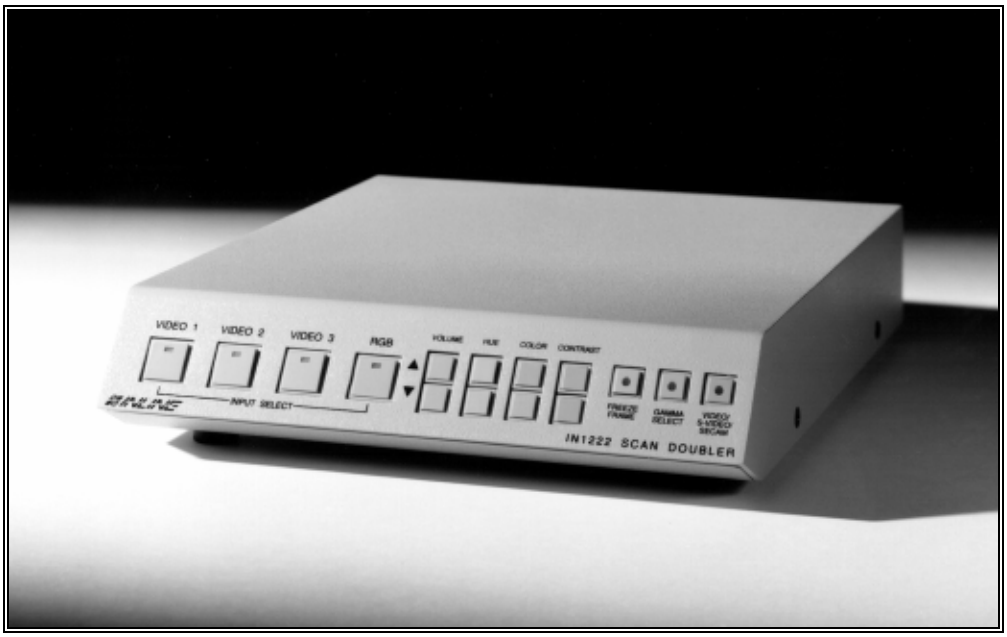
Operation Manual
Scan Doubler / Decoder Series



IN1222 Scan Doubler
IN1422 Scan Doubler
IN1510 Universal Decoder
IN1710 Universal Decoder

INLINE®

INTRODUCTION

This manual covers the installation, operation, and specifications for the **IN1222 / IN1422** Scan Doublers and the **IN1510 / IN1710** Universal Decoders. These four units are virtually identical in operation and functionality. The main difference between the various models is the output signal scan rate (doubled / undoubled), the size of the case (1/2 rack or full rack), and the type of connectors used for audio and video connections. In the **IN1510** and **IN1710** decoders, the Composite Video or S-Video input signals are decoded and output as an RGB interlaced video signal at the same frequency as the original signal. The **IN1222 and IN1422** scan doublers first decode the input signal (using the same circuitry as the **IN1510 / IN1710)** and then double the number of scan lines. The **IN1222 / IN1422** output a non-interlaced RGB video signal at twice the horizontal scan rate of the original input signal. Functions which apply to the **IN1222 / IN1422** but not the **IN1510 / IN1710** will be designated in this manual as ***IN1222 / IN1422 only***. The chart below indicates the major differences between the four models.

MODEL	Size Height	Size Width	Output Decode	Output Double	Freeze Frame	Video Blankin	Input / Output Connectors
IN1222	1U	1/2 Rack	X	X	X		Compact Connectors / Adapters
IN1422	1U	Full Rack	X	X	X		Full Professional Connectors
IN1510	1U	1/2 Rack	X			X	Compact Connectors / Adapters
IN1710	1U	Full Rack	X			X	Full Professional Connectors

DESCRIPTION

The INLINE Scan Doubler / Decoder Series offers advanced decoding and scan doubling capabilities with the following features:

- **Universal digital decoding** for NTSC, PAL, or SECAM video signals
- **Digital scan doubling** (***IN1222/IN1422 only***) improves video signals by doubling the number of scan lines, resulting in a non-interlaced video image output at twice the input signal's horizontal scan frequency. The primary benefit of scan doubling is the elimination of visible scan lines, resulting in a solid, film-like image. Additional benefits include a marked reduction of line flicker and cross-color interference.
- **Two Doubling Modes :**
  Line Doubling - Best for motion video sources, minimizes motion artifacts.
  Frame Mode - Best for still video sources, maximizes image detail.
- **4 x 1 Video/Audio Switching:**
  Three inputs for Composite Video / S-Video with stereo audio
  One RGB input with stereo audio (passive, no decoding or doubling)
- **RS-232 control** of all parameters
- **Front panel controls** to adjust signal parameters - Hue, Color, Sharpness/Contrast, and Volume.
- **Gamma Correction** - 7 different gamma curves allow compensation for display device characteristics
- **Input Memories** - users may store a unique set of signal parameter adjustments for each input (Hue / Color / Contrast / Gamma / Composite Video / S-Video / Volume / Doubled / Undoubled, etc.). Settings are automatically recalled each time an input is selected
- **Selectable output sync** configuration: RsGsBs, RGBS, or RGBH&V
- **Horizontal position control** (available through RS-232 control in non-doubled mode only)
- **Disable scan doubling** allows the units to function as decoders only (***IN1222/IN1422 only***).
- **Digital freeze frame** provides rock-solid still video images (***IN1222/IN1422 only***).

INPUT COMPATIBILITY

The **IN1222/1422** and **IN1510/1710** will operate with NTSC, PAL, or SECAM input signals in composite video or S-video format. For a complete listing of compatible input video standards see page 20. All video and audio input jacks are shown in the diagrams on pages 3, 6 & 7.

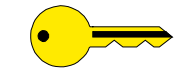
Composite Video / S-Video Signals

The **IN1222** and **IN1510** feature three 4-pin mini-DIN connectors for direct connection of S-Video signals. Composite video signals may be connected to Inputs 1, 2 and 3 by using an **IN9091** adapter (included), which features a female RCA connector for composite video input.

The **IN1422** and **IN1710** feature three female BNC connectors for composite video input and three mini-DIN connectors for S-video input, allowing up to six video sources to be connected simultaneously.

RGB Video Signals

Input #4 on all units is a passive RGB input which will accept virtually any video signal in any format (the unit will pass up to five signal components).



RGB signals sent into Input 4 are not decoded, doubled, or altered in any way and simply pass through the unit. This passive input is typically used to hook up a computer to the doubler/decoder, allowing users to switch between the computer video input and various composite video or S-video inputs.

The **IN1222/IN1510** provide a female 15-pin HD connector for the RGB input.

The **IN1422/IN1710** provide a female 15-pin HD connector and 5 BNC connectors for the RGB input. These two connectors are wired in parallel and only one of them should be used at any time.

Stereo Audio Signals

All units include a stereo audio input jack for each of the four inputs. The units feature audio-follow-video switching meaning that any time an input is selected, one video signal and its companion audio stereo pair are simultaneously routed through the doubler/decoder. The audio inputs are unbalanced and are intended for line level audio signals.

The **IN1222/IN1510** feature four 3.5 mm ring-tip-sleeve type female jacks for audio input. **IN9090** adapters (3.5 mm male to 2-RCA female) are included with the unit to facilitate connection of audio input signals.

The **IN1422/IN1710** feature a pair of RCA female jacks for each input (no adapters required).

