Multi DVI System
MultiMode Fiber Series

AC1088A
AC1089A
AC1090A
AC1091A
AC1092A
AC1093A
AC1094A
AC1095A
AC1096A
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 radiotechniques 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.

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 bloquear la ventilación. Nótese que la colocación incorrecta puede causar calor excesivo, lo que puede resultar en un mal funcionamiento del aparato.
10. El equipo eléctrico deberá ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que produzcan 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.

A: El cable de poder o el contacto ha sido dañado; u
B: Objectos 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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**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: Multi mode fiber optic
               Between daisychain receivers: Cat5/Cat6 or Multi mode fiber optic

Compliance: CE; FCC Class A, IC Class A

Video Support: DVI Single Link

Resolution: 1600x1200, 1080P (if graphics card supports reduced clock rate)

Transmission: Transparent to users

Bandwidth: 1.65 Gbps

Audio

Characteristics: Channels: Stereo Audio;

Serial

Characteristics: Protocol: Asynchronous; transparent to data format;
transparent to data rates up to 115k kbps;

Maximum Total end to end over fiber optic cable, from transmitter to receiver
Distance: or between fiber-fiber daisy chain receivers: to 1,640 ft (500m).
           Between daisy chain receivers over CAT5/CAT6: 600 ft (183m).

Connectors:
AC1088A: (1) Dual LC fiber (1) RJ-45, (2) DVI F;
AC1089A: (1) Dual LC fiber, (1) RJ-45, (1) DVI F;
AC1090A: (1) Dual LC fiber, (2) RJ-45, (1) DVI F;
AC1091A: (2) Dual LC fiber, (2) RJ-45, (1) DVI F;
AC1092A: (1) Dual LC fiber, (1) RJ-45, (2) DVI F; (1) 4 phoenix, (1) 5 phoenix
AC1094A: (1) Dual LC fiber, (1) RJ-45, (1) DVI F; (1) 4 phoenix, (1) 5 phoenix
AC1095A: (1) Dual LC fiber, (2) RJ-45, (1) DVI F; (1) 4 phoenix, (1) 5 phoenix
AC1093A, AC1096A:
(2) Dual LC fiber, (2) RJ-45, (1) DVI F; (1) 4 phoenix, (1) 5 phoenix

All: (1) power inlet

Temperature
Tolerance: Operating: 32 to 104°F (0 to 40°C);
           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: 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)
2. Introduction

2.1 Overview
The Multi DVI System extends DVI video signals over fiber optic cable or Cat5 cable. All models support single link DVI video modes. Either Fiber OR CAT5 inputs and outputs may be utilized as well, however only one combination is active at a time. The units will autosense which port is in use. Note distance limitations of fiber or Cat5.

This manual covers Multi DVI System units for video (AC1088A, AC1089A, AC1090A, AC1091A), Multi DVI units for video, stereo audio, and RS232 serial (AC1092A, AC1093A) and Multi DVI units for video, stereo audio, and pollable RS232 (AC1094A, AC1095A, AC1096A).

Multi DVI 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 cable in a daisy chain or loop-through fashion. Setup and cabling are the same as the single-port receiver.

Serial and audio versions provide stereo audio and full RS232 signals. When used in a daisychainable mode, the RS232 is unidirectional transmit only. The pollable serial versions allow a bi-directional RS 232 session to be made between the Multi DVI transmitter and a single receiver in a daisy chain setup. Each receiver must be addressed with a unique address. See Appendix D for details.

WARNING
This equipment is not intended for, nor does it support, distribution through an Ethernet fiber 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 Multi DVI System receiver:
• The transmitter or receiver unit.
• External power supply (100–250 VAC, 50–60 Hz, autosensing) with cord.
• This manual.
• For pollable serial transmitters, a programming kit to set receiver units addresses is included

2.3 Equipment You May Also Need
• Rackmount Brackets:
  • For or single-port/dual daisychainable receivers:
    • AC1011 for 3 units; AC1012 for 6 units;
  • Stereo Audio cable.
  • DVI Video cable.
  • Serial cable.
  • Fiber Optic cable.

2.4 Compatible Cabling
Cabling for the Multi DVI System must be a dual Multimode 62.5 micron fiber optic cable terminated into a duplex type LC fiber optic connector or Cat5/Cat6 cable pinned to the EIA T568B specification (see Appendix A).
CHAPTER 3: Setup and Installation

3. Setup and Installation

3.1 Data Mode Configuration

For pollable serial versions only: Each receiver unit must have a unique address assigned to it before installation. Pollable series transmitters come with a programming kit consisting of a windows application and a cable adapter to connect to the receiver unit. See Appendix D for instructions.

