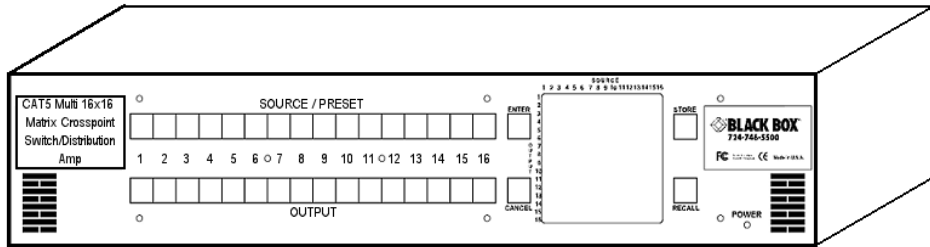




## CAT5 Multi Video System

## CAT5 Multi 16x16 Matrix Switch



**CUSTOMER  
SUPPORT  
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](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto: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.



**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.

**TRADEMARKS USED IN THIS MANUAL**

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

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# 1. Specifications

**Cable Required:** Category 5 shielded or unshielded twisted pair (STP or UTP)

**Compliance:** CE; FCC Class A, IC Class/class A

**Video Support:** Composite to 2048x1536, transmitter/receiver dependent

## Video Resolution and

**Refresh Rate:** Transmitter/Receiver dependent. See specifications for transmitter/receiver used

**Audio Modes:** Transmitter/Receiver dependent. See specifications for transmitter/receiver used

## Serial transmission

**Modes:** Simplex (broadcast) transmit only –requires appropriate transmitter/receiver combination

## Maximum

**Distance:** Total end to end, from source device to farthest destination device, over good CAT5 cable to 1,500 ft (457m) (Receiver dependent )

**Connectors:** (16) RJ-45 input, (16) RJ-45 output, (1) captive screw phoenix; (1) power DIN

**Front Panel Control:** (16) input buttons, (16) output buttons, (4) control buttons

**Serial Control:** RS-232, 7-bit ASCII: 8 data bits, no parity, 1 stop bit, 9600 bps via phoenix connection

## 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:** 24VDC @ 2.0A

**Size:** 3.50"H x 17.2"W x 6.8"D (8.7 x 43.6 x 17.2 cm);

**Weight:** 2.6 lb. (1.2 kg)

# 2. Introduction

## 2.1 Overview

The CAT5 Multi 16 x 16 Matrix Switch switches signals over Category 5 Cable to any number of 16 outputs.

This manual covers the CAT5 Multi 16 x 16 Matrix Switch. CAT5 Multi Video System transmitter units as well as CAT5 Multi Video System receiver units are required for operation. Please contact technical support for help.

## 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 16 x 16 Matrix Switch :

- The 16 x 16 Matrix Switch.
- Power cord.
- This manual.

## 2.3 Equipment You May Also Need

- Serial cable for external control.
- CAT5 cable.

## 2.4 Compatible Cabling

CAT5 cabling for the CAT5 Multi 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 System.

# 3. Setup and Installation

## 3.1 Cabling Considerations

- We recommend mounting and connecting all cabling to the CAT5 Multi VGA System components before applying power.
- Make sure that the CAT5 cable you intend to use has been tested to comply with the TIA/EIA 568B wiring specification.

## 3.2 Making the Connections

### 3.2.1 CONNECTIONS AND SETUP IN GENERAL

Refer to Figure 3-1 for cabling information. See Appendix A for cable pinning information.

1. Connect an RJ-45 cable from a CAT5 Multi Video System transmitter unit into any port labeled SOURCE.

### NOTE

It is recommended to maintain cable lengths as equal as possible from each transmitter unit to the switch. This is due to all adjustments for cable length compensation are done on receiver units. Switching between inputs with unequal cable lengths may cause display images to change due to incorrect cable compensation settings on the receiver.

2. Connect RJ-45 cables from CAT5 Multi Video System receiver units into the ports labeled OUTPUT.

3. Connect the power cable to the unit.

4. If applicable, attach a serial control cable to the 5 position phoenix connector (reference Appendix A for pinout information).