OUTPUT COMPATIBILITY

All INLINE decoders and doublers offer a high quality 24-bit output video signal. The units may be set to any of the following output signal formats as required: RGBS, RGBHV, and RsGsBs (for information on changing output sync formats see page 14). The RGB Video and audio output connections are shown in the diagrams on pages 3, 6 & 7.

The **IN1510/IN1710** and the **IN1222/IN1422** in interlaced (non-doubling) mode output a signal with the same scan rate as the input signal. The decoded signal is compatible with many RGB monitors, video projectors with RGB inputs and will also operate with many LCD projection panels.

The **IN1222/IN1422** in non-interlaced (doubling) mode output a signal at twice the original scan rate. RGB monitors, data projectors, and LCD panels capable of displaying a 31.5 KHz VGA signal (640 x 480 mode) can be used to display the decoded/doubled output signal.

RGB Video Output

The **IN1222/IN1510** feature a 15-pin HD female output connector. One **IN9045** output adapter cable (15-pin HD male to 5-BNC male, 12' long) is included with each unit.

The **IN1422/IN1710** feature both a 15-pin HD female connector and 5 female BNC connectors. The two RGB outputs are wired in parallel and may not be used simultaneously.

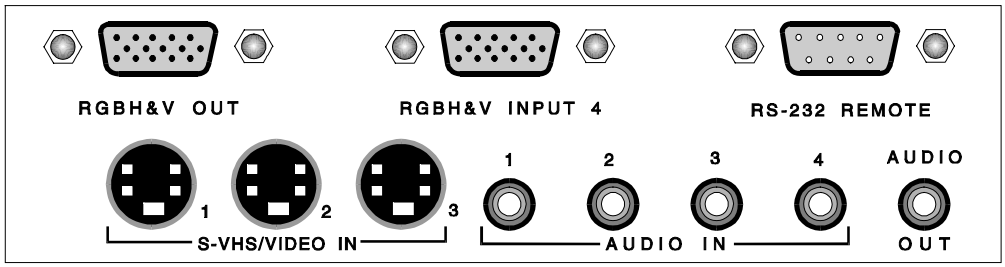
Stereo Audio Output

All units route the selected audio signals to the output connector as an unbalanced line level signal. The output voltage gain varies according to the VOLUME setting for the selected input.

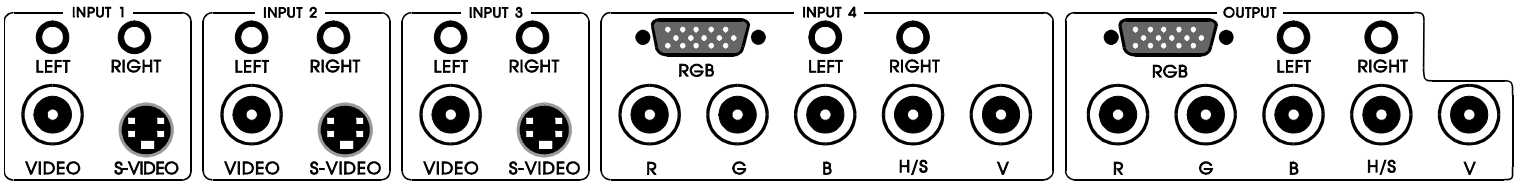
The **IN1222/IN1510** feature a 3.5 mm ring-tip-sleeve type female jack for audio output. An **IN9090** adapter (3.5 mm male to 2-RCA female) is included with the unit to facilitate connection to other audio devices.

The **IN1422/IN1710** feature a pair of RCA female jacks for the stereo audio output.

IN1222 / IN1510 REAR PANEL - INPUT / OUTPUT CONNECTORS



IN1422 / IN1710 REAR PANEL - INPUT / OUTPUT CONNECTORS



INSTALLATION

This section offers step-by-step instructions for installing an **IN1222/1510** or **IN1422/1710**. Detailed application drawings showing all equipment connections are included on pages 6 & 7.

1. Connect the video, audio, and RGB input signals to the appropriate input connectors:
   IN1222/IN1510
   S-Video signals may be connected directly to Inputs 1, 2 & 3.
   Composite video signals may be connected by using **IN9091** adapters.
   Audio signals may be connected using the **IN9090** adapters.
   An RGB signal may be connected to Input 4 using an **IN8000 Series** cable, an I**N9045** cable or any other adapter which conforms to the pin outs (see page 15 for pin-out details).

   IN1422/IN1710
   These units feature one mini-Din connector and one BNC connector for each video input (Inputs 1 - 3) allowing up to three S-video sources and three Composite video sources to be connected simultaneously. Please note that there is only one pair of RCA connectors per input so if two signals are connected to an input, only one may have an audio signal.
   An RGB signal may be connected to the 15-pin HD connector or the 5-BNC connectors. These are wired in parallel and only one of them should receive an input signal.

2. Connect the output signal cable between the scan doubler / decoder output and the display device's RGB input using one of the cables listed below. Pin out information is located on page 15.

   15 Pin Output **IN9045** 15-Pin HD Male to 5-BNC Male, 12' long (included with **1222/IN1510**)
   IN8000 Series 15-Pin HD Male to 15-Pin HD Female, various lengths 6' - 100'

   5 BNC Output **IN7000/IN7400 Series** 4 or 5-BNC Cables, various lengths from 6' - 100'
   (**IN1422/IN1710**) **IN7600/IN7700 Series** 4 or 5-BNC Heavy Duty High Resolution Cables

3. Connect a control system, computer or other source for serial commands to the RS-232 REMOTE connector if desired. For more information on remote control of the units, see pages 16 - 19.

4. Connect a power cable between the POWER input and an A/C power source. The unit utilizes a switch mode power supply which automatically adjusts from 96 - 260 volts and 50 - 90 Hz.

5. Set the output sync format as needed to match installation requirements (see page 14).

6. Using the front panel controls or RS-232 commands (see pages 16 - 19), adjust and store the video parameters for each input source. For best results, the following order is suggested:
   Select S-Video or Composite Video (page 10)
   Select Doubled or Straight Video (***IN1222/IN1422** only*) (page 13)
   Select Doubling Mode: Line Doubling or Frame Mode (***IN1222/IN1422** only*) (page 13)
   Select Gamma Curve (page 10)
   Adjust Sharpness/Contrast (page 9)
   Adjust Hue (page 9)
   Adjust Color saturation (page 9)
   Adjust Volume level (page 9)
   Store Settings for that input - hold INPUT SELECT button until LED flashes (page 8)

RACK MOUNTING

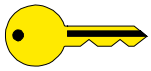
The **IN1222 / IN1510** and **IN1422 / IN1710** may be mounted in a standard 19" equipment rack using the appropriate mounting hardware and procedure listed below:

IN1222 / IN1510 - Use the **IN9083** Rack Ears - 1 U high (optional, not included with units). The **IN9083** Rack Mounting kit includes two rack ears and four mounting screws which are slightly longer than the original case screws.

IN1422 / IN1710 - Use the **IN9123** Rack Ears (included with each unit). The **IN9123** Rack Mounting Kit includes two rack ears and six mounting screws which are slightly longer than the original case screws.

