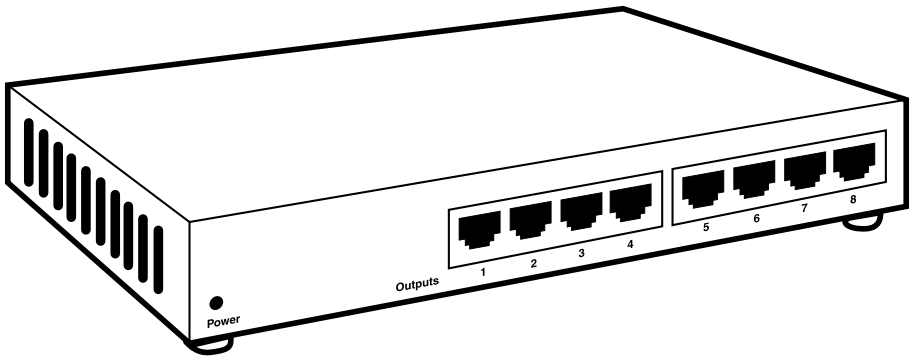




Video CCTV-A/V Hub



**CUSTOMER
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INFORMATION**

Order toll-free in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)
FREE technical support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mailing address: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: www.blackbox.com • E-mail: info@blackbox.com

**FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA
RADIO-FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

EUROPEAN UNION DECLARATION OF CONFORMITY

The manufacturer declares that this product meets the requirements of EU Directive 89/336/EEC by complying with EN 55022.




**NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT**

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Specifications

| | |
|---|---|
| Cable Required: | <p>Between hub and baluns: Unshielded twisted pair (UTP): Construction standard: Category 3 or higher; Gauge: 24 AWG or lower; Core: Solid; Termination: RJ-45 plugs; Pairs: Number needed depends on baluns (see balun manuals); cable with four pairs (eight wires) can support all balun models; Impedance: 100 ohms at 1 MHz; Maximum capacitance: 20 pF/ft. (6.1 pF/m); Maximum attenuation: 6.6 dB/1000 ft. (2 dB/km) at 1 MHz;</p> <p>To attached devices: Depends on baluns (see balun manuals)</p> |
| Compliance: | CE (EN 55022); FCC Class A, IC Class/classe A; CISPR Pub. 22 Class B |
| Video Support: | S-Video; NTSC or PAL composite (baseband) video |
| Transmission: | Transparent to users (automatic, no delay) |
| Required Source Impedance: | <p>Video OUT: 75 ohms; Audio OUT (if any): 600 ohms maximum</p> |
| Required Destination Impedance: | <p>Video IN: 75 ohms; Audio IN (if any): 600 ohms minimum</p> |
| Hub Impedance: | <p>Video IN and video OUT: 100 ohms balanced; Audio IN: 10 kilohms minimum balanced; Audio OUT: 600 ohms balanced</p> |
| Bandwidth (3 dB): | <p>Video: DC to 8 MHz; Audio: 50 Hz to 16 kHz</p> |
| Maximum Differential Input and Output: | <p>Video: 0.55 volts peak-to-peak; Audio: 0.5 volts peak-to-peak</p> |

VIDEO CCTV-A/V HUB

Differential

Insertion Loss: Video: 0 dB maximum at 4 MHz;
Audio: 1 dB maximum at 1 MHz

Video Return Loss: 24 dB minimum

Common-Mode

Rejection: Input balanced, output unbalanced;
Video: Greater than 40 dB over the frequency range;
Audio: Greater than 60 dB over the frequency range

Crosstalk Immunity: 60 dB minimum over the frequency range

Maximum

Distance: Total end to end, from source device through hub(s) to destination device, over good CAT5 cable (assuming A/V source outputs signal at normal strength):
Black & white composite video: 2500 ft. (762 m);
Color composite video: 2200 ft. (671 m);
S-Video: 1000 ft. (305 m)

Indicator: (1) Front-mounted power LED

Connectors: (10) RJ-45 female:
(1) rear-mounted for input;
(1) rear-mounted for looping output;
(8) front-mounted for regular output;
(1) Rear-mounted 5-pin DIN female power inlet

RJ-45 Pins Used: All: Pin 1 is audio 1 ring, Pin 2 is audio 1 tip, Pin 3 is audio 2 ring, Pin 4 is video 2 ring, Pin 5 is video 2 tip, Pin 6 is audio 2 tip, Pin 7 is video 1 ring, and Pin 8 is video 1 tip