5. If using external serial control see Section XX for serial configuration.

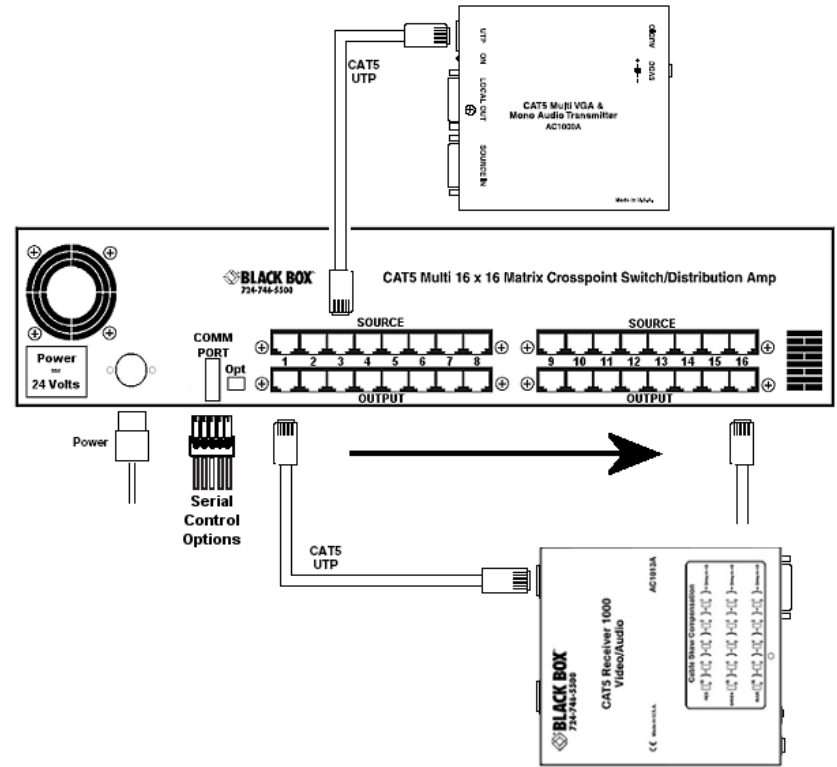


Figure 3-1. Switch connections on the AC1051A.

### NOTE

It is recommended to maintain cable lengths as equal as possible from each transmitter unit to the switch. This is due to all adjustments for cable length compensation are done on receiver units. Switching between inputs with unequal cable lengths may cause display images to change due to incorrect cable compensation settings on the receiver.

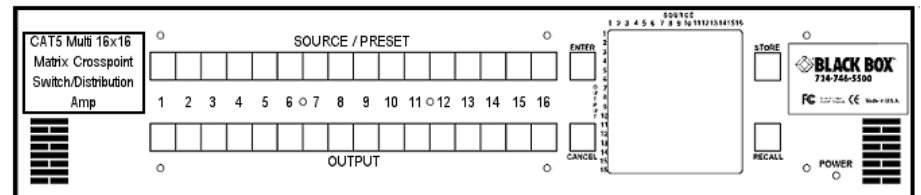


Figure 3-2. Front Panel Buttons on the AC1051A.

**3.2.2 CONTROL OPTIONS OF THE CAT5 MULTI 16x16 MATRIX SWITCH (AC1051A)**

The Cat5 Multi 16x6 Matrix Switch may be controlled via the front panel buttons or via a third party serial control application using a serial cable connection. See the following sections for details.

**3.2.3 FRONT PANEL CONTROL**

The Cat5 Multi 16x6 Matrix Switch may be quickly and easily controlled via the front panel buttons. Additionally, pre-configured Presets may be individually stored and recalled.

Multiple Outputs may be assigned to a single input, but only one input may be assigned to each output.

Pressing an input key will illuminate the input key and all output keys assigned to it.

- To switch an Input to one or more Outputs:
  - Press the desired input key
  - Press the desired Output key(s) (multiple keys are pressed sequentially)
  - Press the Enter key to make the switch
  - To cancel or re-enter keys, press the Cancel key to start over.
- To turn on Output OFF
  - Ensure no input keys are selected
  - Press the Output number key
  - Press the Enter Key.
  - To turn off all outputs at once, Press and hold the Cancel key for 5 seconds.
- To Re-assign Output(s) to a different Input key
  - Press the current Input key twice
  - Press the new Input key
  - Press the Enter key
- To save the current configuration as a Preset
  - Press the Store key
  - Press the Input key number (1-16) where the preset will be stored
  - Press the Enter key
  - To start over, Press the Cancel key
- To Recall a Preset
  - Press the Recall key
  - Press the Input key number (1-16) that the Preset was stored under
  - Press the Enter key
  - To start over, Press the Cancel key.

**3.2.4 SERIAL CONTROL**

The Cat5 Multi 16x6 Matrix Switch may be controlled serially via the 5 position captive screw connector on the rear of the unit.. Serial protocols is RS 232.

Protocol:

7-bit ASCII: 8 data bits, no parity, 1 stop bit, 9600 bps (optional 19.2 kbps)

RS-232 Interface:

SW1 = OFF

SW2 = OFF

SW3 == OFF for 9600 baud or ON for 19.2 kbaud

Wiring:

TX+ == Transmit (TD)

RX+ == Receive (RD)

GND == GND

**3.3.5 SERIAL COMMANDS**

The Cat5 Multi 16x6 Matrix Switch features a full suite of control commands as referenced below.