Installation Procedure

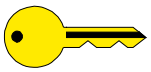
KEY CONCEPT



*The **IN1222 / IN1510** and **IN1422 / IN1710** are exactly 1 U high without the feet. If other equipment will be located in the space immediately below the scan doubler / decoder, the installer may have to remove the feet from the bottom of the case before mounting the unit in the equipment rack.*

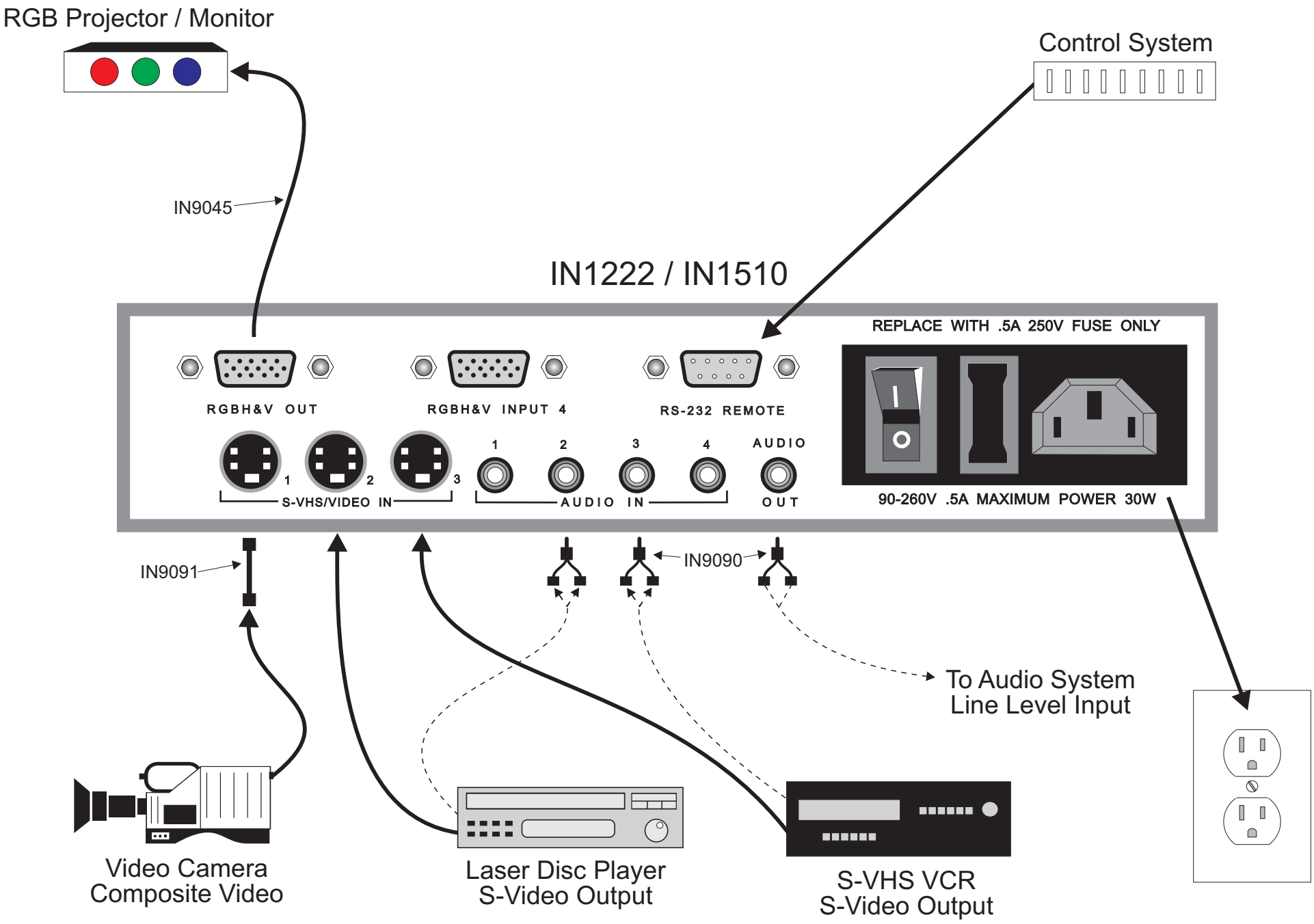
1. Remove power from the scan doubler / decoder.
2. Remove the case screws and retain for future use.
3. Place the rack ears along each side of the case, aligning the rack ear holes with the holes in the side of the case.
4. Use the provided mounting screws to attach the rack ears to the scan doubler / decoder case.
5. Mount the unit in a 19" EIA standard equipment rack using standard rack mounting screws.

KEY CONCEPT

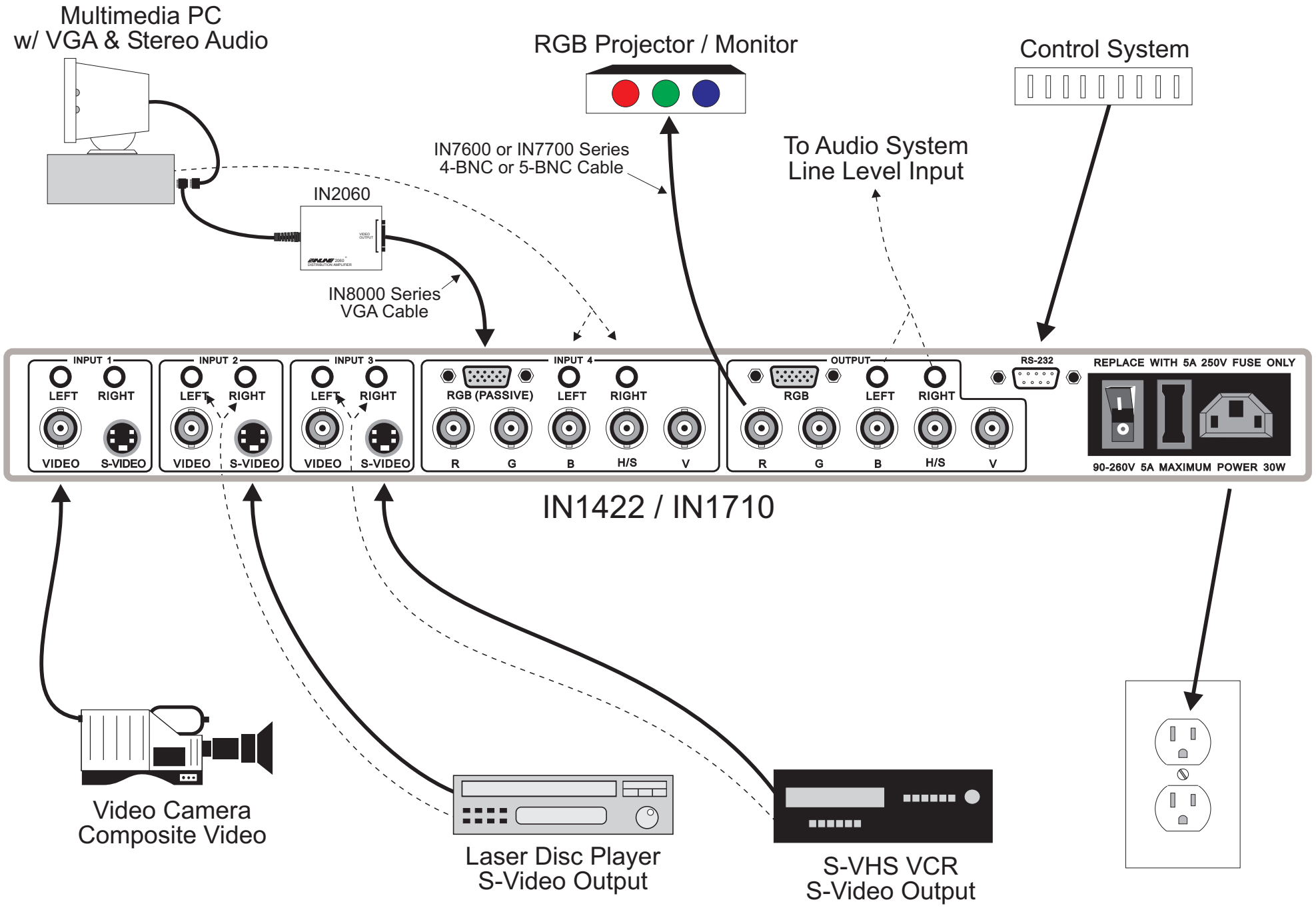


*The shorter original case screws must be used to hold together the case if the rack ears are ever removed. If the longer screws are used in the case without the rack ears, they will extend too far into the unit, causing serious damage to the internal circuitry. This type of damage is **not** covered under warranty.*

