

ServSwitch™ BRAND
CAT5 KVM Extender



ACU1022A
ACU1028A
ACU1049A
ACUVREM
ACUREMSW

Welcome to the ServSwitch™ Family!

Thank you for purchasing a BLACK BOX® ServSwitch™ Brand CAT5 KVM Extender model! We appreciate your business, and we think you'll appreciate the many ways that your enhanced keyboard/video/mouse system will save you money, time, and effort.

That's because our ServSwitch family is all about breaking away from the traditional, expensive model of computer management. You know, the one-size-fits-all-even-if-it-doesn't model that says, "One computer gets one user station, no more, no less." Why not a single user station (monitor, keyboard, and mouse) for multiple computers—even computers of different platforms? Why not a pair of user stations, each of which can control multiple computers? Why not multiple user stations for the same computer?

With our ServSwitch products, there's no reason why not. We carry a broad line of robust solutions for all these applications. Do you have just two PCs, and need an economical alternative to keeping two monitors, keyboards, and mice on your desk? Or do you need to share dozens of computers, including a mix of IBM® PC, RS/6000®, Apple® Macintosh®, Sun Microsystems®, and SGI™ compatibles among multiple users with different access levels? Does your switch have to sit solidly on a worktable and use regular everyday cables? Or does it have to be mounted in an equipment rack and use convenient many-to-one cables? No matter how large or small your setup is, no matter how simple or how complex, we're confident we have a ServSwitch system that's just right for you.

The ServSwitch™ family from Black Box—the one-stop answer for all your KVM-switching needs!

This manual will tell you all about your new ServSwitch™ Brand CAT5 KVM Extender, including how to install, operate, and troubleshoot it. For an introduction to the Extender, see **Chapter 2**. The Extender product codes covered in this manual are:

ACU1022A

ACU1028A

ACU1049A

ACUVREM

ACUREMSW

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Cautions and Notes

The following symbols are used in this guide:



CAUTION. This indicates an important operating instruction that should be followed to avoid any potential damage to hardware or property, loss of data, or personal injury.



NOTE. This indicates important information to help you make the best use of this product.

**FEDERAL COMMUNICATIONS COMMISSION
AND CANADIAN DEPARTMENT OF COMMUNICATIONS****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.

Shielded cables must be used with this equipment to maintain compliance with radio frequency energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.

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 the Canadian Department of Communications.

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 le Ministère des Communications du Canada.

DECLARATION OF CONFORMITY

EUROPEAN UNION COMPLIANCE STATEMENT

WARNING!

This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user might be required to take adequate remedial measures.

This product complies with the following harmonized standards for Information Technology Equipment: EN55022:2006 (Class A), EN55024:1998 + A1:2001 + A2:2003.

To maintain compliance the use of correctly installed shielded (STP/FTP) interconnection cable is advised. Only use CPU cables and power supplies provided (or recommended) for use with this product.

When used in environments that have high levels of electromagnetic interference or excessive power ground noise, you may experience disturbances to video and/or data transmission. If this is the case, please refer to the Troubleshooting section of the User Guide for further information, or contact Technical Support. In electrically noisy environments, the use of shielded (STP/FTP) rather than unshielded (UTP) interconnection cable is recommended.



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 pedestals 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.

Safety Precautions and Installation Guidelines

To ensure reliable and safe long-term operation please note the following installation guidelines:

- Do not use to link between buildings.
- Only use in dry, indoor environments.
- If the building has 3-phase AC power, try to ensure that equipment connected to the Local and Remote Units is on the same phase.
- Try not to route the CATx link cable alongside power cables.
- The use of shielded CATx cable is recommended to maintain compliance.
- Ensure that the system connected to the Local Unit is connected to power ground.
- Ensure that the monitor connected to the Remote Unit is connected to power ground and does not use an isolated power supply.
- The Remote Unit and any power supplies can get warm. Do not situate them in an enclosed space without any airflow.
- Do not place the power supply directly on top of the Remote Unit.
- This product is not suitable for use in isolated medical environments.



To safeguard against personal injury and avoid possible damage to equipment or property, please observe the following:

- Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not attempt to dismantle or repair any power supply. Do not use a power supply if it appears to be defective or has a damaged case.
- Connect all power supplies to grounded outlets. In each case, ensure that the ground connection is maintained from the outlet socket through to the power supply's AC power input.
- Do not attempt to modify or repair this product, or make a connection from the CATx link interface (RJ45) to any other products, especially telecommunications or network equipment.

