

# Operation Manual



**IN2160 High Resolution VGA Video Interface**





## Installation and Safety Instructions

### *For Models without a Power Switch:*

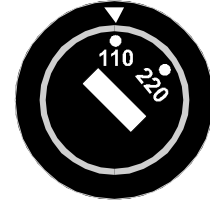
The socket outlet shall be installed near the equipment and shall be accessible.

### *For Models with 110 / 220V Power Selector:*

**Caution:** Before applying power to this unit, the voltage selector must be set to the appropriate setting to match local A/C line voltage. Improper setting of the voltage selector may cause damage to the unit and create a potential fire hazard.

The voltage selector is a round switch located next to the A/C power input connector which looks like this:

Using a straight slot screwdriver or small coin, rotate the selector to the correct position so that the arrow lines up with 110 or 220 as appropriate for local power line voltage as indicated in the chart below:



Local A/C Voltage	Voltage Selector Setting
110 ~ 120 VAC	110
220 ~ 240 VAC	220

### *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.

### *For IN2001 / IN3234 / IN3236 / IN3502 / IN3504 / IN3506 / IN3562 / IN3564 / IN3566 / IN3572 / IN3574 / IN3576:*

**Caution:** Double pole / neutral fusing.

### *For all Models with Integral Lithium Battery:*

**Caution:** Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.



## Instructions d'installation et de sécurité

### *Pour les modèles sans interrupteur de courant:*

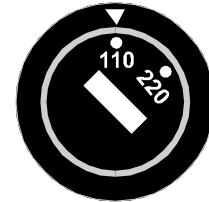
La prise de courant d'alimentation sera installé près de l'équipement et sera accessible.

### *Pour les modèles avec un sélecteur d'alimentation 110V/220V:*

**Attention:** Avant de connecter l'appareil au circuit d'alimentation, le sélecteur de courant doit être positionné sur la sélection appropriée correspondant au voltage du circuit de courant alternatif local. Une mauvaise sélection peut engendrer des dommages à l'appareil et créer un danger d'incendie.

Le sélecteur d'alimentation est un commutateur rond positionné près du connecteur d'alimentation. Il se représente comme suit:

A l'aide d'un tourne-vis plat ou d'une pièce de monnaie, le sélecteur peut être tourné dans la position adéquate en veillant que la flèche corresponde avec 110 ou 220, en fonction de la valeur du circuit de courant local. (Voir tableau ci-dessous)



Circuit local AC	Position Sélecteur
110 ~ 120 VAC	110
220 ~ 240 VAC	220

### *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.

### *Pour IN2001 / IN3234 / IN3236 / IN3502 / IN3504 / IN3506 / IN3562 / IN3564 / IN3566 / IN3572 / IN3574 / IN3576:*

**Attention:** Double pôle / fusible au neutre.

### *Pour tout les modèles avec une batterie au lithium interne:*

**Attention:** Danger d'explosion si la batterie est incorrectement remplacée. Ne remplacez la batterie qu'avec le même modèle, ou avec un modèle recommandé par le constructeur. Traitez les batteries usagées selon les instructions du fabricant, ou selon les normes écologiques en vigueur.



## Installations und Sicherheitshinweise

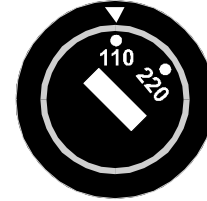
### Für Geräte ohne Netzschalter:

Die Netzsteckdose soll in der Nähe des Gerätes installiert und frei zugänglich sein.

### Für Geräte mit 110 / 220V Spannungswähler:

**Achtung:** Bevor Sie dem Gerät Spannung zuführen, muß der Spannungswähler entsprechend der Spannung des lokalen Wechselspannungsnetzes eingestellt werden. Die falsche Stellung des Spannungswählers kann eine Beschädigung des Gerätes und möglicherweise ein Feuer verursachen.