IN1222 / IN1510 Application Diagram



IN1422 / IN1710 Application Diagram



OPERATION

The **IN1222 / IN1510 / IN1422 / IN1710** may be controlled by the front panel buttons or through the RS-232 port. All switching functions and most video / audio adjustment functions can be accessed using the front panel. A few adjustments are available only through RS-232 control (see pages 16 - 19).

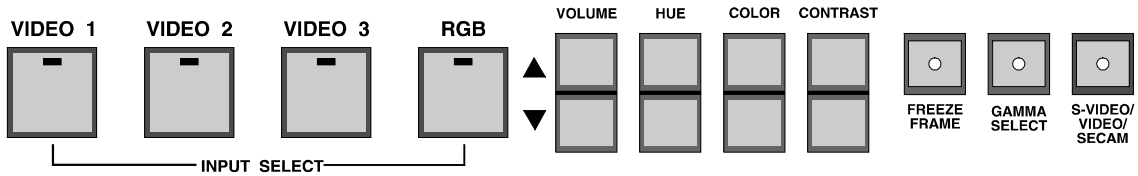
Using the Front Panel Controls

The control panel is divided into three types of control buttons:

Input Select Buttons are the four large buttons on the left end of the panel.

Audio / Video Adjustment Buttons are located in the center and include a pair of small buttons to adjust each parameter up or down.

Function Buttons are three small buttons located on the right end of the panel which toggle between various modes.



INPUT SELECT Buttons

The buttons labelled VIDEO 1, VIDEO 2, VIDEO 3, and RGB may be used to select the desired input video source. The stereo audio associated with that input will automatically be selected at the same time. Whenever the unit is first turned on, INPUT 1 is automatically selected. The RGB input is passively routed through to the output at power down. To select an input, press and release one of the INPUT SELECT buttons. A green LED will light in one of the four buttons to indicate the current selection.

KEY CONCEPT

The INPUT indicator LEDs work in conjuction with the VOLUME, HUE, COLOR, and CONTRAST up and down adjustment buttons. When an input source is being adjusted the corresponding INPUT SELECT LED will flash. ***If the LED stops flashing while adjustments are being made, the controls have reached the upper or lower limit of their adjustment range.***

Storing Settings

The INPUT SELECT buttons are also used to store the unique audio and video settings for input channels 1 - 3 and the VOLUME setting on Input 4. By following the procedure which follows, each input source can be fine tuned and all settings stored for automatic recall whenever that input is selected:

1. Select the desired input using an INPUT SELECT button.
2. Make all desired audio and video adjustments for that input source.
3. Save all settings by pressing and holding the same INPUT SELECT button for five seconds. The INPUT SELECT LED will flash to indicate that all settings have been stored for that input.
4. Repeat steps 1 - 3 for each input source.

KEY CONCEPT

The ***Store Settings*** *procedure stores all important parameters for each input including Volume, Hue, Color, Contrast, Gamma, Video/S-Video, Doubling Mode, and SECAM enable/disable.* ***If changes are made to an input and the settings are not stored, those changes will be lost if the unit is switched to a different input.*** *The unit always recalls the last stored settings whenver an input is selected.*

VOLUME Control
Volume levels may be adjusted and stored for each of the four inputs in order to compensate for different audio input levels from the various sources. The volume circuitry is active, allowing the output signal voltage to be set either higher or lower than the original input signal. Press the upper button to increase the volume level or the lower button to decrease the volume level. If either button is pressed and quickly released, the volume level will change up or down by one step out of a total adjustment range of 40 steps. If either button is pressed and held the volume will quickly increase or decrease.

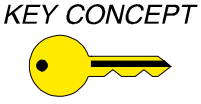
If no volume level has been stored for an input, the factory default level (15 steps below maximum) is automatically recalled each time the input is selected or at power on.

Bass and treble can also be adjusted and stored for inputs 1 - 4 using RS-232 commands (pages 18 & 19).

HUE Control
This control functions for Inputs 1 - 3 when receiving NTSC input signals (it has no effect on PAL or SECAM input signals). The HUE control has no effect on the passive RGB input. The top button skews the hue phase toward the Red end of the color spectrum and the bottom button adjusts the phase towards the Green end of the spectrum. Pressing either button once quickly adjusts the hue setting by one step out of a total adjusment range of 63 steps. Press and hold either adjustment button for a continuous rapid hue adjustment. The factory default setting is in the middle of the range.

COLOR Control
The unit employs an automatic color level circuit, and the color saturation level can be adjusted over a limited range (±5%). The COLOR control will not reduce the color to zero. The COLOR control has no effect on the passive RGB input. The top button increases the color saturation and the bottom button decreases the color saturation. Pressing either button once quickly adjusts the color setting by one step out of a total adjusment range of 8 steps. Press and hold either adjustment button for a continuous rapid color adjustment. The factory default setting is three steps above the minimum setting.

CONTRAST Control
Along with the GAMMA control, **the CONTRAST control is very critical for proper adjustment of the unit.** The control labeled CONTRAST actually controls both contrast *and* sharpness. The unit has been programmed with 32 contrast / sharpness settings. Every time an upper or lower button is pushed the unit will change one "click" to the next setting. Press and hold either adjustment button for a continuous rapid adjustment.



The factory default setting is at the bottom of the range (contrast and sharpness set for flat gain). The higher contrast settings are located at the top of the adjustment range. It is recommended that users set the CONTRAST control to the extreme top position and move down one step at a time until a pleasing picture is attained. ***For most applications, the best image will occur with one of the 6 - 8 highest sharpness / contrast settings.***

GAMMA Button
Gamma correction is an effective tool used to compensate for the non-linear response of most display devices. The gamma setting may also be changed as required to accomodate the wide variation of video gain and contrast characterstics found in various video program sources. INLINE scan doublers and decoders offer eight different gamma curve adjustments (seven active gamma curves plus no gamma). Along with the CONTRAST control, the GAMMA control setting is critical to proper adjustment and should generally be set first with all other controls set to the factory default position.

The default setting is Gamma Curve 0 (no gamma correction). Each time the GAMMA button is pressed, the unit moves one click up to the next gamma curve. The complete cycle includes eight gamma settings, beginning with Gamma Curve 0 and ending when Gamma Curve 7 is reached, at which point it jumps back to Gamma Curve 0.

The GAMMA select LED is off when Gamma Curve 0 is selected (no gamma correction).

