary adjustment.
- **Solution 2:** Increase the Input Active Pixels to match the input settings.
- **Solution 3:** Increase the output resolution to a value greater than the input active area.

Problem: The image on the monitor is compressed horizontally.

- **Solution 1:** Increase the Input Total Pixels setting to match the input signal. Refer to *Input settings* on page 7 for information on how to make the necessary adjustments.
- **Solution 2:** Reduce the Input Active Pixels setting to match the input signal.

Problem: The image on the monitor is stretched vertically.

- **Solution 1:** Increase the number of input active lines to match the input settings.
- **Solution 2:** Increase the output resolution to a greater value than the input active area.

Problem: The image on the monitor is compressed vertically.

- **Solution:** Reduce the number of input active lines to match the input signal.

Problem: The image on the monitor is cropped to the left side.

- **Solution 1:** Reduce the Input H-Blanking to match the input signal.
- **Solution 2:** Increase the Output H-Position to line up the image on the monitor. Use the blue screen.

- **Solution 3:** Adjust the Monitor Position or Size Controls to fit the image on the monitor. Use the blue screen.

Problem: The image on the monitor is cropped on the right side.

- **Solution 1:** Increase the Input H-Blanking to match the input signal.
- **Solution 2:** Reduce the Output H-Position to line up the image on the monitor. Use the blue screen.
- **Solution 3:** Adjust the Monitor Position or Size Controls to fit the image on the monitor. Use the blue screen.

Problem: The image on the monitor is cropped on the top.

- **Solution 1:** Reduce the Input V-Blanking to match the input signal.
- **Solution 2:** Increase the Output V-Position to line up the image on the monitor. Use the blue screen.
- **Solution 3:** Adjust the Monitor Position or Size Controls to fit the image on the monitor. Use the blue screen.

Problem: The image on the monitor is cropped on the bottom.

- **Solution 1:** Increase the Input V-Blanking to match the input signal.
- **Solution 2:** Reduce the Output V-Position to line up the image on the monitor. Use the blue screen.
- **Solution 3:** Adjust the Monitor Position or Size Control to fit the image on the monitor. Use the blue screen.

Problem: The image on the monitor has multiple faint vertical lines.

- **Solution:** Adjust the Input Total Pixels until the faint vertical lines move out of view or until only one line remains. Refer to *Input settings* on page 7 for information on how to make the necessary adjustment.

Problem: The image on the monitor has one faint vertical line.

- **Solution:** Adjust the Input Phase to move the faint vertical line out of view.

Problem: Some characters on the monitor appear fuzzy.

- **Solution 1:** Adjust the Input Total Pixels until all the characters are sharp.
- **Solution 2:** Adjust the Input Phase until all the characters are sharp.

Problem: The monitor only displays the upper half of the signal.

- **Solution**: The Input Scan Type is set incorrectly. For non-interlaced signals, select Scan Type and verify that the Interlaced Setting is turned off. Select the Interlaced Setting to toggle on/off.

Problem: The image on the monitor jitters up and down.

- **Solution**: The Input Scan Type is set incorrectly. For interlaced signals, select Scan Type and verify that the Interlaced Setting is turned on. Select the Interlaced Setting to toggle on/off.

Problem: The monitor displays a double image.

- **Solution:** The odd and even fields are not detected. For interlaced signals, the detection of odd and even fields can be corrected by selecting Scan Type, then Invert Sync.

Problem: The image on the monitor has jagged edges.

- **Solution:** The odd and even fields are swapped. For interlaced signals, the odd and even fields can be switched by selecting Scan Type, then Swap Fields.

Problem: The settings on the IN1401 will not move to the desired values.

- **Solution 1:** The combination of settings on the IN1401 may be invalid. Please refer to the chart in *Limitations of settings* on page 13 to verify that the adjustments are within the scaler's operating perimeters.
- **Solution 2:** Your settings may be outside the range of predefined modes. Switch to the User Defined Mode to allow for a full range of settings. Select Options, Auto Defeat, and User Defined.