Der Spannungswähler ist ein runder Schalter in der Nähe der Netzeingangsbuchse mit folgendem Aussehen:



Drehen Sie den Wähler mit einem normalen Schraubenzieher oder einer kleinen Münze so, daß der Pfeil auf die 110 oder 220 zeigt, entsprechend der Spannung Ihres lokalen Netzes wie hier angezeigt:

Lokale Netzwechselspannung	Stellung des Spannungswählers
110 ~ 120 V	110
220 ~ 240 V	220

### 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.

### Für IN2001 / IN3234 / IN3236 / IN3502 / IN3504 / IN3506 / IN3562 / IN3564 / IN3566 / IN3572 / IN3574 / IN3576:

**Achtung:** Allpolige Absicherung

### Für alle Geräte mit eingebauter Lithium Batterie:

**Achtung:** Explosionsgefahr bei falschem Batterieeinsatz. Batterie nur ersetzen durch den gleichen oder entsprechenden Typ wie vom Hersteller empfohlen. Entsorgung verbrauchter Batterien nur nach den Anweisungen des Herstellers.



## Instalacion E Instrucciones de Seguridad

### Modelos Sin Interruptor:

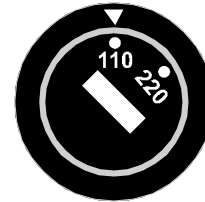
La conexión debe ser instalada cerca del equipo y debe ser accesible.

### Modelos con Selector de Voltaje de 110/220V:

**Precaución:** Antes de operar esta unidad, el selector de voltaje debe instalarse de forma que corresponda a la línea de voltaje local. Instalación inadecuada del selector de voltaje puede causar daño a la unidad y originar un incendio.

El selector de voltaje es un cambio vía redondo localizado cerca de la conexión eléctrica, como se ve en el dibujo:

Use un destornillador común o una moneda pequeña, mueva el selector a la posición correcta, de forma que las flechas indiquen 110 o 220 de acuerdo con el voltaje local, como está indicado a continuación.



Voltaje Local A/C	Selector de Voltaje
110 ~ 120 VAC	110
220 ~ 240 VAC	220

### Para Todos Los Modelos:

Dentro de la unidad, no hay partes para reparar. Llame un técnico calificado.

### Modelos con Fusibles Internos o Externos:

Para prevenir un incendio, reemplace solo con el mismo tipo de fusible.

### Modelos IN2001 / IN3234 / IN3236 / IN3502 / IN3504 / IN3506 / IN3562 / IN3564 / IN3566 / IN3572 / IN3574 / IN3576:

**Precaución:** Double Polo / Fusible Neutral.

### Modelos con Batería de Lithium Interna:

**Precaución:** Peligro de explosión si la batería es reemplazada incorrectamente. Reemplace solamente con la misma clase de batería, o una equivalente recomendada por el fabricante. Deseche las baterías usadas de acuerdo con las instrucciones del fabricante.

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### **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.**



### **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.

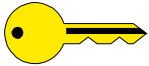
## DESCRIPTION

The **IN2160** is a high performance computer video interfaces dedicated for VGA, SVGA, and XGA, graphic cards. Like other Inline interfaces, the **IN2160** performs the following functions:

**Signal Splitting** - allows the simultaneous connection and viewing of both the computer's local monitor and a second output device such as a large screen data projector, monitor, or color printer.

**Physical Interfacing** - Computers employ many different types of video output connectors, making it difficult to hook up computers directly to data projection devices. The **IN2160** simplify interfacing, routing, and switching tasks by acting as an adapter. The **IN2160** can be attached to a VGA computers and will provide a video output signal on BNC connectors which can easily be connected to an RGB display device. The output signal format may be set to any of the following formats: RGBHV (default), RGBS, and RGsB.