3.2 Cabling Considerations

- We recommend mounting and connecting all cabling to the Multi DVI System components before applying power. Please note recommended power sequence below.

3.3 Making the Connections

3.3.1 Connections and Setup in General

This section contains figures showing connections with the specific Multi DVI 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 Multi DVI System transmitter video input port, which is a DVI connector labeled DVI IN.
2. If desired, attach a local monitor via the local monitor port to DVI OUT.
3. Make your audio and/or serial connections.
   For audio: Connect the audio input to the AUDIO connector
   For RS-232: Connect the serial input to the RS-232 COMM connector port 1.
   (Port 2 is reserved for internal console use)
4. Connect the fiber optic or CAT5 cable to the transmitter.
5. Do not apply power to the transmitter at this time.

At the receiver end:

1. Connect the DVI OUT connector to the display unit, and attach any audio or serial connections depending on the model of Multi DVI System (see Sections 3.3.2 through 3.3.5 for model-specific connections). If pollable serial mode is in use, the receiver must have a unique address. Please see Appendix D.
2. Make sure that the fiber optic or Cat5 cable connection from the transmitter or receiver are secure.
3. Apply power to the display, then to the receiver.
4. Next, the transmitter should be powered on and finally the video source signal. Reference Appendix B for Link status and LED indicator explanations.

If there are any problems at either end, see Chapter 4.
3.3.2 CONNECTIONS ON THE SINGLE-PORT MULTI DVI

The AC1088A, AC1089A units support DVI video over fiber optic cable. Note that CAT5 inputs and outputs may be utilized as well, however only one combination is active at a time. The units will autosense which port is in use. Figure 3-1 shows the video only Multi DVI System Transmitter connections, and Figure 3-2 shows the receiver connections.
3.3.3 CONNECTIONS ON THE SINGLE-PORT DVI/AUDIO/RS-232

The Single-Port Multi DVI System with Audio and RS-232 supports video, stereo audio and full-modem serial (RS-232) signals over fiber optic or cat5 cable. Figure 3-3 shows the Single-Port Multi DVI System with Audio and RS-232 Transmitter connections, and Figure 3-4 shows the receiver connections. Note that CAT5 inputs and outputs may be utilized as well, however only one combination is active at a time. The units will autosense which port is in use.

Use RX 1 / TX 1 port for serial communications. RX 2 / TX 2 is reserved to program the Multi DVI System units.

Figure 3-3. Transmitter connections on the AC1092A.

Figure 3-4. Receiver connections on the AC1094A.
MULTI DVI SYSTEM

3.3.4 CONNECTIONS ON THE DUAL DAISYCHAINABLE RECEIVER OR DUAL DAISYCHAINABLE VIDEO/AUDIO/RS-232 RECEIVER

The dual daisychainable receiver is used when the same signal is distributed to multiple display devices on a single cable in a daisychain or loop-through fashion. Note that daisy chaining utilizes the CAT5 connector only on the AC1090A and AC1095A. The CAT5 or Fiber OUT may be used on the AC1091A, AC1093A, or AC1096A units. These units will autosense which port is in use at power on. CAT5 Cable lengths must not exceed 600 ft between units and multimode fiber optic cable lengths must not exceed 1,640 ft.

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

Figure 3-5 shows how connections are made on the dual daisychainable receiver with video and Figure 3-6 shows how connections are made on the dual daisychainable receiver with Audio and RS-232. Note that serial is one way simplex for AC1093A units or pollable for AC1095A and AC1096A units. See Appendix D to set up and use pollable serial mode.

*NOTE: All Connections are shown. Depending on model purchased not all connectors will be available.

Figure 3-5. Dual daisychainable receiver connections on the AC1090A, AC1091.

Figure 3-6. Dual daisychainable receiver connections on the AC1093A, AC1095A, AC1096A.

*NOTE: All Connections are shown. Depending on model purchased not all connectors will be available.
4. Troubleshooting

4.1. Common Problems

In most cases, nearly every issue with the Multi DVI System can be resolved by checking the Fiber optic or CAT5 cable and making sure that it’s properly terminated and in the case of CAT5 cable, 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 cable is terminated correctly.
- Is the display device powered on and functioning?
- Power on units in sequence (display, receiver, transmitter, video source).
- Display may not be correctly identified by source device. See Appendix E for DDC communication issues.