Temperature

Tolerance: Operating: 32 to 131°F (0 to 55°C);
Storage: -4 to +185°F (-20 to +85°C)

Humidity

Tolerance: Up to 95% noncondensing

Enclosure: Aluminum

| | |
|----------------|---|
| Power: | From utility-power (mains) outlet to power inlet, through detachable external power supply: Input: 100 to 250 VAC at 50 or 60 Hz (autosensing), up to 700 mA; Output: +5 VDC at up to 4 A; +12 VDC at up to 1 A; -12 VDC at up to 0.6 A; Consumption: 5 watts maximum |
| Size: | 1.3"H x 8.5"W x 4"D (3.3 x 21.6 x 10.2 cm) |
| Weight: | Hub chassis: 1 lb. (0.5 kg); Power supply 1.5 lb. (0.7 kg) |

2. Introduction

The Video CCTV-A/V Hub distributes one or two S-Video or baseband video signals and one or two audio signals to be distributed to up to eight destinations on unshielded twisted-pair (UTP) cable for more cost-effective and versatile cabling.

When used in conjunction with any of several of our video baluns (such as product codes IC440A, IC441A-R2, IC444A, IC446A, and IC447A), the Video CCTV-A/V Hub eliminates the need to run expensive coaxial cable or audio cable between the audio/video (A/V) source and destination devices. You can run UTP cable instead, which is already wired into most commercial sites, to distribute audio and video signals to multiple locations. For even greater versatility, a looping output allows the source input to be distributed to additional daisychained or cascaded hubs.

You can connect a set of the Video CCTV-A/V Hub's RJ-45 jacks to your site's structured cabling through a modular wall jack in the work area. The video and audio twisted pairs are independent of each other; it's not necessary to use all of them in a given application, and it's not necessary for all signals to be transmitted in the same direction. The hub is designed for one-to-many point-to-point configurations; further expansion through cable tapping is not supported.

The hub is designed for use with CCTV cameras and monitors, videocassette recorders, camcorders, switchers, multiplexors, and other baseband or S-Video audiovisual devices. Use it in applications such as CCTV security and surveillance, classroom audio/video instruction, corporate audio/video presentations, and trade-show demonstration systems.

Here are some of the useful features of the hub:

- Distributes CCTV and A/V to multiple destinations over twisted pair, creating a centralized cabling system that replaces costly and bulky coax.
- Standard modular RJ-45 connections for quicker moves, adds, and changes.
- Supports S-Video and NTSC and PAL composite video
- Color transmission over as much as 2200 feet (671 m) of CAT5 between the source and destination.
- Supports up to 2 video and 2 audio channels.
- Integrates seamlessly with many IC440 series baluns.
- Supports looping output to daisychain or cascade to other hubs.
- Rubber stand-offs for desktop placement.

3. Installation

3.1 Installing a Single Hub

To install a Video CCTV-A/V Hub that isn't daisy-chained or cascaded with any other devices, follow the steps below.

CAUTION!

Do not attempt to open the housing. There are no user-serviceable parts inside the Video CCTV-A/V Hub.

To avoid electrical interference, keep your equipment, baluns, and cables away from neon or fluorescent lights, generators, electric motors, high-voltage lines, and other sources of high-voltage or high-frequency electromagnetic signals.

Keep in mind that video and audio 1 form one set of signals, while video and audio 2 form another set.

1. The Video CCTV-A/V Hub is polarity sensitive and works in conjunction with many of our IC440 series video baluns. If you want to use the hub with baluns that have an opposite signal polarity, you'll need to reverse the signal polarity of the cabling between the hub and the baluns (that is, cross-pin it). Make sure, however, that the pinout of any balun you use with the hub has the same pinout as the hub. (A table that shows the hub's pinout is printed on the hub's rear panel.)
2. Connect the appropriate video baluns to the audio/video source and destination devices, following the directions in the baluns' manual. Run the appropriate patch cables from the baluns to your site's twisted-pair cabling system.

The hub supports up to two video and two audio channels. So the hub will work with the:

- Video Balun (IC440A);
- Video Stereo Audio Balun (IC441A-R2);
- CCTV Video Balun (IC444A);
- Dual Audio/Video Balun (IC446A); and
- S-Video Balun (IC447A).

