CAT5 Multi Video System
(Video/Audio/RS232)
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.

FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA RADIO FREQUENCY INTERFERENCE STATEMENTS

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TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.
1. Specifications

**Cable Required:** Between transmitter and receiver(s): Category 5 shielded or unshielded twisted pair (STP or UTP)

**Compliance:** CE; FCC Class A, IC Class Classe A

**Video Support:** VGA, SVGA, XGA, XGA-2, RGBHV, RGB, YUV

**Resolution and Refresh Rate:** At 500 ft. (137.2 m) or less: Up to 2048 x 1536 at up to 75 Hz; See the Maximum Distance specification

**Transmission:** Transparent to users (automatic, no delay)

**Required Source Interface:** Video OUT: 75 ohms; Audio OUT (if any): 600 ohms maximum

**Destination Interface:** Video IN: 75 ohms; Audio IN (if any): 600 ohms minimum

**Bandwidth:** Video (3 dB): DC to 8 MHz

**Audio Characteristics:** Channels: Stereo, line level

**Serial Characteristics:** Protocol: Asynchronous; transparent to data format; transparent to data rates up to 19.2 kbps; Operation: Simplex or full duplex, user-selectable;

**Maximum Distance:** Total end to end, from source device to farthest destination device, over good CAT5 cable (assuming A/V source outputs signal at normal strength): Up to 500 ft. (152 m) at resolutions up to 2048 x 1536 at up to 75 Hz;

**Connectors:** AC1060A: (1) 4 captive screw, (1) RJ-45, (1) HD15 F; (1) DB9 M AC1061A: (1) 4 captive screw, (1) RJ-45, (1) HD15 F; (1) DB9 M AC1062A: (1) 4 captive screw, (2) RJ-45, (1) HD15 F; (1) DB9 M AC1065A: (1) 4 captive screw, (1) RJ-45, (1) HD15 F; (1) DB9 M AC1066A: (1) 4 captive screw, (2) RJ-45, (1) HD15 F; (1) DB9 M All: (1) power inlet

**Temperature Tolerance:** Operating: 32 to 104°F (0 to 40°C);

**Tolerance:** Storage: -4 to +140°F (-20 to +60°C)

**Humidity Tolerance:** Up to 80% noncondensing

**Enclosure:** Steel

**Power:** From utility-power (mains) outlet to power inlet, through detachable external power supply: Input: 100 to 250 VAC @ 50 or 60 Hz (autosensing); Output: +5 VDC; Consumption: 5 watts maximum

**Size:** AC 1060A: 1.2”H x 4.1”W x 4.3”D (3.1 x 10.4 x 10.9 cm) AC1061A, AC1062A, AC1065A, AC1066A: 1.2”H x 4.1”W x 5.5”D (3.1 x 10.4 x 14.0 cm)

**Weight:** 1.0 lb. (0.45 kg) (all units)

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2. Introduction

**2.1 Overview**
The CAT5 Multi Video System extends VGA or Component video signals as well as stereo audio and RS232 signals over ordinary Category 5 cable. All models support RGBHV, RGB, VGA, and component video, and they use a transmitter-to-receiver setup. They can be used as video splitters as well as video extenders.

This manual covers CAT5 Multi Video System Transmitter/Receivers (AC1060 - AC1062A, AC1065A-AC1066A).

These models enable you to broadcast line-level mono audio and RS232 serial, along with video from your computer, to as many as 100 computer monitors up to 500 feet (152 m) away over CAT5.

CAT5 Multi Video System receivers are available with single or dual daisychainable connections. The dual daisychainable receiver is used when the same signal is distributed to multiple display devices across a single CAT5 cable in a daisychain or loop-through fashion. Setup and cabling are the same as the single-port receiver.

All models support refresh rates/resolutions up to 2048 x 1536 @ 75 Hz at up to 500 feet (152 m).

**WARNING**
This equipment is not intended for, nor does it support, distribution through an Ethernet network. Do not connect these devices to any sort of networking or telecommunications equipment!