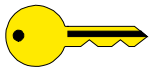
The GAMMA select LED is on when an active gamma curve is selected (Curves 1 - 7).

S-VIDEO / VIDEO / SECAM Button
Inputs 1, 2 and 3 can accept either S-Video or Composite Video input, but the unit must first be set to accept and decode one one these formats. The primary function of this button is to toggle between S-Video or Composite Video input.

S-Video input is selected when the LED is on (factory default setting).

Composite video input is selected when the LED is off.

KEY CONCEPT



It is very important to store the appropriate S-Video / Video setting for each input source during the installation process *(see* ***Store Settings*** *procedure listed on page 8). This will insure proper decoding when switching between inputs.*

Selecting SECAM Video
The unit will automatically detect and decode NTSC and PAL input signals. SECAM decoding is normally disabled (factory default setting) and must be manually selected using the S-VIDEO / VIDEO / SECAM button. To decode SECAM input signals, hold down the button until the INPUT SELECT LED flashes three times and a normal video image is displayed. Store this selection (Store Settings, page 8).

FREEZE FRAME Button (IN1222 / IN1422 only)
The FREEZE FRAME button may be used to store and view a single video frame. The digital freeze frame offers a perfectly still image of a single video frame for extended study or presentation purposes. This provides a much better image than the freeze frame feature found on most VCRs. Each time the FREEZE FRAME button is pressed it toggles the unit between Freeze Frame or normal motion video.

Freeze Frame is engaged when the LED is on.

Freeze Frame is disabled when the LED is off (normal motion image, factory default setting).

BLANKING Button (IN1510 / IN1710 only)
The BLANKING button offers a way to blank the decoder output. The sync signal is still sent, but a black video image replaces the previous input selection. The BLANKING button toggles between blanking on and blanking off each time the button is pressed.

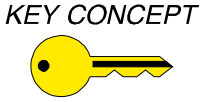
Blanking is engaged when the LED is on.

Blanking is disengaged when the LED is off (normal picture, factory default setting).

SCAN DOUBLING PRIMER

Garden variety composite video or S-Video images are interlaced, meaning that the picture information from each video frame is split into two fields. Field one contains all of the odd horizontal lines and Field two contains all of the even horizontal lines. Each field is displayed for only 1/60 of a second, so the human eye actually merges all the odd and even lines from the two fields into a single image which is refreshed completely 30 times a second (timings are for NTSC). Unfortunately, this merging process is not perfect and we can easily perceive the video scan lines, especially on large screen displays.

Scan doublers increase the number of scan lines resulting in a new type of video image, IDTV which stands for Improved Definition Television. The images are no longer in their original NTSC, PAL, or SECAM format since they have been decoded to an RGB format, the number of scan lines has been doubled, and the horizontal scan rate has been doubled. Scan doublers output a non-interlaced image, and employ progressive scanning, where the image is completely drawn in a single pass from the top to the bottom of the screen before moving to the next frame. Scan doubled images are virtually free from scan lines and have a solid, film-like appearance. Various methods are employed by scan doublers to achieve a non-interlaced, scan doubled image and two of these techniques are discussed in the following section.



*Scan doublers double the horizontal scan rate, but **the vertical refresh rate is not changed**. If the input video signal is 50 Hz the output signal will still be 50 Hz.*

LINE DOUBLING TECHNIQUES

The **IN1222** and **IN1422** will allow users to select and store a different line doubling technique for each input as required by the type of input source. The **IN1222 / IN1422** offer three choices: Line Doubling, Frame Mode, and Disable Doubling.

Line Doubling - is the default mode for INLINE scan doublers and is best for displaying motion video sources with minimal motion artifacts. This method stores a single field and displays each line within the field twice (the first and last lines of the frame are only displayed once). Looking from top to bottom on the display would be:

Field One - Line 1, Line 3, Line 3, Line 5, Line 5, etc. for the first 1/60th of a second and
Field Two - Line 2, Line 2, Line 4, Line 4, Line 6, Line 6, etc. for the second 1/60 of a second.

Frame Mode - is the preferred mode for still video, offering the greatest image detail on input sources such as document cameras and slide-to-video converters. While frame mode offers the best detail for still sources, it should not be used with motion video sources, as extreme motion artifacts will occur. In Frame Mode (also known as Field Overlay) the scan doubler stores both fields of one frame in memory and then displays both fields on the screen at the same time. The display would appear from top to bottom as follows:

Line 1, Line 2, Line 3, Line 4, Line 5, Line 6, etc. for 1/60th of a second.
The same image is actually displayed twice, for a total time of 1/30th of a second.

Disable Doubling - Low quality video images with excessive noise or poor detail may not benefit from scan doubling, therefore the **IN1222** and **IN1422** provide a way to disable the scan doubling on selected inputs. The output video is still decoded from composite video or S-Video to RGBHV (or other selected output format), but the signal remains at its original horizontal scan rate and is still interlaced.

Selecting Doubling Modes (*IN1222 / IN1422 Only*)
The following procedure will allow users to select and store the desired doubling mode (or disable doubling) for Inputs 1, 2, and 3.

1. Turn the unit power on.
2. Select the desired input channel and make the necessary installation adjustments.
3. Hold down the appropriate front panel button (see chart below) continuously for 3 seconds until the button LED flashes twice. This indicates that the doubling method has been changed for that input. Release the button.
4. Store the doubling mode selection and all other adjustments by pressing and holding the INPUT SELECT button for the source currently being adjusted (hold for 5 seconds until LED flashes).
5. Repeat Steps 1 - 4 for other input(s) as desired.

Doubling Mode	Hold Down Button
Line Doubling (*factory default*)	Press GAMMA button for three seconds
Frame Mode	Press GAMMA button for three seconds
Enable Doubling (*factory default*)	Press FREEZE button for three seconds
Disable Doubling	Press FREEZE button for three seconds

Each of the button presses listed above causes the unit to toggle between Line Doubling / Frame Mode or Enable / Disable Doubling. If the user is unsure of current settings, it is best to begin the installation by resetting the unit to factory defaults (Line Doubling Mode, Doubling Enabled). The unit may be reset to factory default settings by pressing and holding the VIDEO 1 channel select button while toggling the power switch to "ON". Please note that this will reset all video and audio adjustments, so it is generally best to do this at the beginning of the set-up procedure before adjustments have been stored.

POWER ON ADJUSTMENTS

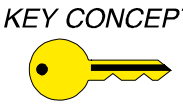
The **IN1222 / IN1510 / IN1422 / IN1710** utilize "Power On" settings to control two setup parameters. In order to access a Power On adjustment, the user must hold down the indicated button continuously while toggling the unit's power switch to "ON" (if power is already on, the user can hold down the indicated button and switch the power off and then back on).

Reset to Factory Defaults

The **IN1222 / IN1510** and **IN1422 / IN1710** offer a powerful set of controls for adjusting video and audio parameters. If the set-up technician or users have changed several of the parameters and want to get back to average settings, the simplest way is to reset the unit to the factory default settings.