NOTE *The user-defined mode must adhere to the setting limitations listed in the* Limitations of settings *on page 13.*

Problem: The Input Total Pixels setting will not decrease.

- **Solution 1:** The Input H-Blanking may be set too high. Reduce the Input H-Blanking to match the input signal.
- **Solution 2:** The Input Active Pixels may be set too high. Reduce the Input Active Pixels to match the input signal.

Problem: The Input Active Pixels setting will not increase.

- **Solution 1**: The Input Total Pixels may be set too low. Increase the Total Pixels setting to match the input signal. Refer to *Input settings* on page 7 for information on how to make this adjustment.
- **Solution 2**: The Input H-Blanking may be set too high. Reduce the Input H-Blanking to match the input signal.
- **Solution 3**: The output resolution may be set too low. Select an output resolution that is greater that or equal to the Input Active Area.

Problem: The input active lines **will not increase.**

- **Solution 1:** The Input V-Blanking may be set too high. Reduce the Input V-Blanking to match the input signal.
- **Solution 2:** The output resolution may be set too low. Select an output resolution that is greater that or equal to the Input Active Area.

Problem: The Input H-Blanking will not increase.

- **Solution 1:** The Input Total Pixels may be set too low. Increase the Input Total Pixels to match the input signal. Refer to *Input Settings* on page 7 for information on how to make this adjustment.
- **Solution 2:** The Input Active Pixels may be set too high. Reduce the Input Active Pixels setting to match the input signal.

Problem: The Input V-Blanking will not increase.

- **Solution:** The input active lines may be set too high. Reduce the input active lines setting to match the input signal.

Problem: The output resolution will not decrease.

- **Solution 1:** The IN1401 can only scale up. If a lower output resolution is desired, connect a signal with a lower Input Active Area.
- **Solution 2:** The Active Pixels/Active Lines may be set too high. Reduce the Input Active Pixels/ input active lines setting to match the signal.

Specifications

Video input

Number/signal type	1 VGA-XGA RGBHV, RGBS, RGsB
Connectors	5 female BNC
Nominal level	0.7 Vp-p for RGB
Minimum/maximum levels	Analog: 0 V to 1.0 Vp-p with no offset
Impedance	75 ohms
Horizontal frequency	24 kHz to 60 kHz
Vertical frequency	50 Hz to 120 Hz
Resolution range	640 x 480 to 1024 x 768, NTSC/PAL
Return loss	<-30 dB @ 5 MHz
DC offset (max. allowable)	1.5 V

Video processing

Digital sampling	8 bit, 24 bits per color; 13.5 MHz standard
Colors	16.78 million

Video output

Number/signal type	1 scaled RGBHV
Connectors	1 female 15-pin HD
Nominal level	0.7 Vp-p for RGB
Minimum/maximum levels	0 V to 0.7 Vp-p
Impedance	75 ohms
Scaled resolution	640x480[2,4,5,6,7,8,9], 800x600[2,4,5,6,7,8,9], 852x480[2,4,5,6,7,8,9], 1024x768[2,4,5,6,7,8], 1152x864[2,4,5,6], 1280x720[2,4,5,6,7,8] (HDTV 720p), 1280x768[1,2,3], 1280x1024[2,4,5], 1365x768[2,4,5,6], 1365x1024[2] [1] = at 56 Hz [2] = at 60 Hz [3] = at 65 Hz [4] = at 72 Hz [5] = 75 Hz [6] = 85 Hz [7] = 96 Hz [8] = at 100 Hz [9] = at 120 Hz

Sync

Input type	RGBHV, RGBS, RGsB
Output type	RGBHV
Input level	0 V to 5.0 Vp-p
Output level	0 V to 5.0 Vp-p, unterminated
Input impedance	75 ohms
Output impedance	75 ohms
Polarity	Positive or negative (switch-selectable)

Control/remote — scaler (IN1401-2 only)