**2.2 Package Contents**
You should have received the following when ordering a CAT5 Multi Video System receiver:

- The transmitter or receiver.
- External power supply (100–250 VAC, 50–60 Hz, autosensing) with cord.
- This manual.
2.3 Equipment You May Also Need
• Rackmount Brackets:
  For or single-port/dual daisychainable units:
  AC1009 for 4 transmitter units; AC1010 for 8 transmitter units;
  AC1011 for 3 receiver units; AC1012 for 6 receiver units;
• Audio cable with RCA jacks.
• Video cable with HD15 connectors.
• Serial cable with DB9 connectors.
• CAT5 cable.
• For the single-port audio models, an audio splitter.

2.4 Compatible Cabling
CAT5 cabling for the CAT5 Multi Video System must be pinned to the TIA-EIA T568B wiring specification. We also highly recommend that all CAT5 cables be pre-terminated and tested. Cables terminated on-site or in an existing infrastructure should be tested before use to ensure compliance with the TIA-EIA T568B specification. Using incorrectly terminated CAT5 cables can damage the CAT5 Multi Video System.

3. Setup and Installation

3.1 Data Mode Configuration
RS 232 Serial signals are fixed at 9600 baud. Three wire serial protocol is used (Tx, Rx, GND). There are no changeable configuration settings.

3.2 Cabling Considerations
• We recommend mounting and connecting all cabling to the CAT5 Multi Video System components before applying power.
• Makes sure that the CAT5 cable you intend to use has been tested to comply with the TIA/EIA 568B wiring specification.

3.3 Making the Connections
3.3.1 Connections and Setup in General
This section contains figures showing connections with the specific CAT5 Multi Video System models. In general, however, the connection and setup procedure at both transmitter and receiver ends is as follows:

At the transmitter end:
1. Connect the source video to the CAT5 Multi Video System transmitter video input port, which is an HD15 connector labeled SOURCE IN.
2. If desired, attach a local monitor via the local monitor port to LOCAL OUT.
3. Make your audio or serial connections. Connect the audio input to the AUDIO connector Pins 1 (Left Audio +), 2 (ground), 3 (Right Audio +)
4. Connect the serial input to the RS-232 (DB9 female) port.
5. Connect the CAT5 cable to the transmitter.
6. Apply power on the transmitter. The LED should light and, if there’s a local monitor attached, a video image should appear on the monitor’s screen.

At the receiver end:
1. Connect the SOURCE OUT HD15 connector to the display unit, and attach any audio or serial connections.
2. Make sure that the CAT5 cable connection(s) from the transmitter are secure.
3. Apply power. The LED should light and video should appear on the display (make sure display is powered ON).
4. For video clarity, adjust the EQ compensation knob, which optimizes the image for the length of CAT5 cable used. Counter clockwise is zero feet of cable and clockwise is 500 ft of cable. Turn knob slowly to ensure display has time to sync up.

NOTE
The single-port units with audio have a single audio input. So, for audio capabilities on the attached monitor, you’ll need an audio splitter.
5. If necessary, adjust one or two (never all three) of the skew compensation switches to add a 10ns delay for that color. This may be necessary for Cat6 cables or cat5/5e cables in the 400 to 500 ft range.

If there are any problems at either end, see Chapter 4.

### 3.3.2 CONNECTIONS ON THE SINGLE-PORT VGA/AUDIO/SERIAL

The single-port units support video, serial and audio signals over CAT5 cable. The audio signal is line-level audio, and powered speakers are required. Note that there’s a single connection for audio input. If you use a local station, you’ll need an audio splitter for that jack. (For more information, call Technical Support).

The serial signal is 3 wire RS232 (Tx, Rx, Gnd). You can also use the transmitters and receivers to make video-only connections without audio or serial.

Figure 3-1 shows the Single-Port CAT5 Multi Video System Transmitter connections, and Figure 3-2 shows the receiver connections.

The Multi Video receiver unit AC1065A is used for component video. A video adapter cable is required to connect RCA video inputs into the HD15 connector.