3. Place the Video CCTV-A/V Hub in its final location.

Before you run cabling from the hub to the baluns, you need to keep maximum cabling distances in mind. Given the type of video (if any) you're transmitting and the type of UTP cable you're using, the hub's final location must be within maximum distance specs of the source and destination devices (see the **Maximum Distance** specification in **Chapter 1**). These distances assume that the cable used conforms to the **Cable Required** specification in **Chapter 1**. Note that every cable and device interconnection is equivalent to 10 ft. (3 m) of cable and must be included in the maximum cable length calculation. If you're not sure of your cable length, you can estimate it by performing a DC resistance test with a digital ohmmeter, as shown in Figure 3-1. 1000 feet (305 m) of 24-AWG cable should give a reading of approximately 26 ohms (52 ohms if you are measuring at one end with the opposite cable ends shorted).

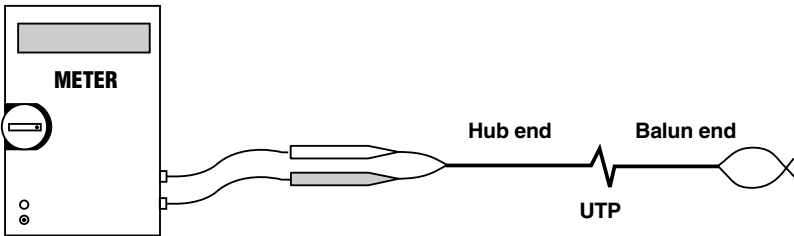


Figure 3-1. Measuring cable impedance.

The Video CCTV-A/V Hub must be kept away from sources of radio-frequency or electromagnetic radiation; at least:

- a) 5" (12.7 cm) from power lines carrying 2 kVA or less.
- b) 12" (30.5 cm) from fluorescent lighting and power lines carrying between 2 and 5 kVA.
- c) 36" (91.4 cm) from power lines greater than 5 kVA.
- d) 40" (101.6 cm) from transformers and motors.

You'll get the best performance by using a single continuous run of cable. Do not use flat-satin cable (that is, cable whose wires aren't twisted), even for patching short runs. Flat-satin cable acts as an antenna and will pick up nearby radio-frequency interference.

4. Identify the pinout of all involved video baluns and the Video CCTV-A/V Hub to see whether you'll need to use any cross-pinned cable. For example, if you're using all Video Stereo Audio Baluns (IC441A-R2), all of the UTP cable can be straight-through-pinned. Table 3-1 shows the pinouts of several of the baluns that can be used with the hub and straight-through-pinned cable. Figure 3-2 shows the difference between a balun RJ-45 pinning that needs straight-through cable (straight polarity) and one that needs cross-pinned cable (reverse polarity).

Table 3-1. Sample balun pinouts.

| | IC440A | IC441A-R2 | IC446A | IC447A |
|----------------|---------------|------------------|---------------|---------------------|
| Video 1 | 7 & 8 | 7 & 8 | 7 & 8 | 7 & 8 Y/luminance |
| Video 2 | N/A | N/A | 4 & 5 | 4 & 5 C/chrominance |
| Audio 1 | N/A | 1 & 2 | 1 & 2 | N/A |
| Audio 2 | N/A | 3 & 6 | 3 & 6 | N/A |

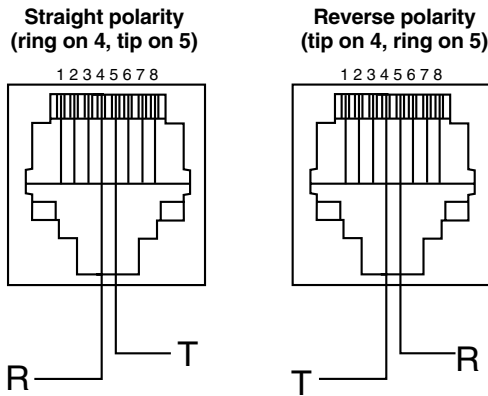


Figure 3-2. Connector signal polarity for the “video 2” signal.

5. Run the hub's power cord from the 5-pin DIN power inlet on its rear panel, shown in Figure 3-3, to the nearest working AC power outlet. The Power LED on its front panel, shown in Figure 3-4, should light up and stay on.

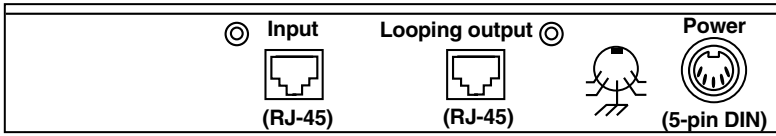


Figure 3-3. The hub's rear panel.