Reset to Factory Defaults: Hold down the VIDEO 1 Channel Select button while turning power on. This resets the video / audio adjustments for all input channels to factory default settings:

Video / Audio:	All adjustment parameters set to factory defaults (average settings)
Channel Selection:	Input 1 Selected (Input 1 is selected each time the power is turned on)
Video / S-Video:	S-Video selected for all input channels
Gamma:	Gamma Curve 0 (no Gamma Correction)
SECAM:	SECAM disabled (unit automatically decodes NTSC or PAL)
Scan Doubling:	Enabled (***IN1222 / IN1422 only***)
Doubling Mode:	Line Doubling (***IN1222 / IN1422 only***)
Baud Rate:	1200
Command Codes:	[ ]



Output Sync Format *is not effected by the Power On "Reset to Factory Defaults." Output Sync Format can only be changed by using the Power ON settings described in the paragraph below or by using RS-232 commands (see page 19).*

Select Output Sync Format

The **IN1222 / IN1510 / IN1422 / IN1710** feature flexible output sync format capability. This allows users to select an output video format which meets the needs of both the video switching / distribution system and the display device. Users who wish to emulate a standard 640 x 480 VGA signal should select the factory default output format, which is RGBHV with negative sync polarities.

Holding down the appropriate button at Power On will change the output signal to the desired format:

Output Sync Format	Hold Down Button at Power On
RGBHV(++)	VOLUME UP
RGBHV(--)	HUE UP
RGBS	COLOR UP
RsGsBs	CONTRAST UP

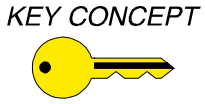
UNIVERSAL POWER SUPPLY

The IN1222 / IN1510 / IN1422 / IN1710 employ a universal (switch mode) power supply which automatically adjusts to accept input voltages worldwide. Input voltage can range between 96V and 260V AC and frequency may range from 50 Hz to 90Hz. The power entry module uses an IEC standard male connector for power connection. U.S. domestic units are shipped with a standard IEC female to Edison male power cable.

Changing Fuses

The power entry module includes a quick-change fuse holder located to the left of the power switch. This holder contains the main fuse and a spare fuse. If the fuse blows:

1. Remove the power cord from the unit.
2. Use a flat blade screwdriver to remove the fuse holder.
3. Replace the blown fuse with the spare fuse.
4. Replace the spare fuse with a new .5A 250V slow blow fuse.
5. Seat the fuse holder back into the power entry module and reattach the power cord.



THE IN1222 / IN1510 / IN1422 / IN1710 CONTAIN NO INTERNAL FUSES, JUMPERS, DIP SWITCHES OR OTHER USER SERVICABLE PARTS. IF THE CASE IS OPENED THERE IS ELECTRIC SHOCK HAZARD AND DAMAGE MAY OCCUR TO THE COMPONENTS. REFER ALL SERVICE TO INLINE.

RGB PIN OUT INFORMATION

The following information applies to the 15-pin HD connectors on the **IN1222 / IN1510 / IN1422 / IN1710.** The **IN1422 / IN1710** also include a set of 5 - BNC Female connectors for RGB input and output.

Input 4 - RGB Passive Input
RGB Output

Input 4 and the RGB output both employ a 15-pin HD female connector with the following pin-outs:

Pin 1	Red Signal	Pin 9	No connection
Pin 2	Green Signal	Pin 10	Ground
Pin 3	Blue Signal	Pin 11	No connection
Pin 4	No connection	Pin 12	No connection
Pin 5	Ground	Pin 13	Horizontal Sync *or* Composite Sync Signal
Pin 6	Red ground	Pin 14	Vertical Sync Signal
Pin 7	Green ground	Pin 15	No connection
Pin 8	Blue ground		

The output sync format for decoded / doubled images (Inputs 1 - 3) has no effect on the output format of RGB signals sent into Input 4. For instance, if the scan doubler is set to output RGBS, an RGBHV signal applied to Input 4 will still appear at the output as RGBHV, but the decoded / doubled signals will appear at the output as RGBS.

USING RS-232 CONTROL

The **IN1222/IN1510** and **IN1422/IN1710** include an 9-pin REMOTE CONTROL port which will accept serial commands from a control system, computer serial port, or any other device capable of sending out serial ASCII commands at compatible baud rates. All switching, adjustment, and set-up parameters can be controlled using RS-232 commands. A few functions cannot be accomplished from the front control panel and are available *only* through RS-232 control:

Audio Mute
Audio Bass and Treble Control
Comprehensive Control of Individual Contrast Filter Settings and Coring Settings
Horizontal Picture Centering (non-doubling mode only)
Saving the settings from one input to other selected inputs
Changing the RS-232 Baud Rate
Changing the command codes (delimiters)
Getting Firmware Information on the Microcontroller

Details on the commands above, and a complete listing of RS-232 codes is included on pages 18 & 19.

COMMUNICATION PROTOCOL

8 data bits
1 stop bit
No parity check
1200 baud (factory default setting)

BAUD RATE SELECTION

The **IN1222 / IN1510 / IN1422 / IN1710** have a factory default baud rate of 1200 and can communicate at baud rates from 1200 up to 19200. Baud rates can only be changed and saved via RS-232 commands (see page 18).

The units revert back to a baud rate of 1200 each time the power is turned off. If the unit will be turned on and off frequently and the control system is going to use one of the higher baud rates, then the "SAVE0" command (save global settings) should be used to save the appropriate baud rate and command code settings. Once the settings have been saved this way, the unit will recall the new baud rate and command codes at power up.

COMMAND CODE STRUCTURE

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. When a command is completed, the unit provides a response code; "OK" indicates the command was received and executed,
"ERR" indicates there is a problem with the code and the command was not executed.

INLINE doublers and decoders can be set to recognize one of four sets of leading codes and ending codes.
These are: [ ] { } ( ) < > . The factory default for leading / ending codes is [ ]. The unit can only be set to a different command code by using an RS-232 command (see page 18).

A complete command consists of:

[The leading code
CH4 The command code. In this case CH4 would select the RGB input.
] The ending code

Sample command codes:

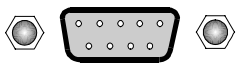
[CH1] Selects input 1
[GAM3] Selects Gamma Correction curve 3 for the current input channel

Controlling Multiple INLINE Products

INLINE products such as the Pathfinder, V-Net, the **IN1222 / IN1240 / IN1422** doublers and the **IN1510 / IN1540 / IN1710** decoders use a similar communications protocol and command code structure. By setting each unit to a different command code pair, up to four different INLINE products can be controlled by a single RS-232 serial control port. Once a unit is set to look for a certain pair of leading and ending delimiters (command codes), it will ignore all other commands sent by the port.

When daisy chaining multiple units together the 9-pin RS-232 control cable between the units must be wired in parallel. The receive pin on all units must be connected together. Do not connect the transmit pin between units.

CONTROL PORT PIN-OUTS



The RS-232 control port is located on the rear panel just to the left of the power switch. The control port uses a 9-Pin D male connector and the pin outs are:

Pin#	Signal
2	Receive
3	Transmit
5	Ground

RS-232 ASCII CODES

The table below lists the ASCII control codes for the **IN1222 / IN1510 / IN1422 / IN1710**. These are virtually identical to the codes used with the **IN1240 / IN1540**, and new codes for the current version are indicated by an asterisk (*). The most current version of firmware as of this writing is **V1.4a**.