### KEY CONCEPT



*The **IN2160** is not a scan converter. The data projector, monitor, or other output device must be compatible with the horizontal scan rate output by the computer video card.*

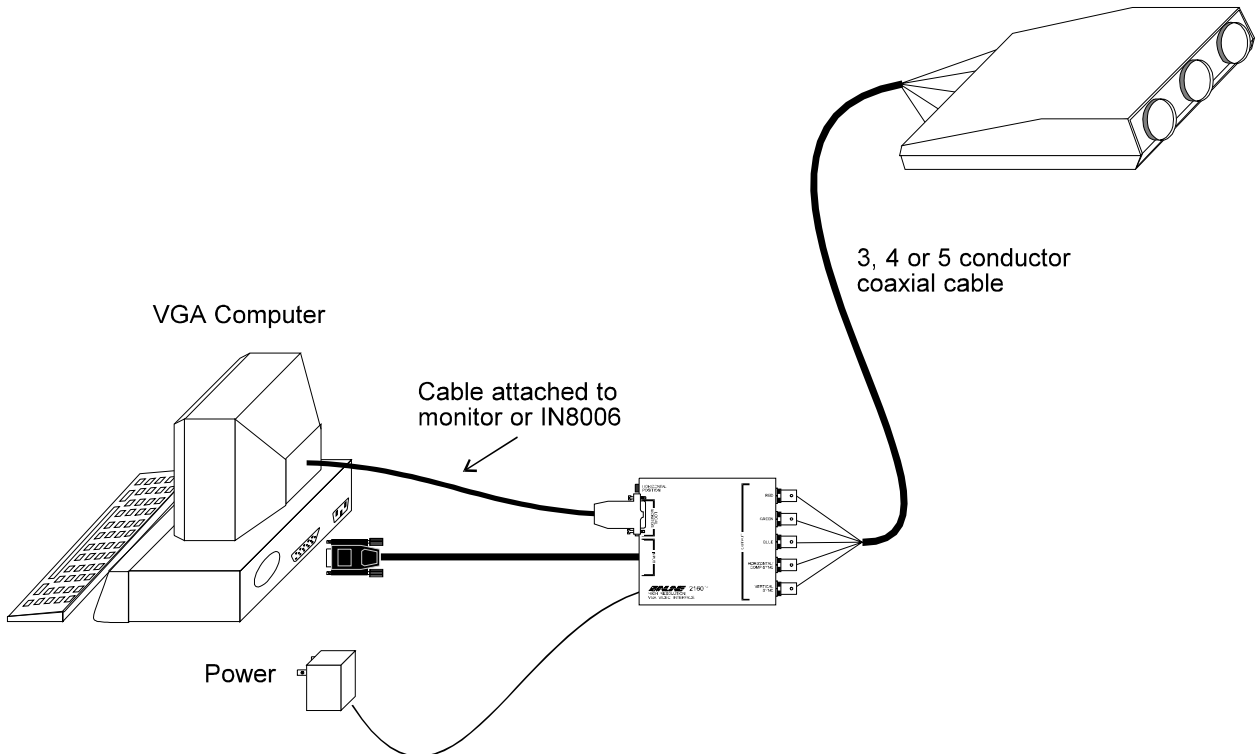
The **IN2160** High Performance Dedicated VGA interface offers easy operation and the following features:

- ◆ **400 MHz Bandwidth** - High performance interface design ensures that video signals will be interfaced with no loss of image detail.
- ◆ **Analog Interface** - the unit will operate with Analog Video with TTL level horizontal and vertical sync signals.
- ◆ **VGA Input and Output** - the input and output are directly compatible with VGA, SVGA and XGA graphic cards.
- ◆ **Buffered Local Monitor Output** - provides a buffered output to be connected to the local computer monitor.
- ◆ **Monitor Emulation Switch** - eliminates the need for a termination plug if a local monitor is not used. Emulates a color VGA monitor.
- ◆ **Flexible Output Signal Formats** - RGBHV (default), RGBS, and RGsB
- ◆ **Horizontal Position Control** - allows picture to be centered precisely on the data display screen.
- ◆ **Sync Polarity Preservation Switch**- enables the sync polarity to be preserved, or to set them for negative polarity.
- ◆ **Serration Pulse Removal Switch** - for RGBS output, enables the user to remove serration pulses from the sync output.