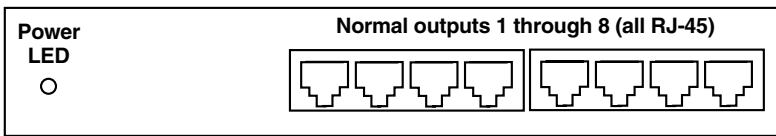


Figure 3-4. The hub's front panel.

6. Connect the cable coming from the A/V source devices to the RJ-45 input jack on the hub's rear panel, as shown in Figure 3-5.
7. One at a time, connect the twisted-pair cables coming from the A/V destination devices into the RJ-45 output jacks on the hub's front-panel, as shown in Figure 3-6.
8. Power on the source and destination equipment and send an audio/video signal from the source. Verify the presence and quality of the audio and video. If anything's wrong, refer to **Section 4.1**.

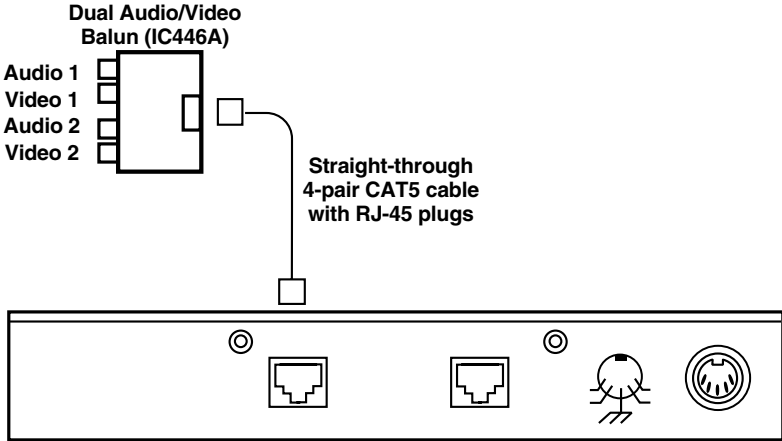


Figure 3-5. Balun-to-hub input connection (IC446A balun shown).

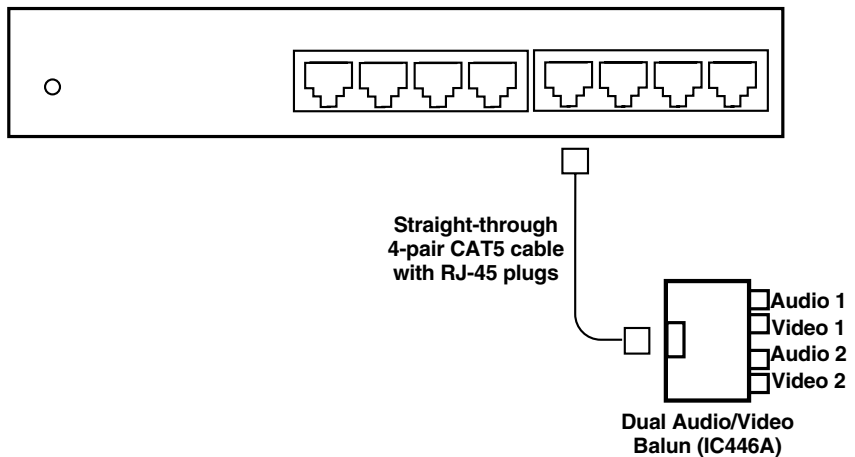


Figure 3-6. Hub-to-balun output connection (IC446A balun shown).

3.2 Typical Applications

Figures 3-7 and 3-8 show a pair of typical applications.

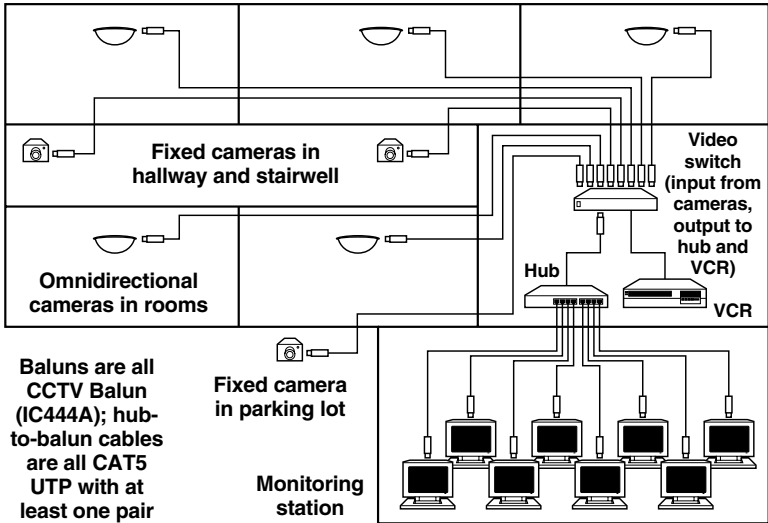


Figure 3-7. A hub-based closed-circuit security video system.