COMMAND	DESCRIPTION
ACI3	Set ACI to 1200 baud rate *default*
ACI4	Set ACI to 2400 baud rate
ACI5	Set ACI to 4800 baud rate
ACI6	Set ACI to 9600 baud rate
ACI7	Set ACI to 19200 baud rate
BAS+	Increase Bass level by 3dB
BAS-	Decrease Bass level by 3dB
BAS,	Set Bass level to 0dB *default*
BASxxx	Set Bass level to value xxx: range for xxx is 240 - 255
CMDCD0	Select command code "[" & "]" *default*
CMDCD1	Select command code "{" & "}"
CMDCD2	Select command code "(" & ")"
CMDCD3	Select command code "<" & ">"
CH1	Select Input 1 *power on default setting*
CH2	Select Input 2
CH3	Select Input 3
CH4	Select Input 4 - RGB Passive Input
CON+	Increase CONTRAST level 1 step
CON-	Decrease CONTRAST level 1 step
CON,	Set CONTRAST level to normal setting *default*
CONxxx	Set CONTRAST level to xxx value, xxx: 000-255
FRZ0	Disable Freeze Frame (Disable Blanking on **IN1510/IN1710**) *default*
FRZ1	Freeze Current Frame (Enable Blanking on **IN1510/IN1710**)
GAM0	Disable GAMMA Correction function *default*
GAM1	Select GAMMA Correction curve 1
GAM2	Select GAMMA Correction curve 2
GAM3	Select GAMMA Correction curve 3
GAM4	Select GAMMA Correction curve 4
GAM5	Select GAMMA Correction curve 5
GAM6	Select GAMMA Correction curve 6
GAM7	Select GAMMA Correction curve 7
HSCAN0	**(*IN1222/IN1422 only*)** Disable doubling for current input (15.75 kHz output signal)
HSCAN1	**(*IN1222/IN1422 only*)** Enable doubling for current input (31.5 kHz output) *default*

COMMAND	DESCRIPTION
HUE+	Increase HUE phase 1 step
HUE-	Decrease HUE phase 1 step
HUE,	Set HUE phase to normal setting *default*
HUExxx	Set HUE phase to xxx value, range for xxx: 000-255
INTP0	(***IN1222/IN1422*** *only*) Set Doubling Mode to Line Doubling *default*
INTP1	(***IN1222/IN1422*** *only*) Set Doubling Mode to Frame Mode
INF0 *	Get the model number & firmware version
MUTE0	Disable Audio Mute *default*
MUTE1	Enable Audio Mute
POSTL	Horizontal position adjustment - shift left (Only when doubling is disabled)
POSTR	Horizontal position adjustment - shift right (Only when doubling is disabled)
POSTHxx	Horizontal position adjustment - set to xx, range of xx: 00-FF (Doubling disabled)
SAT+	Increase COLOR level 1 step
SAT-	Decrease COLOR level 1 step
SAT,	Set COLOR level to normal setting *default*
SATxxx	Set COLOR level to xxx value, xxx: 000-255
SAVE	Save current channel's settings (Vol./Hue/Color/Cont./Gamma/S-Video/Doubling Mode/Secam)
SAVE*s*	Save the current channel's settings to a selected channel *s* (*s* = 1, 2, or 3)
SAVE0	Save the global settings (baud rate, command code)
SEC0	Disable SECAM decoder *default*
SEC1	Enable SECAM decoder
SVIDEO0	Select composite video input for the current channel
SVIDEO1	Select S-Video input for the current channel *default*
SYNC0 **	Select H & V Output Sync, positive polarity
SYNC1 **	Select H & V Output Sync, negative polarity *default*
SYNC2 **	Select Composite Output Sync
SYNC4 **	Select Sync on RGB
TRE+	Increase Treble level by 3dB
TRE-	Decrease Treble level by 3dB
TRE,	Set Treble level to 0dB *default*
TRExxx	Set Treble level to xxx value, range for xxx: 240 - 255
VOL+	Increase volume 8dB
VOL-	Decrease volume 8dB
VOLxxx	Set volume level to xxx value, range for xxx: 192 to 255
VOL,	Set volume level to normal, *default*

*This code prompts the unit for feed back and will result in special response codes.
**When the output sync is changed via these RS-232 commands, the new setting is automatically saved as soon as the command is sent (there is no need to send the SAVE or SAVE0 command).

VIDEO SPECIFICATIONS

	IN1510 / IN1710	IN1222 / IN1422
Video Input Characteristics		
Input voltage (peak-to-peak)	0.6 - 1.4V	
Input impedance (terminated, f=6MHz)	75Ω	
Input capacitance (f=6MHz)	35 - 45pF	
Crosstalk between the 3 input channels	–60 - –55dB	
Digital Decoder		
NTSC standards[1]	NTSC -M	
PAL standards[1]	PAL -D, B, G, H, I	
SECAM standards[1]	SECAM -L, B, D, G, H, K1	
Video Control Characteristics		
Hue phase (Available for NTSC only)	–180.0° - +178.6°	
Color level (chroma gain)	±5%	
Sharpness / Contrast level[2]	32 Pre-programmed settings	
RGB Output Characteristics (*for inputs 1-3, 75Ω doubly terminated*)		
Input to output delay (referenced to the input signal) [3]	60Hz : $^{138}/_{780}$ line *or* 11.245µS 50Hz : $^{138}/_{944}$ line *or* 9.356µS	Single Scan Mode 60Hz : $0.5+^{137}/_{780}$ line *or* 42.941µS 50Hz : $0.5+^{137}/_{944}$ line *or* 41.288µS Double Scan Mode 60Hz : $1+^{137}/_{780}$ line *or* 74.720µS 50Hz : $1+^{137}/_{944}$ line *or* 73.288µS
RGB output voltage (peak-to-peak value, without sync)	0.7 - 0.8V	
RGB output voltage (peak-to-peak value, with sync)	0.9 - 1.1V	
Sync output voltage HIGH	2.4V min.	
Sync output voltage LOW	0.5V max.	
Output impedance	75Ω	

Notes:

1. Video only, no teletext or closed-caption supported.
2. Refer to the *Programmer's Guide* for details.
3. For reference only. These timing figures are not recommended for applications which require absolute timing accuracy. The actual delay is dependent on the quality of the input signal and will also be influenced by the position of the video adjustment controls (Hue, Color and Sharp controls).
   The delay time is based on a 15.734kHz horizontal frequency for 60Hz NTSC and 15.625kHz horizontal frequency for 50Hz PAL/SECAM. The actual delay timing depends on the horizontal frequency of the input signal.

AUDIO SPECIFICATIONS

	IN1222 / IN1422 / IN1510 / IN1710
Audio Inputs	Stereo Unbalanced Line Level
Audio Outputs	Stereo Unbalanced Line Level
Frequency Response	20 Hz to 20 KHz ±3dB
Signal to Noise Ratio	80dB