## INSTALLATION

This section offers step-by-step instructions for installing the **IN2160**. See the diagram below.

1. Turn the computer and computer monitor off. Disconnect the computer monitor (if present) from the video output port on the computer.
2. Connect the input cable of the **IN2160** to the output of the computer.
3. Connect the local computer monitor (if present) to the local monitor output of the **IN2160**. If no local monitor is used, set the monitor emulation dip switch to emulate a color VGA monitor.
4. Connect the **IN2160** output (5 BNC connectors) to the data display device's RGB input, using three, four, or five high resolution BNC cables or a multi-conductor RGBHV, RGBS, or RGB "snake". The **IN7000 Series**, **IN7100 Series** and **IN7200 Series** high resolution cables are well suited for this purpose. Take care while making connections to insure that the red output is connected to the red input, green output to the green input, etc.



5. Set the dip switches for the requirements of your installation. The **IN2160** factory default output format is RGBHV. If your display device, routing system, or cabling require a different format, use the dip switches to change the output signal to RGBS or RGsB as desire.

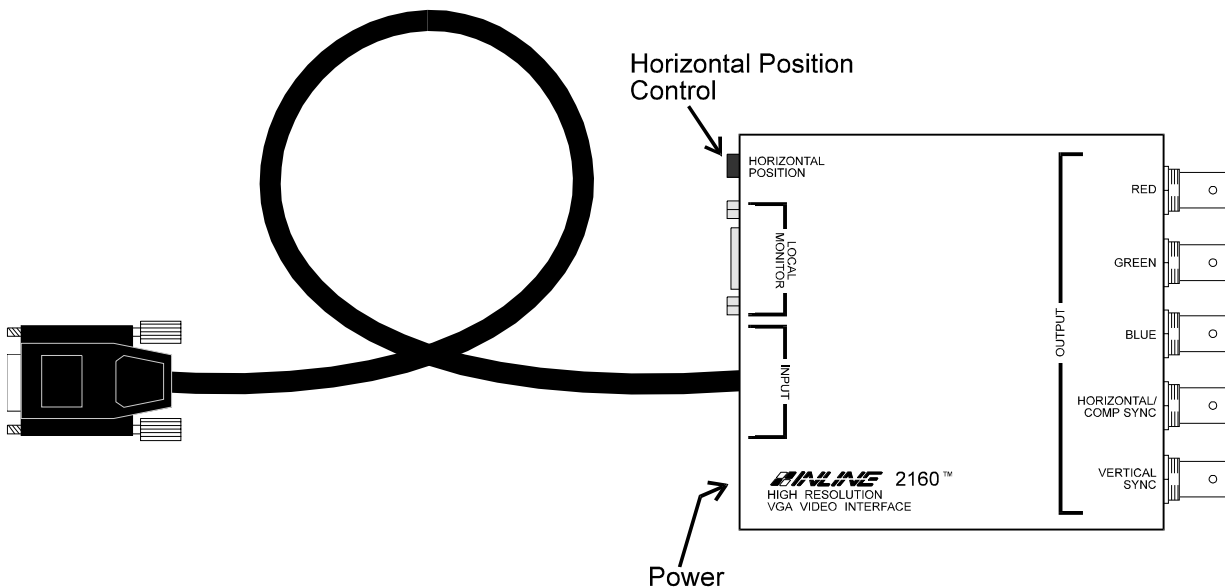
6. Connect the 9 VDC, 500 mA power adapter to the **IN2160**. The LED next to the power jack should light to indicate it is on.
7. Complete the installation by turning the computer and computer monitor on. If required, adjust the horizontal position control.