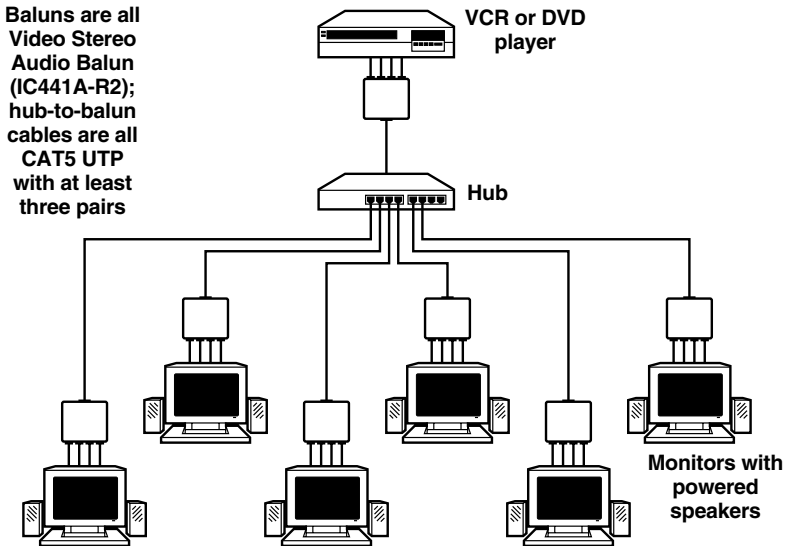


Figure 3-8. A hub-based classroom-video-broadcast system.

3.3 Installing a Hub in a Daisychain or Cascade

One Video CCTV-A/V Hub may be daisychained or cascaded with others in order to distribute a baseband A/V source to more than eight destinations. For example, an A/V presentation from a VCR or DVD player can be distributed to multiple classrooms using preinstalled CAT5 twisted-pair cable, as shown in Figures 3-9 and 3-10. Due to the active electronics in the hub, you can daisychain or cascade as many as eight layers of hubs together.

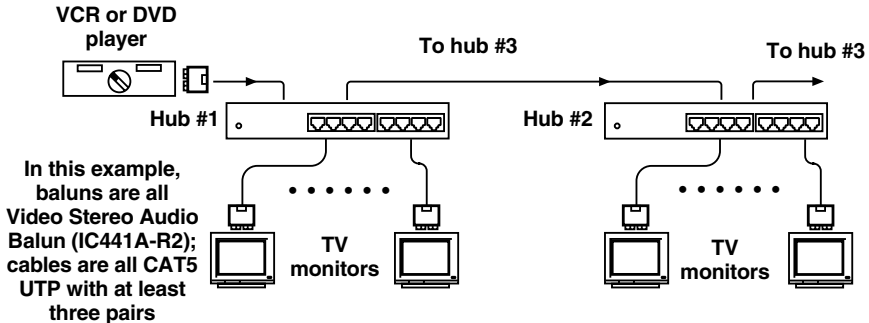


Figure 3-9. Daisy chaining hubs.

To daisy chain hubs as shown in Figure 3-9 without occupying any of your regular output ports, you can use the Video CCTV-A/V Hub's "looping output" RJ-45 jack, the right-hand RJ-45 jack on its rear panel. To link one hub to a second hub, run a 4-pair CAT5 cable from the looping output of the first hub to the input port of the second hub (the left-hand RJ-45 jack on its rear panel). The cable must be straight-through-pinned and terminated with RJ-45 plugs on either end. Your daisy chain can be as many as eight hubs long.

NOTE

The regular "distribution port" outputs and the looping output don't amplify the signal. The maximum distance from the source device to the most distant destination device may be up to 2500 feet (762 m) depending on the type of A/V signal being transmitted. The hub can be used with cross-connect blocks and patch panels, but each cross-connect results in an effective loss of distance of 5 to 10 feet (1.5 to 3 m). When splicing connections onto a cross-connect block, make sure that the individual wires remain twisted right up to within half an inch (1.3 cm) of the cross-connect.