**Problem:** Video signal is poor.

**Solution:**
- See Appendix C for changing compression mode.
- 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.
- In 1080P mode, the PC graphics card needs to be set to reduced clock rate mode. Contact the graphics card manufacturer.

**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 daisychain receivers, the serial signal is a unidirectionally broadcast mode.
- If using pollable RS232, ensure each receiver has a unique address. The transmitter is always address 0. See Appendix D.
4.2 Calling Black Box
If you determine that your Multi DVI 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 Multi DVI System:
• Package it carefully. We recommend that you use the original container.
• If you are shipping the Multi DVI 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. AUDIO connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Right Channel</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Left Channel</td>
</tr>
</tbody>
</table>

Table A-2. COMM serial connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Serial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Rx 2 (console)</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Tx 2 (console)</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Rx 1</td>
</tr>
<tr>
<td>Pin 5</td>
<td>Tx 1</td>
</tr>
</tbody>
</table>

Table A-3. T568B CAT5 pinout

![T568B CAT5 Specification](image)
Appendix B. Status LED’s

The Multi DVI System feature “status-at-a-glance” LED’s to ensure the units are functioning properly and to isolate problems with input signals, units, and/or cabling thus saving time during installation and troubleshooting. Reference the following tables for information on these indicators. The UTP connector also contains LED indicators on either side to provide visual cues on connection and traffic status.

## Link Status LED’s

<table>
<thead>
<tr>
<th>LED</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 1   | Normal Operation == OFF  
|     | ON == EXCEPTION—a serious problem has occurred with the unit. Contact Technical Support. |
| 2   | Normal Operation == ON  
|     | ON == Active DVI signal detected from source for transmitter side OR Active DVI display detected if receiver side |
| 3   | Normal Operation == ON  
|     | Indicates active link between transmitter and receiver |
| 4   | Normal Operation == ON  
|     | Indicates video packet transmission between transmitter and receiver |

### Multi DVI RJ45 UTP status Indicators:

- **Left Side LED**: Should blink when data is sent between transmitter and receiver. If no blinking occurs, check DVI signal input from the video source.
- **Right Side LED**: Should be ON when communication is established between a transmitter and receiver. If it is off, check cabling between the units.
Appendix C. Compression Mode

The Multi DVI System features two video compression modes to enable high resolution video extension over long distances. Compression modes may be changed with a simple jumper setting accessible through the front cover. *All units must be set to the same compression mode for proper operation.*

The two modes are:

- **Pixel Compression mode.** Suitable for static non motion content. **DEFAULT**
  Jumper J10 IN

- **Color Compression mode.** Suitable for moving content such as DVD movies.
  Jumper J10 OUT

To change the compression mode, remove the compression mode jumper access cover on the front of the Multi DVI unit and remove or install a jumper on J10 underneath.

![Figure C-1. Compression Mode Jumper Access](image)
APPENDIX D. Pollable Serial Mode

The pollable serial daisychainable receivers with video, audio and RS232 serial feature the ability to open a bi-directional session between a pollable transmitter and a single pollable receiver in a daisychain installation.

Each pollable receiver must have a unique address set first. Once this has been done, a special command (discussed below) is sent to the transmitter to specify the receiver to open a session with. Once this has been done, serial communication can occur between the RS232 source and display.

If an address of 0 is sent, the RS232 commands will be broadcast to all receivers.

The following details the installation and setup procedure.

To set the receiver address requires the programming kit that came with the pollable transmitter. This kit includes a special cable and windows setup program. Following are instructions on set up and receiver addressing.

1) Install the Multi DVI Pollable Serial Setup Tool from the included CDROM onto a PC with a serial port. Insert the CDROM into the PC, navigate to the CDROM directory and run the file D:\SETUP.EXE (in this example D is the CDROM drive. Please substitute the appropriate CDROM letter of your drive if it is different). Follow the prompts to install the software.

2) Once the software has been installed, navigate to the location it was installed (default is C:\Program Files\BlackBox), and run the file BBSAMGUI.EXE.

3) In the top menu, click the CommPort option and select OpenPort.

4) In the Comm window, click on the CommPort menu item and select properties.

5) Verify the correct COM port is selected and Connection properties are 9600 maximum speed, 8 Data bits, No Parity, 1 Stop Bit, Flow Control is set to NONE. Click OK when done.

6) In the Comm window, click the CommPort menu item and select Port Open. A window will pop up indicating the selected COM port is open.