## HORIZONTAL POSITION CONTROL

The location of the horizontal position control is diagrammed below. The horizontal position control adjusts the position of the image on the data display device from left to right (it has no effect on the local computer monitor).

Many data projectors and monitors have their own horizontal position control, and the interaction of the display device's horizontal control and the interface's horizontal control may result in a dark image on the data display. The following procedure is suggested to ensure best results:

1. Adjust the **IN2160** horizontal position control so a good quality image is displayed. This control should not be set to an extreme position.
2. Adjust the display device horizontal position control until the image is centered as desired.
3. If the image appears dark or the colors are not properly displayed, fine tune the controls on both the display device and the interface until the picture is centered and a good quality image is attained.



## DIP SWITCH SETTINGS

Most installations will not require any changes to the dip switch settings, and the **IN2160** will generally be operated with the factory default settings. The Factory Default setting and specialized dip switch settings are indicated below.

### Factory Default Settings



**Dip Switches ON:** 2 & 4

**Signal Format:** Red / Green / Blue / Horizontal and Vertical Sync

**Horizontal Position Control:** Enabled

**H & V Sync Polarity:** Negative, Negative

**Monitor Emulation:** Disabled

With the exception of Dip Switch 6, all Dip Switches only affect the BNC output signal. They do not affect the local monitor output.

#### Dip Switch 1 - Horizontal Position Control:

- 1 When enabled, the Horizontal Position control can be used to center the image of the BNC output.
- 0 The Horizontal Position control is disabled. The output sync timing (position, pulse width, etc.) is very similar to the input sync signal.

#### Dip Switch 2 - Sync on Green Output:

- 1 No sync on green. The output sync will be determined by dip switch 3.
- 0 The output will be RGSB (Sync on Green video.)

#### Dip Switch 3 - RGSB/RGBHV Output:

Dip switch 2 must be set to 1 for this dip switch to affect the output sync format.

- 1 RGSB output.
- 0 RGBHV output.

#### Dip Switch 4 - Horizontal and Vertical Sync Polarity:

This function is only valid when the **IN2160** is set for RGBHV output (Dip switch 2 must be set to 1 and dip switch 3 to 0.)

- 1 The Horizontal and Vertical sync signals will have a negative polarity regardless of the polarity of the input signal.
- 0 The polarity of the Horizontal and Vertical sync signals will mirror the polarity of the input signal.

#### Dip Switch 5 - Serration Pulse Removal:

This function is only valid when the **IN2160** is set for an RGSB output.

- 1 The output composite sync signal will not have serration pulses.
- 0 The output composite sync signal will pass serration pulses.

#### Dip Switch 6 - Monitor Emulation:

This switch can be used to emulate a local monitor is one is not present (such as in the case of a laptop.) The **IN2160** automatically provides 75 Ohm termination for the video, and this switch provides an ID bit identification to emulate a color VGA monitor.

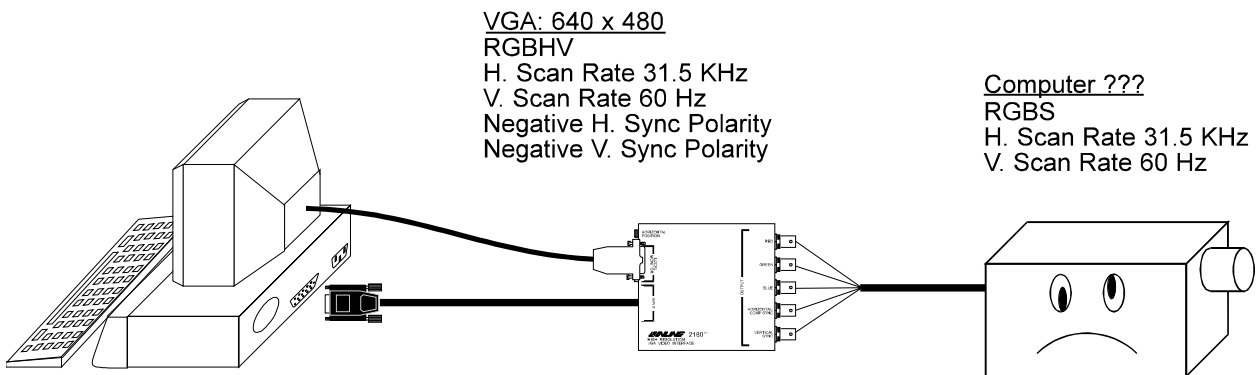
- 1 Emulate the presence of a monitor.
- 0 Do not emulate a monitor. There must be a monitor to ensure a proper output from the computer.