### 3.3.3 CONNECTIONS ON THE DUAL DAISYCHAINABLE VGA/AUDIO/SERIAL RECEIVER

The dual daisychainable receiver is used when the same signal is distributed to multiple display devices on a single CAT5 cable in a daisy chain or loop-through fashion.

Setup and cabling are the same as the single-port receiver, but the dual daisychainable model has an additional RJ-45 connector for linking to another dual daisychainable receiver or single-port receiver.

Figure 3-7 shows how connections are made on the dual daisychainable receiver. Note that serial is one way simplex.

The Multi Video receiver unit AC1066A is used for component video. A video adapter cable is required to connect RCA video inputs into the HD15 connector.

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![Figure 3-1. Transmitter connections on the AC1060A.](image1)

![Figure 3-2. Receiver connections on the AC1061A/1065A.](image2)

![Figure 3-5. Dual daisychainable receiver connections on the AC1062A/AC1066A.](image3)
CHAPTER 3: Setup and Installation

3.3.4 A TYPICAL SINGLE-PORT TRANSMITTER–RECEIVER APPLICATION
Figure 3-9 shows a typical application in which the single-unit transmitter is connected over CAT5 to a single-unit receiver.

4. Troubleshooting

4.1. Common Problems

In most cases, nearly every issue with the CAT5 Multi Video System can be resolved by checking the CAT5 termination and making sure that it’s pinned to the TIA/EIA 568B wiring specification. However, there may be other problems that cause the system to not perform as it’s designed. Below are solutions to the most common installation errors.

Problem: No video signal at the transmitter local port or at the receiver.
Solution:
• Check that both units are powered.
• Make sure the CAT5 cable is terminated correctly per the TIA/EIA 568B wiring specification.
• Is the display device powered on and functioning?
  In some cases, the video termination may be mismatched. The transmitters and receivers ship with 75-ohm termination as the default. To disable termination, see Appendix B.

Problem: Video signal is poor.
Solution:
• Have all receiver settings been finished (see sections 3.3).
• Check all cable connections.
• The video signal’s refresh rate may be set too high. Reset to a lower refresh rate in your monitor-configuration menu.
• There may be a delay skew issue. Call Technical Support.

Problem: Audio is poor.
Solution:
• Powered speakers are required. Make sure speaker power is ON.
• Check input source levels from the source device. Make sure the audio source is not overdriven or underdriven.

Problem: Serial communication doesn’t work correctly.
Solution:
• Are the serial devices connected properly? Are the serial parameters correct for source/destination devices?
• Are the serial cables terminated correctly? If a null-modem cable is used, it must be placed at the receiver end.
• When using daisy chain receivers, the serial signal is a unidirectionally broadcast mode only. In this mode, all other CAT5 Multi Video System devices must be the simplex serial type. For assistance, contact Technical Support.
• The last device in a daisychain configuration must be a standard receiver unit with a terminated serial board.
CHAPTER 4: Troubleshooting

Problem: “Green shift” or “green washout” on multimedia signals.
Solution: Please contact Technical Support.
The standard video/serial model is designed to function with DC coupled signals in which the black level is referenced to 0 volts. Nearly all VGA cards function this way. Some media servers, however, provide AC coupled signals and can cause a green color shift in the video. This is a result of the sync clamping on the red and blue channels of the video/serial model.
For five-component (RGB/H&V) AC coupled video, the AC1060A single port transmitter has optional DC restoration circuitry that is easily enabled via a dipswitch setting (see Appendix C).

4.2 Calling Black Box
If you determine that your CAT5 Multi VGA System is malfunctioning, do not attempt to alter or repair it. It contains no user-serviceable parts. Contact Black Box 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.
• any particular application that, when used, appears to create the problem or make it worse.

4.3 Shipping and Packaging
If you need to transport or ship your CAT5 Multi VGA System:
• Package it carefully. We recommend that you use the original container.
• If you are shipping the CAT5 Multi VGA System for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Authorization (RA) number.