Serial control port	RS-232, female 3-pole captive screw connector
Baud rate and protocol	1200-57600 baud, 8 data bits, 1 stop bit, no parity
Serial control pin configurations	1 = TX, 2 = GND, 3 =RX
Program control	Extron Control Software

General

Power	100VAC to 240VAC, 50/60 Hz, 15 watts, internal, autoswitchable
Temperature/humidity	Storage -40° to +158°F (-40° to +70°C) / 10% to 90%, noncondensing Operating +32° to +122°F (0° to +50°C) / 10% to 90%, noncondensing
Rack mount	Yes, with optional rack shelf
Enclosure type	Metal
Enclosure dimensions	1.7" H x 8.5" W x 7.3" D (1U high, half rack wide) 4.3 cm H x 7.3 cm W x 18.5 cm D (Depth excludes connectors.)

Product weight	2.0 lbs (0.9 kg)
Shipping weight	4 lbs (2 kg)
Vibration	ISTA 1A in carton (International Safe Transit Association)
Listings	ETL (UL1950)
Compliances	CE
MTBF	30,000 hours
Warranty	3 years parts and labor

NOTE *All nominal levels are at ±10%.*

NOTE *Specifications are subject to change without notice.*

Part Numbers

These items are included with the IN1401.

Included Parts	Part Numbers
IN1401-1 scaler	60-728-01
IN1401-2 scaler with RS-232	60-728-02
Rubber feet (4)	
IEC power cord	
Extron Tweeker	
IN1401 User's Manual	
3.8 mm captive screw connector, 3-pin *IN1401-2 only*	

Optional Accessories	Part Numbers
IU Basic Rack Shelf	60-601-01
1U Universal Rack Shelf Kit	60-190-01
Half rack width false faceplace kit	70-339-xx
Male to male VGA cable, MHR	26-238-xx
BNC-5 Mini HF bulk cable	20-020-xx
Plenum BNC-5 mini bulk cable	20-103-xx

Extron's Warranty

Extron Electronics warrants this product against defects in materials and workmanship for a period of two years from the date of purchase. In the event of malfunction during the warranty period attributable directly to faulty workmanship and/or materials, Extron Electronics will, at its option, repair or replace said products or components, to whatever extent it shall deem necessary to restore said product to proper operating condition, provided that it is returned within the warranty period, with proof of purchase and description of malfunction to:

USA, Canada, South America, and Central America:

Extron Electronics
1230 South Lewis Street
Anaheim, CA 92805, USA

Europe, Africa, and the Middle East:

Extron Electronics, Europe
Beeldschermweg 6C
3821 AH Amersfoort
The Netherlands

Asia:

Extron Electronics, Asia
135 Joo Seng Road, #04-01
PM Industrial Bldg.
Singapore 368363

Japan:

Extron Electronics, Japan
Kyodo Building,
16 Ichibancho
Chiyoda-ku, Tokyo 102-0082
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This Limited Warranty does not apply if the fault has been caused by misuse, improper handling care, electrical or mechanical abuse, abnormal operating conditions or non-Extron authorized modification to the product.

If it has been determined that the product is defective, please call Extron and ask for an Applications Engineer at (714) 491-1500 (USA), 31.33.453.4040 (Europe), 65.6383.4400 (Asia), or 81.3.3511.7655 (Japan) to receive an RA# (Return Authorization number). This will begin the repair process as quickly as possible.

Units must be returned insured, with shipping charges prepaid. If not insured, you assume the risk of loss or damage during shipment. Returned units must include the serial number and a description of the problem, as well as the name of the person to contact in case there are any questions.

Extron Electronics makes no further warranties either expressed or implied with respect to the product and its quality, performance, merchantability, or fitness for any particular use. In no event will Extron Electronics be liable for direct, indirect, or consequential damages resulting from any defect in this product even if Extron Electronics has been advised of such damage.

Please note that laws vary from state to state and country to country, and that some provisions of this warranty may not apply to you.

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