VIDEO TIMING

	IN1510 IN1710	IN1222 / IN1422	
		Single scan	Double scan
Input Signal Timing			
Horizontal frequency of input signal	f_H Hz		
Vertical frequency of input signal	f_V Hz		
RGB Output Horizontal Timing (*NTSC mode*)			
Pixel clock	780f_H Hz		1560f_H Hz
Horizontal frequency (line rate)	f_H Hz		2f_H Hz
Total pixels per line	780 pixels		780 pixels
Active pixels per line	640 pixels		640 pixels
Horizontal blanking interval	140 pixels		140 pixels
Horizontal synchronization pulse	64 pixels		64 pixels
Front porch	Adjustable (RS-232 Commands)		56 pixels
Back porch	Adjustable (RS-232 Commands)		20 pixels
RGB Output Vertical Timing (*NTSC mode*)			
Vertical frequency (field rate)	f_V Hz		f_V Hz
Frame rate	½f_V Hz		f_V Hz
Total lines per field	262.5 lines	262.5 lines	525 lines
Visible lines per field	241.5 lines	241 lines	481 lines
Vertical blanking interval	21 lines	21.5 lines	44 lines
Vertical synchronization pulse	6 lines[4]	6 lines	12 lines
Front porch	3.5 lines[4]	3.5 lines (of) 3 lines (ef)[5]	7 lines
Back porch	11.5 lines[4]	12.5 lines (of) 12 lines (ef)[5]	25 lines
RGB Output Horizontal Timing (*PAL/SECAM mode*)			
Dot clock	944f_H Hz		1888f_H Hz
Horizontal frequency (line rate)	f_H Hz		2f_H Hz
Total pixels per line	944 pixels		944 pixels
Active pixels per line	768 pixels		768 pixels
Horizontal blanking	176 pixels		176 pixels
Horizontal synchronization pulse	64 pixels		64 pixels
Front porch	Adjustable (RS-232 Commands)		88 pixels
Back porch	Adjustable (RS-232 Commands)		24 pixels
RGB Output Vertical Timing (*PAL/SECAM mode*)			
Vertical frequency (field rate)	f_V Hz		f_V Hz
Frame rate	½f_V Hz		f_V Hz
Total lines per field	312.5 lines	312.5 lines	625 lines
Visible lines per field	287.5 lines	287 lines	573 lines
Vertical blanking	25 lines	25.5 lines	52 lines
Vertical synchronization pulse	6 lines[4]	6 lines	12 lines
Front porch	3 lines[4]	2.5 lines (of) 3 lines (ef)[5]	5 lines
Back porch	16 lines[4]	16.5 lines (of) 17 lines (ef)[5]	35 lines

Notes:

4. The number of lines may vary depending on the source of the input signal.
5. of: odd field, ef: even field.

GENERAL SPECIFICATIONS

	IN1222 / IN1510	IN1422 / IN1710
Video Connectors		
Inputs 1, 2 & 3 - S-Video / Composite Video	(3) 4-Pin Mini DIN Female	(3) 4-Pin Mini Din (3) BNC Female
Input 4 - Passive RGB	15-Pin HD Female	15-Pin HD Female (5) Female BNC
RGB Output	15-Pin HD Female	15-Pin HD Female (5) Female BNC
Audio Connectors		
Inputs 1 - 4 - Stereo Audio	(4) 3.5mm Mini Female Stereo (Ring/Tip/Sleeve)	(4) Stereo Pairs RCA Female
Output - Stereo Audio	(1) 3.5mm Mini Female Stereo (Ring/Tip/Sleeve)	(1) Stereo Pair RCA Female
Remote Control Connector	9-Pin D Male	
Power Supply		
Input port	IEC Standard Male Connector	
Input voltage / frequency	96V - 260 VAC / 40 Hz - 90 Hz	
Power consumption	10W	
Fuse	(1) .5A / 250V Slow Blow	
Environmental Capabilities		
Operating temperature	+5°C - +40°C	
Storage & transport temperature	–20°C - +60°C	
Operating relative humidity	20 - 90%	
Storage & transport relative humidity	5 - 95%	
Heat radiation	direct sunlight radiation not allowed	
Operating vibration	10-50Hz @ 2G	
Operating position	any position	
Safety and EMI Data		
Safety regulation	UL applying	
EMI regulation	complies with FCC Class A	
Dimensions	1.75" H x 8.5" W x 10.25" D	1.75" H x 19" W x 11.5" D
Shipping Weight	7.5 pounds	14 pounds

ACCESSORIES INCLUDED

IN1222 / IN1510	IN1422 / IN1710
(1) - **IN1222** Scan Doubler or **IN1510** Decoder (1) - **IN9045** 15-Pin HD Male to 5-BNC Male, 12' long (5) - **IN9090** 3.5mm Mini Male to 2-RCA Female (3) - **IN9091** 4-Pin Mini DIN (S-Video) to RCA Female (1) - **IN9038** 15-Pin HD Male to Male Gender Changer (1) - Power Cord (U.S. Domestic units only) (1) - Operations Manual	(1) - **IN1422** Scan Doubler or **IN1710** Decoder (1) - **IN9123** Rack Mounting Kit (1) - Power Cord (U.S. Domestic units only) (1) - Operations Manual

OPTIONAL ACCESSORIES

IN8000 Series Cables - 15 Pin HD Male to 15 Pin HD Female cables
IN8200 Series Cables - 15 Pin HD Male to 9 Pin D Female, for use with NEC projector switchers
IN7000/IN7400 Series Cables - 4 or 5 BNC High Resolution Cables
IN7600/IN7700 Series Cables - 4 or 5 BNC High Resolution Heavy Duty Cables
The Input and Output cables listed above are available in a variety of lengths from 6' - 100' with longer lengths available by special order.

IN9045 Output Adapter Cable - 15 Pin HD Male to 5 Male BNC Cable - 12' Long
IN9083 Rack Mount Kit - For **IN1222 / IN1510,** includes (2) Rack Ears and (4) Attachment Screws

TROUBLESHOOTING

The **IN1222/IN1422** Scan Doublers and **IN1510/IN1710** Universal Decoders are designed to offer problem free operation. There are no internal user adjustable or serviceable parts. This section lists a few potential symptoms of improper installation / adjustment and the most common solutions to these problems.

No picture is displayed on the monitor / video projector.

1. Verify all input cable connections.
2. Verify output cable connections.
3. Check the unit power supply connection at both ends.
4. Make sure the unit is set to an output sync format which is compatible with the display device.
5. Verify that the unit has been switched to an active input.
6. Check to see if the display device has been switched to its RGB input.

Two images are displayed side by side on the display screen. (IN1222/IN1422 only)

The **IN1222/IN1422** is probably being used in its scan doubling mode with an incompatible monitor or video projector. Either switch to the "Disable Doubling" mode (Page 13), or use an RGB display device which is capable of showing a 31.5 KHz (VGA type) video signal.

When switching from one input to another the video and audio parameters are not recalled properly for each channel.

The video and audio parameters such as volume, hue, color, contrast, and Video/S-Video must be stored (see Store Settings on page 8) *before* switching to another channel. This will cause all parameters to be recalled automatically whenever a channel is selected.

The unit does not respond to RS-232 commands.

1. Check the baud rate settings. The default is 1200 baud at power on (unless a different baud rate has been previously set and stored). In order to use a higher baud rate the unit must be set to that baud rate using an RS-232 command (Pages 16 & 18). ***1200 baud is highly recommended.***
2. Verify the command code settings (Pages 17 & 18).
3. Verify that all ASCII characters are in upper case and that there is no confusion between the letter O and number 0 (zero).
4. Check the control cable construction. If you built a custom control cable, did you remember to swap the transmit and receive so the units can communicate?

The video image on the screen is magenta colored and very noisy.

The unit may be set for "SECAM Enabled". Verify that the unit is set to the proper decoder format. If the unit has been set to the "SECAM Enabled" mode and the input signals are NTSC or PAL, switch back to the "SECAM Disabled mode" (see page 10).

When power is applied to the unit all LEDs flash continuously.

The unit has an internal hardware problem. Call your INLINE dealer to arrange for repairs.

If problems persist, contact your INLINE dealer for assistance or call the INLINE Technical Services Department at (800) 882-7117.

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 merchantibility or fitness for any particular purpose, all of which are expressly disclaimed.**

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