Contents

1. Quick Setup	10
2. Overview 11	
2.1 Introduction	11
2.2 Glossary	11
2.3 Features	13
2.4 Product Range	14
2.5 Compatibility	15
2.6 How to Use This Guide	16
3. Installation	17
3.1 Package Contents	17
3.2 Interconnection Cable Requirements	18
3.3 Remote Unit Installation	19
3.4 Connecting the Remote Unit	21
3.5 Local Unit Installation	24
3.6 Connection to Local Hubs	26
4. Remote Unit Configuration & Operation	28
4.1 Video Configuration Overview	28
4.2 Video Adjustments	29
4.3 Other Remote Configuration & Operation Options	31
5. Local Unit Operation	33
5.1 Overview	33
5.2 Operation of Dual Access Local Units	34
6. Troubleshooting & FAQ	36
6.1 Video	36
6.2 Audio	37
6.3 Serial	37
6.4 Keyboard & Mouse	38
6.5 General Questions	39

Appendix A: Example Applications	40
Appendix B: Rack Mount Options	44
Appendix C: Advanced Cabling Issues (Skew)	45
Appendix D: Audio/Serial Ports	47
Appendix E: Calling Black Box	49
Appendix F: Specifications	50

1. Quick Setup

This section briefly describes how to install your KVM extender system and optimize the video signals. Unless you are an experienced user, we recommend that you follow the full procedures described in the rest of this manual.

Set Cable Length Jumpers

Remove Remote Unit cover and set all three jumpers to position for Interconnect cable length (see page 19)

Install system

1. Connect Remote Unit to KVM and audio/serial devices (if present).
2. Connect Local Unit or Extender Hub to CPU.
3. Connect Remote and Local Units with compatible CAT5/5e Interconnect cable.
4. Power up system.

Any Problems? See Installation and Troubleshooting sections.

View Test Card

<ftp://ftp.blackbox.com/connectivity/ServSwitch/>

Provides useful image for adjusting video.

Adjust EQ and Peak controls

Optimize video quality on Remote console monitor

2. Overview

2.1 Introduction

The ServSwitch™ Brand CAT5 KVM Extender products described in this manual enable high-resolution video, PS/2 keyboard and mouse, stereo audio, and serial port signals to be communicated up to 300m over Category 5/5e (CATx) cable.

A basic KVM extension system comprises a *Local Unit* (transmitter) and a *Remote Unit* (receiver). The Local Unit connects directly to the computer (or a KVM switch system) using the supplied cable(s). The user *console* (keyboard, mouse and monitor) attaches to the Remote Unit. The Remote and Local Units communicate video and data information along the connecting CATx cable (see Figure 1).

Within the product range, models are available with combinations of the following:

- Audio transmission: bi-directional stereo audio (16-bit digitized).
- Serial transmission: transparent serial COM port (to 19.2Kbps).
- Dual access: allowing a second user console at the Local Unit.
- KVM switch allowing additional CPU to be connected to Remote Unit and used as console.

2.2 Glossary

The following terms are used in this guide:

<i>CATx</i>	Any Category 5, 5e, 6 or higher cable.
<i>PSU</i>	Power Supply Unit.
<i>KVM</i>	Keyboard, Video and Mouse.
<i>Console</i>	A keyboard, monitor, and mouse, plus optional serial devices.
<i>Dual Access</i>	A system allowing connection of local and remote user consoles.