## SPECIAL APPLICATION: LCD DISPLAY DEVICES

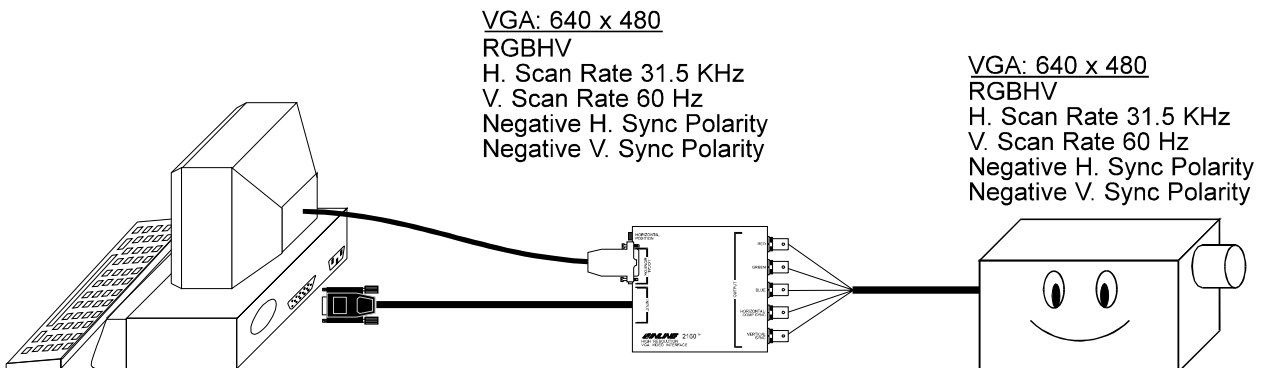
When using an Interface with an LCD panel or projector, some special considerations must be made. Many LCD display devices utilize a “look-up table” when identifying an input signal. The display device compares the parameters of the input signal to those in its table and looks for a match. If there is no match to the signal format it is receiving, it may not be able to display the image properly. Some parameters that the LCD devices use to recognize a signal are sync format, polarity, and horizontal and vertical scan rates.

An Interface is often used to change the sync format. However, in doing this, you might make the signal unrecognizable to the LCD device. For example, let's look at a 640 x 480 VGA signal:



The user is utilizing the **IN2160** interface to convert a VGA signal to an RGBS output. The LCD projector is expecting to see VGA as RGBHV at 31.5 KHz. Because the interface changes the signal format to RGBS, the LCD projector does not recognize the signal as VGA at 640 x 480 resolution. The resulting image may be the wrong size, scrambled, or nothing at all.

The solution is to set the **IN2160** for an RGBHV output so that the LCD projector can recognize it as VGA. In addition, you may need to set the dip switches to mirror the input sync polarities and/or disable the Horizontal position control.



## TROUBLESHOOTING

### **The display device connected to the IN2160 output has a bad/scrambled image.**

**Solution 1:** Verify that the correct input cable is being used.

**Solution 2:** The display device connected to the output of the interface may not be compatible with the computer output. VGA runs at 31.5 KHz, but SVGA can be as high as 48 - 58 KHz with newer modes such as 1600 x 1200 running at 80+ KHz!.