**NOTE**

**Every character sent to the switch (except the binary address prefix byte) is echoed to the controller. The controller should verify that the characters match before sending the next one. This is a simple form of error detection and in-band flow control.**

**It is possible to send a complete command sequence terminated by the ASCII "Carriage Return" character (HEX 0D) without verifying each character, but some inter-character delay (1 millisecond) must be added. This will allow the switch to process each character properly.**

**Failure to observe these requirements will normally result in an "Invalid Entry!" response from the switch. A longer inter-character delay value should remedy this problem.**

**Command Strings:**

A valid command string will begin with a Command character, and terminate with a "Carriage Return" (<CR>).

**Notes:**

1. All commands are "echoed" at the terminal prompt.
2. Any invalid command sequences will return an error prompt / string.

**Output Commands:**

The following Output Command formats shall be used:

**Oxx=<CR>** : Report an output (x) channel configuration.

Device replies with:

**Oxx=yy<CR><LF>**

**Parameters:**

x = Output channel (1 - 16)

y = Input channel assigned to selected output channel (0 = OFF)

**Oxx=yy<CR>** : Configure an output (x) channel.

Device replies with:

**Oxx=yy<CR><LF>**

**Parameters:**

xx = Output channel (1 - 16)

yy = Input channel assigned to selected output channel (0 = OFF)

**Preset Commands:**

The following Preset Command formats shall be used:

**Pxx=<CR>** : Report a preset (x) configuration.

Device replies with:

**Pxx=aa,bb,cc,dd,de,ff,gg,hh, ii, jj, kk,ll,,mm,nn,oo,pp<CR><LF>**

**Parameters:**

xx = Preset (0 - 16) – If x = 00, the current (working) configuration is reported.

aa = Output 1 input selection (0 = OFF)

bb = Output 2 input selection (0 = OFF)

:

pp = Output 16 input selection (0 = OFF)

**Pxx<CR>** : Saves current (working) configuration as a preset (xx) configuration.

Device replies with:

**Preset xx Stored! <CR><LF>**

**Parameters:**

xx = Preset (1 - 16)

**Pxx=a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p<CR>** : Configures a preset.

Device replies with:

**Preset xx Stored! <CR><LF>**

If xx = 00 or if x = a recalled preset, the current working preset is reported as:

**P00=a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p<CR><LF>**

If xx = a stored preset, the new preset configuration will be saved in preset memory location xx.

**Parameters:**

xx = Preset (0 - 16)

aa = Output 1 input selection (0 = OFF)

bb = Output 2 input selection (0 = OFF)

:

pp = Output 16 input selection (0 = OFF)

**Recall Commands:**

The following Recall Command formats shall be used:

**Rxx<CR>** : Recall preset (xx) and copy to current working preset.

Device replies with:

**P00=a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p<CR><LF>**

**Parameters:**

aa = Output 1 input selection (0 = OFF)

bb = Output 2 input selection (0 = OFF)

:

pp = Output 16 input selection (0 = OFF)

**Clear Working Preset**

This command will turn all outputs off immediately.

**C<CR>** : Clear working preset

**Device replies with: P00=00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00<CR><LF>**

## Status Commands

The following Status Command formats shall be used:

**S=<CR>** : Report master device status.

Device replies with:

**Pxx= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P01= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P02= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P03= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P04= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P05= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P06= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P07= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P08= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P09= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P10= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P11= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P12= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P13= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P14= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P15= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

**P16= aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp <CR><LF>**

### Parameters:

xx = Current (working) preset If xx = 01 – 16 then a stored preset is loaded. If any output configuration is changed after loading a stored preset, then xx = 00.

aa = Output 1 input selection (00 = OFF)

bb = Output 2 input selection (00 = OFF)

:

pp = Output 16 input selection (00 = OFF)

## ID Commands

The following ID Command formats shall be used:

**? <CR>** : Report ID / firmware version

Device replies with:

**MV16X16 Core vx.y<CR><LF>**

**MV16X16 Panel vx.y<CR><LF>**

### Parameters:

x = Major firmware revision

y = Minor firmware revision

# 4. Troubleshooting

## 4.1. Common Problems

In most cases, nearly every issue with the CAT5 Multi VGA 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.

Please reference the appropriate manual for the transmitters/receivers if these units are suspect.

- Problem:** Serial communication does not work
- Solution:**
- Ensure serial cable is pinned correctly.
  - The Matrix switch inputs serial on the Rx pin and outputs data on the Tx pin. In some cse the controller may need its Tx pin connected to the switch Rx pin and the controller Rx pin connected to the switch Tx pin.
- Problem:** Not all commands are executed and/or an "Invalid Entry" is returned
- Solution:**
- Ensure there is at least a 1 msec inter character delay between characters form the controller.

## 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. Captive Screw Connector.



Pin	Signal
1	Tx+
2	Not used
3	Rx+
4	Not used
5	Ground



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