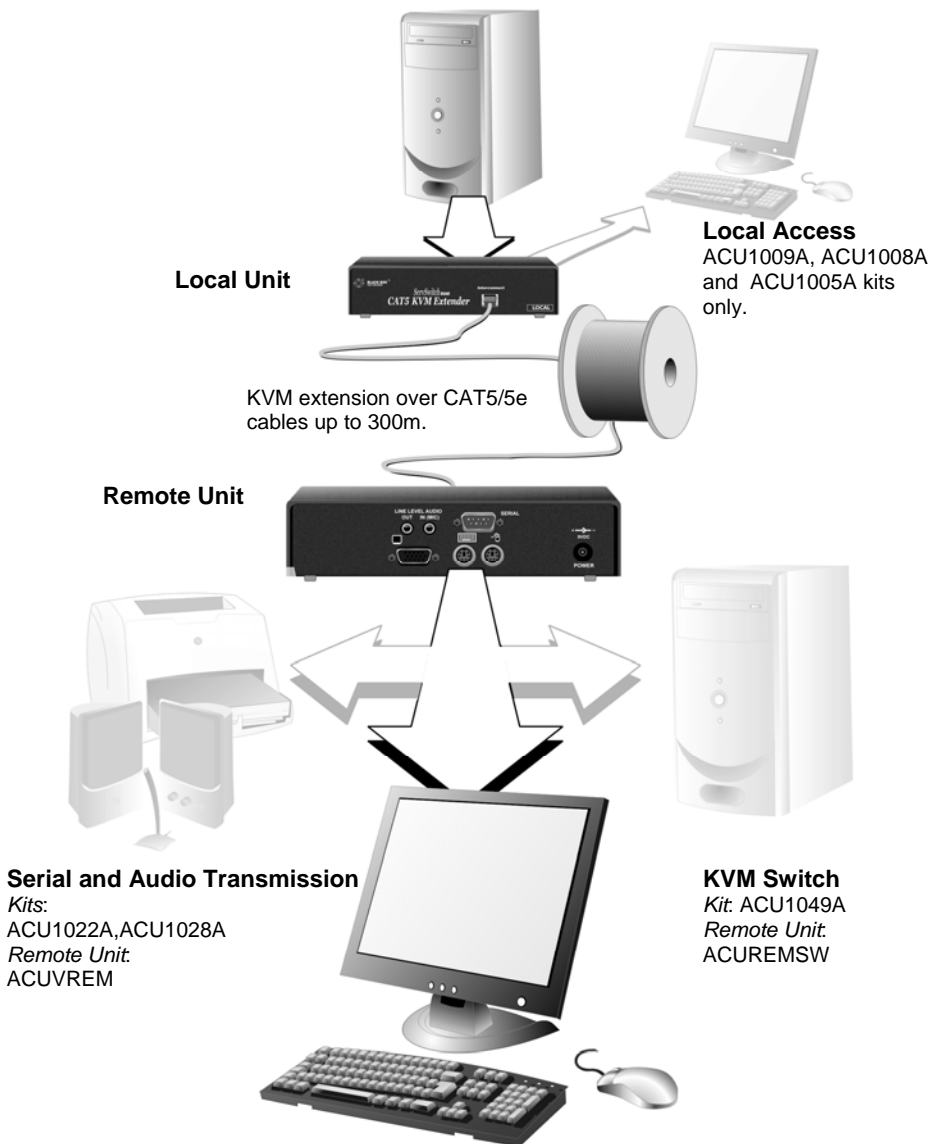


Figure 1 ServSwitch™ Brand CAT5 KVM Extender system

2.3 Features

All members of the ServSwitch™ Brand CAT5 KVM Extender product family described here offer the following features:

- Support for high video resolution over extended distances:
 - 1600x1200@60Hz up to 65m
 - 1280x1024@75Hz up to 120m
 - 1024x768@75Hz up to 300m
- Adjustable video equalization compensates for loss of image quality over extended cable lengths.
- Fully buffered signals to ensure consistent remote operation of your PC.
- DDC emulation in Local Unit ensures compatibility for all standard graphics modes (except for SUN models).
- Intelligent PS/2 keyboard and mouse emulation ensures PCs do not lock-up and allows peripherals to be hot-plugged.
- Dual-Access models allow local or remote operation.
- *Audio/serial models only*: Transparent serial port (on certain models) enables any serial device to be extended (up to 19.2K Baud). The serial port may be used to extend one device (requiring handshaking lines), or up to three simple serial devices (no handshaking).
- *Audio/serial models only*: Bi-directional stereo audio (16-bit digitized) support on certain models enables high-quality audio extension.
- *Switching models only*: KVM switch for connecting additional PC to Remote Unit.
- Local Units are normally powered directly by the PC (or switch).
- Private Mode on dual-access models allows a local user to lock out the remote.
- Rack mount options available.
- Surge protection on each RJ45 port.
- Remote Units are fully compatible with ServSwitch™ Brand CAT5 KVM Extender Local Hubs.
- CPU cables included (certain models).

2.4 Product Range

This manual describes the following five products from the ServSwitch™ Brand CAT5 KVM Extender range:

KVM, Audio and Serial Extension kits

ACU1022A	Single Video Channel, PS/2 KB & Mouse, Serial, Stereo Audio Local Unit (Single Access) + Remote Unit
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ACU1028A	Single Video Channel, PS/2 KB & Mouse, Serial, Stereo Audio Local Unit (Dual Access) + Remote Unit
----------	---

KVM Extension and Remote KVM Switching kits

ACU1049A	Single Video Channel, PS/2 KB & Mouse Local Unit (Dual Access) + Remote Unit Remote Unit incorporates KVM switch
----------	--

Remote Units only

ACUVREM	Single Video Channel, PS/2 KB & Mouse, Serial, Stereo Audio
---------	---