**Solution 3:** Check the dip switch settings to make sure the unit is putting out a sync format that the display device can use. For most applications the default dip switch settings (see Page 5) will work best.

**Solution 4:** The RGSB or RGBHV cable may have a bad sync line. Try running the sync through another cable.

### **The output image is very dark.**

**Solution:** The horizontal position control may be set off to an extreme position or may be interacting poorly with the horizontal position control on the display device. Follow the horizontal position adjustment procedure listed on **Page 4**.

### **The output image is missing a color.**

**Solution:** Possibly the output RGSB or RGBHV cable is bad. Try switching connections on the output to verify that the bad color's cable is OK (*Example:* If there is no red, try running the green output through the red cable and see if green is displayed or not.)

### **The output image is very bright and overdriven looking with poor contrast.**

**Solution 1:** The signal may be unterminated. Check the internal termination jumpers to ensure they are set for 75 Ohm termination.

**Solution 2:** Check the contrast and brightness settings on the display device. Many CRT type display devices look best with the contrast set toward the upper end of the adjustment range (75 - 95%) and the brightness set towards the middle of the adjustment range (40 - 60%).

### **The output image is too green.**

**Solution 1:** The dip switches may be set for Sync on Green output. Try changing the dip switches to output an RGSB or RGBHV signal.

### **The output image is doubled, with two images displayed side-by-side.**

**Solution:** The display device may not be compatible with the horizontal scan rate of the computer. This problem often occurs when a 31.5 KHz VGA signal is sent into an RGB monitor which is only compatible with signals at 15.75 KHz.

If problems persist, call INLINE Technical Services at (800) 882-7117 for further assistance.

## SPECIFICATIONS

<b>Input</b>	
Connector type	15 Pin HD male
RGB Video Signals	Analog, 0.7 Vp-p Nominal
Input Impedance	75 Ohms
Sync Signals	TTL compatible
Horizontal Scan Range	15.0 KHz - 135.0 KHz
Vertical Scan Range	30 Hz - 180 Hz
<b>Output</b>	
Connector Type	5 BNC Female connectors
Output Signal Formats	RGBHV (Default), RGBS or RGsB,
RGB Signals	Analog Video, 75 ohm impedance
Bandwidth	400 MHz @ -3 dB
Rise and Fall Times	0.875 nano seconds
Gain	1.0 ± 5%
Sync Signal	H, V and S: 5V unterminated and 2Vp-p 75 ohm terminated Gs: 0.3 Vp-p 75 Ohm terminated
Horizontal Pulse Width	Horizontal Position Enabled: approximately 1.5 µsec Horizontal Position Disabled: Approximately the same as the input signal
Vertical Pulse Width	Approximately the same as the input signal
<b>Controls</b>	
External	Horizontal Position Control Dip Switches
Internal	Untermination jumpers for red, green and blue
<b>Dimensions</b>	
Size	1.25" H x 5" W x 4" D
Shipping Weight	3 lb.
<b>Power</b>	
Power Supply	IN9204-X: External AC to DC Power Transformer, 9V 500 mA
<b>Regulatory Compliance</b>	
Safety	UL 1950, 3 <sup>rd</sup> Ed.; CE: EN60950-92; CAN/CSA-22.2 No. 950 3 <sup>rd</sup> Ed.
EMI	FCC class A; CE: EN50081-1, EN55022, EN50082-1

<b>Optional Accessories</b>	
<b>IN8000 Series VGA Cable:</b> Available in a variety of lengths from 3' to 100'	
<b>IN7000-5 Series RGBHV Cable:</b> Standard 5 - BNC Cable available in a variety of lengths from 6' to 250'	
<b>IN7100-5 Series RGBHV Cable:</b> High Resolution 5 - BNC Cable, available in lengths from 6' to 250'	
<b>IN7200-5 Series RGBHV Cable:</b> Ultra High Resolution 5 - BNC Cable, available in lengths from 6' to 250'	

## 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 two (2) 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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