7) Locate and connect the serial interface cable from the programming kit and connect the DB9 end to the PC and the phoenix connector to the serial port of the receiver that needs to be addressed.

8) It is recommended to create a list of receiver addresses and label each receiver with its’ address and intended location for future reference.
APPENDIX D. Pollable Serial Mode, cont

9) To address the receiver unit, ensure the serial cable is connected to the receiver and the PC running the setup application, select the address desired (between 1—254) in the Address Selector box in the top left. Next click the SET UNIT ADDRESS button next to it. The command has completed successfully when the STATUS bar indicates “Instruction Completed”. To check a receiver address, click the READ ADDRESS (Receiver) button.

10) If desired, the baud rate of the receiver may also be changed to match the display connected to it if necessary. All receivers must be set to the same baud rate. Select desired baud rate in the Baud Rate box, then click the Baud Rate Selector button.

11) Once all receivers have been addressed and installed, the lower half of the setup tool can be used to test communication from the transmitter to each individual receiver.

12) Simply enter the desired receiver address in the Address Selector and click the SET NEW ADDRESS button. Text entered on the right TRANSMITTING box will appear below in the RECEIVING box if everything is working correctly. Transmitter address will always be 0.

Figure C-1: Multi DVI Pollable Serial Setup Tool GUI

Text in Transmitting area should be mirrored in Receiving area in normal operation
In order to utilize the pollable serial mode in normal operation and connect to individual receivers, a special command needs to be sent to the transmitter in order to establish a session between transmitter and receiver. Follow the steps below to do this (must be done from serial control application in use on port 1).

1) To establish a bi-directional RS232 session with a specific receiver, the transmitter needs the receivers address set. To do this send a CTRL-D <ID> carriage return, where <ID> is the receiver address (between 1-254)

2) To broadcast serial commands to all receivers, set <ID> to 0.

3) To disable serial communication to all receivers, set <ID> to 255 (to enable serial communication again, simply set <ID> to a receiver address.

Once a transmitter has the correct ID set, normal bi-directional communication can occur between transmitter and receiver.
APPENDIX E. DDC Modes

The Multi DVI System features the ability to send DDC display identifiers to the video source in order to determine display capabilities. The DDC is a data communication channel used in plug and play devices to accurately report a display’s capabilities and identify the manufacturer. If this data is not available, the video source may revert to a low resolution or not display at all.

The Multi DVI features the ability to report a Universal Display (MRI Magic Display) that supports most popular VESA standards in standard or widescreen formats as well as the ability to clone an actual display’s DDC information that is attached to either the local DVI output of the transmitter or a receiver’s DVI output.

The various modes are detailed below:

Mode 1: Universal Display (MRI Magic Display) (DEFAULT)
   This mode reports a generic display supporting popular screen formats and is suitable for most if not all display types.

Mode 2: Clone DDC from DVI Output of transmitter
   This mode copies the DDC from a display attached to the local output of the transmitter.

Mode 3: Clone DDC from receiver (first one if using daisychain options)
   This mode copies the DDC data from a display attached to the receiver (first receiver if a daisychain mode is in use).

To change modes requires internal jumpers to be changed. See Figure E-1 for jumper locations (settings are stored in non-volatile RAM and are not lost when power is removed). All settings are done at transmitter:

Mode 1: To restore, install jumper J20 while transmitter is power on. No other cable connections need to be made.

Mode 2: To clone DDC from a display connected to the local DVI output of the transmitter, Install a jumper on J9 and J20 while transmitter is powered off, then connect the display to the transmitter and power it on. Remove J20 while transmitter is powered on and leave J9 in. The video source does not need to be connected.

Mode 3: To clone DDC from a display connected to the DVI output of the receiver, remove jumper on J9, ensure J20 is in while transmitter is powered off, then connect the display to the receiver and the receiver to the transmitter and power everything on. Remove J20 while transmitter is powered on and leave J9 off. The video source does not need to be connected.
Figure E-1. Jumper locations to change DDC Mode.
Appendix E. Rackmounting Units

The Rackmount Kits include brackets for mounting a transmitter, receiver, or a dual daisychainable receivers in a 19 rack. Figure F-1 shows the 2-Unit Rackmount Bracket (AC1011), which holds three units in a 19” x 1U rack.

Not shown are brackets for 6 units. The 6-Unit Transmitter/Receiver Bracket (AC1012) is like the AC1011 but occupies 2U of space instead of 1U in a 19” rack, stacking 3 units atop 3 units.

Figure E-1. Mounting with the AC1011 kit.