ACUREMSW	Single Video Channel, PS/2 KB & Mouse, KVM Switch
----------	---

2.5 Compatibility

Interface Compatibility

- **PS/2 Keyboard:** Compatible with all standard keyboards. Certain keyboards with enhanced features may also be supported with custom firmware.
- **PS/2 Mouse:** Compatible with all standard 2-button, 3-button and wheel mice. To connect to a PC that does not have a PS/2 mouse port, an active serial converter is required - Model: *AC244A*.
- **Audio:** Input and output are line-level. Amplified speakers are required. A microphone may be directly connected to the Remote Unit (optional pre-amplification).
- **Serial:** Transparent up to 19.2K Baud (38.4K operation may be possible with some devices). The following serial signals are extended: TX, RX, RTS, CTS, DTR, DSR. In rare cases, a wiring adaptor may be required to transfer RI and DCD.
- **Video:** VGA to SXGA. Separate sync, composite sync, or sync-on-green. Maximum resolution and refresh rates depend on cable length and cable type (see **Appendix F: Specifications**, page 50).

Extender Compatibility

You can use ServSwitch™ Brand products belonging to the same family in any combination. However, it is not possible to mix Standard and Audio products within a system.

<i>Family</i>	<i>CAT5</i>	<i>CATx</i>	<i>Micro</i>	<i>Hubs</i>
Standard	ACU1001A ACU1009A ACU1049A ACUREM ACUREMSW	ACU2001A ACU2009A ACU2201A-R2 ACUR001A ACUR002A ACUR004A	ACU3001A ACU3009A ACUMREM ACU1006MRA	ACU1006RA ACU1006DRA ACU1012RA
Audio	ACU1022A ACU1028A ACUVREM	ACU2022A ACU2028A ACU2222A-R2 ACURA001A ACURA002A ACURA004A	ACU3022A ACUWREM ACU1006MRVA	ACU1006VRA ACU1006DVRA
Serial	ACU1002A ACU1008A ACUSREM			ACU1006SRA ACU1006DSRA
SUN	ACU1004A ACU1005A			
PS/2 No Video			ACU1007A	

2.6 How to Use This Guide

This guide describes the installation and configuration of Standard and Serial members of the ServSwitch™ Brand CAT5 KVM Extender range. Although the connection and operation of these systems is relatively straightforward, you should consider the following before getting started:

Connection & Compatibility

If you have purchased an *Extender kit*, this will contain all the cables required to connect the Local Unit to your PC or KVM switch. The remote console (keyboard, monitor and mouse) and any serial equipment connect directly to the Remote Unit.

If you have purchased a *Remote Unit*, ensure that it is compatible with your Local Unit or hub (see **Extender Compatibility**, page 15).

For information about connection and installation, see **Installation**, page 17.

Interconnection Cable

You will need CATx cable, terminated with RJ45 plugs, to connect the Local and Remote Units (see **Interconnection Cable Requirements**, page 18).

Adjusting Video

Video signals become distorted when transmitted over CATx cable. To get the best from your extender system, it is *essential* that you adjust the Remote Unit to optimize the video image quality:

- For experienced users, there is a **Quick Setup** section at the start of this guide (see page 10).
- For the full procedure, see **Remote Unit Configuration & Operation**, page 28.
- Refer to **Appendix C: Advanced Cabling Issues (Skew)**, page 45 for a more in depth discussion of skew correction and advanced cabling issues.

3. Installation

For first-time users, we recommend that you carry out a test placement, confined to a single room, before commencing full installation. This will allow you to identify and solve any cabling problems, and experiment with the KVM extender system more conveniently.

3.1 Package Contents

You should receive the following items in your extender package. If anything is missing, please refer to **Appendix E: Calling Black Box**, page 49.

- Extender Remote Unit.
- 9V DC universal power supply for Remote Unit.
- Extender Local Unit.
Only included in extender kits.
- 6ft (1.8m) KVM CPU combination cable with PS/2 (6-pin mini-DIN male-to-male) keyboard and mouse connectors and VGA video (HD15 male to female) connector.
Models: ACU1022A and ACU1028A only.
Not included with individual Remote Unit ACUVREM.
- 3ft (1.0m) KVM CPU combination cable with PS/2 (6-pin mini-DIN male-to-male) keyboard and mouse connectors, VGA video (HD15 male) connector, and 25-way (DB25 Female) extender connector.
Model: ACU1049A only.
- 6ft (1.8m) Serial cable (DB9 male/female connectors, 1:1 connections).
Models: ACU1022A and ACU1028A only.
- 6ft (1.8m) Dual audio cable (3.5mm stereo plugs).
Models: ACU1022A and ACU1028A only.
- IEC AC Power Cord.
- Quick Start Guide.