If you need to reach more destinations than eight hubs can accommodate, you can cascade from each hub to multiple others as shown in Figure 3-10 instead of daisychaining. The regular outputs and looping output can all be used for this purpose—any of these ports may be connected to the input port of another hub. In the example in Figure 3-10, ten hubs (one first-layer hub, one not-shown second-layer hub attached to its looping output, and eight other second-layer hubs connected to its regular outputs) are used to distribute an A/V program to up to 72 monitors in an auditorium, multi-classroom, or corporate training environment.

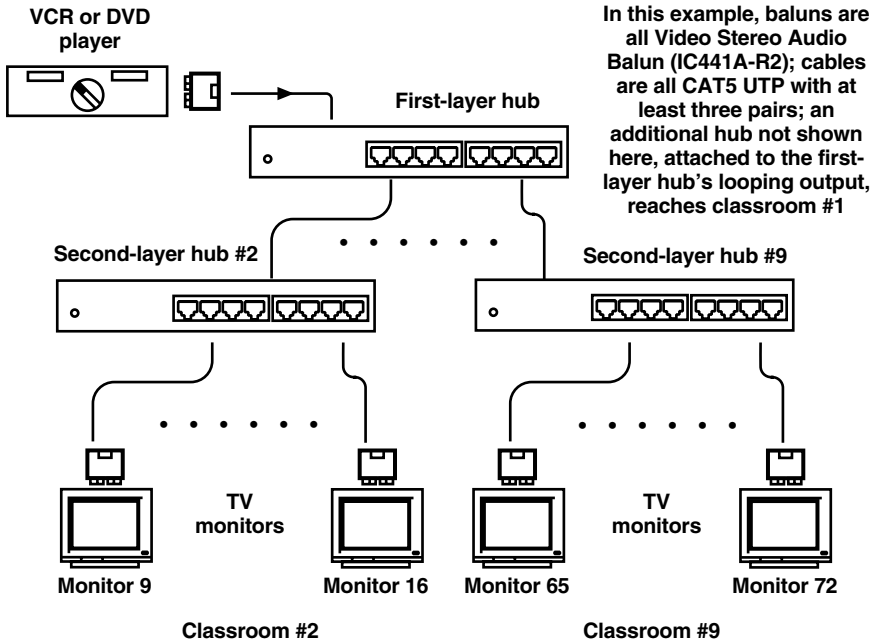


Figure 3-10. Cascading hubs.

4. Troubleshooting

4.1 Common Concerns

Here are some problems that can occur with the Video CCTV-A/V Hub and some of their possible causes and solutions:

The Power LED doesn't come on.

The hub's probably not getting any power. Make sure that the hub's power cord is securely plugged into both the hub and a working AC outlet. If necessary, temporarily plug another device into the outlet to make sure that the outlet works.

You get no video image or audio.

The UTP cable might be disconnected or broken, or there might be an open wiring path or split or crossed twisted pairs. Try these remedies: Check all of your UTP connections; verify wiring continuity with an ohmmeter; check the pinning and pairing of your UTP cabling; and make sure the pinouts of all of the baluns you're using match the hub's.

You get a distorted video image.

The signal polarity might be reversed; there might be a cable pinning, pairing, or construction problem; or there might be a pinning mismatch between the hub and baluns. Try these remedies: Verify that polarity is straight through on each A/V channel; verify that the pinouts of all of the baluns you're using match the hub's; check the pinning and pairing of your UTP cabling; and make sure that the pairs in your UTP cabling are fully twisted up to the connection points.

The picture is clear but has lost color.

The end-to-end link is probably suffering excessive signal loss. Make sure that your cable connections are secure; that your equipment and cables are well away from neon and fluorescent lights, generators, electric motors, high-voltage lines, and other sources of high-voltage or high-frequency electromagnetic signal; and that you're not trying to run your UTP cabling too far. (The maximum distance over which the hub and baluns can transmit and receive video signals depends on your cable and your video and audio equipment; refer to the **Maximum Distance** specification in **Chapter 1**.)

4.2 Calling Black Box

If you determine that the Video CCTV-A/V Hub is malfunctioning, *do not attempt to alter or repair the unit*. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem;
- when the problem occurs;
- the components involved in the problem, including the models of baluns; type, make, and length of cabling; and the source and destination A/V equipment;
- any particular application that, when used, appears to create the problem or make it worse; and
- the results of any testing you've already done.

4.3 Shipping and Packaging

If you need to transport or ship your Video CCTV-A/V Hub:

- Package it carefully. We recommend that you use the original container.
- If you ever ship the hub back to us for any reason, contact Black Box to get a Return Authorization (RA) number.



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