Appendix A. Cabling Pinouts

Table A-1. HD15 video connector.

<table>
<thead>
<tr>
<th>Pin</th>
<th>RGBHV (VGA)</th>
<th>RGBS</th>
<th>RGsB YUV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red +</td>
<td>Red +</td>
<td>Red +</td>
</tr>
<tr>
<td>2</td>
<td>Green+</td>
<td>Green+</td>
<td>Green+</td>
</tr>
<tr>
<td>3</td>
<td>Blue+</td>
<td>Blue+</td>
<td>Blue+</td>
</tr>
<tr>
<td>4</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Red-</td>
<td>Red-</td>
<td>Red-</td>
</tr>
<tr>
<td>7</td>
<td>Green-</td>
<td>Green-</td>
<td>Green-</td>
</tr>
<tr>
<td>8</td>
<td>Blue-</td>
<td>Blue-</td>
<td>Blue-</td>
</tr>
<tr>
<td>9</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>10</td>
<td>Gnd</td>
<td>Gnd</td>
<td>—</td>
</tr>
<tr>
<td>11</td>
<td>Gnd</td>
<td>Gnd</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>13</td>
<td>H Sync</td>
<td>C Sync</td>
<td>—</td>
</tr>
<tr>
<td>14</td>
<td>V Sync</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>15</td>
<td>Gnd</td>
<td>Gnd</td>
<td>—</td>
</tr>
</tbody>
</table>

Table A-2. AUDIO connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Left Channel</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Right Channel</td>
</tr>
<tr>
<td>Pin 4</td>
<td>-</td>
</tr>
</tbody>
</table>
Appendix A. Cabling Pinouts

Table A-3. DB9 Male Serial connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>3 wire</th>
<th>Simplex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>TX</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A-4. T568B CAT5 pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orange/White</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Orange</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Green/White</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Blue</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Blue/White</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Green</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Brown/White</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Brown</td>
<td>4</td>
</tr>
</tbody>
</table>

CAT5 MULTI VIDEO SYSTEM.

Appendix B. Setting Sync Signal Output Termination

In some cases, it may be necessary to disable the 75-ohm termination of the video outputs on the CAT5 Multi Video System units. This can be done by opening the case of each unit and installing jumpers on the circuit board. The settings disable/enable the 75-ohm termination on individual units. For instance, changing a transmitter termination affects the local monitor port only; it doesn’t affect the receivers. Conversely, changing a receiver affects the output port of the receiver, not the transmitter. The following diagrams show the jumper locations for each type of assembly reference the transmitter manual for transmitter settings.

Figure B-1. 1-port transmitter.

Figure B-2. Receiver termination settings
Appendix C. DC Restoration of AC coupled source

The Cat5 Multi Video system is designed to function with DC coupled signals with the black level referenced to 0 volts. Nearly all VGA cards function this way. However, some media servers or digital camera devices provide AC coupled signals and can cause a green color shift in the video. This is a result of the sync clamping on the Red and Blue channels. The single port transmitter has been designed with full DC restore capability. A simple switch setting is all that is required.

The following diagrams show the switch location and settings for the AC1060A transmitter assembly.

*Note: Switch settings other than shown below may result in unpredictable performance and are not supported by Black Box.*

DC restore option:
Enable: Switch position B, C ON (UP)
Disable: Switch position B, C OFF (default)

Appendix D. Rackmounting Units

The Rackmount Kits include brackets for mounting a single transmitter, single receiver, or a single dual daisychainable receiver. Figure E-1 shows the 1-Unit Rackmount Bracket (AC1008), which can be used to mount a single CAT5 Multi VGA System unit on a wall. Figure E-2 shows the 4-Unit Rackmount Bracket (AC1009), which holds four units in a 19" x 1U rack.

Not shown are brackets for 8 units. The 8 Unit Rackmount Bracket (AC1010) holds the mounted units like the 4-Unit Rackmount Bracket (AC1009) but is 2U high instead of 1U high, stacking 4 slots directly above 4 slots.