3.2 Interconnection Cable Requirements

To connect the Local and Remote Units you will need CATx (any category 5, 5e, 6 or higher) cable terminated with RJ45 plugs. Please note that shielded cable is advised to maintain regulatory EMC compliance.

Interconnect cables must be solid-core type. Stranded patch cable will give poor results over longer distances. The pairing of the cable and pinning of its connectors should normally be in accordance with EIA-568B.

<i>Pin*</i>	<i>Color (EIA-568B)</i>	<i>Signal</i>
1 2	White/Orange Orange/White	Blue Video
3 6	White/Green Green/White	Green Video
4 5	Blue/White White/Blue	Red Video
7 8	White/Brown Brown/White	Data

* Looking into the RJ45 socket on a Remote Unit, Pin 1 is on the right and Pin 8 on the left.




EIA-568A wiring can also be used. Contact Technical Support for details.



*With some cables, video performance may be improved by using a crossover patch cable at each end, an alternative RJ45 pin-out or an external skew correction device (see **Appendix C: Advanced Cabling Issues (Skew)**, page 45).*

3.3 Remote Unit Installation

Setting the Cable Length Jumpers

 *If your application uses a CATx cable less than 75m in length, you can continue to the next section.*

Remote Units incorporate video equalization circuitry, allowing you to compensate for the loss in image quality that occurs when video signals are transmitted along lengthy CATx cables. At the factory, Remote Units are configured to optimize the video signals for Interconnect cables up to 100m in length.

If you intend to use cables of 100-300m in length:

1. Unfasten and remove the screws on each side of the Remote Unit.
2. Carefully remove the top plate.
3. Locate the three cable length jumpers on the Remote Unit's main circuit board (see Figure 2).

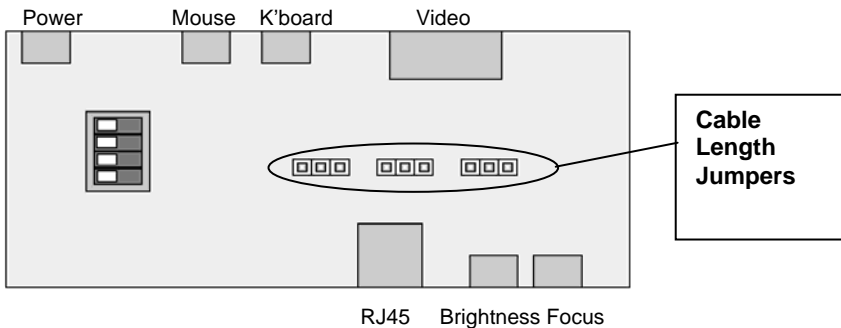











Figure 2 Location of cable length jumpers on Remote Unit's main circuit board

4. Set the three cable length jumpers as follows:

Interconnect Cable Length (m)	Jumper Position (as viewed from front, with RJ45 connector towards you)		
0 – 100	No jumpers (default)		
			
100 – 200			
200 – 300			



If you are at the top end of a cable range, and you are using a high screen resolution (1024x768 or higher), you may achieve better quality video compensation by selecting the next cable length range.



Ensure that all three jumpers are set to the same position. If you are carrying out a test placement prior to final installation, set the jumpers to the positions appropriate to the test cable's length. When your tests are complete, set the jumpers to the positions appropriate for the CATx cable length used in the full installation.

While you have the Remote Unit's cover off, you may also want to change some of the other jumper settings or DIP switch options:

3.4 Connecting the Remote Unit

To install a Remote Unit:

1. Switch off all devices.

Connect your keyboard, monitor(s) and mouse to the Remote Unit as shown in Figure 3 (Switching) or Figure 4 (Audio/Serial).



These ports may also be attached to the CPU side of a KVM switch in order to have a remote CPU. However, if you are attempting to use the extender between cascaded KVM switches this may not work. Please contact Technical Support to discuss your application.

2. If appropriate, connect audio equipment and serial devices. Connect the audio cables as follows:

<i>Remote Unit</i>	<i>Audio Device</i>
Audio Out	Speakers
Audio In (MIC)	Microphone

3. Connect the CATx cable to the INTERCONNECT socket on the front of the Remote Unit as shown in Figure 5.
4. Turn the **Brightness** and **Focus** controls fully anticlockwise.
5. Connect the 9V power supply to power the unit.



Only use the power supply originally supplied with this equipment or a manufacturer approved replacement.

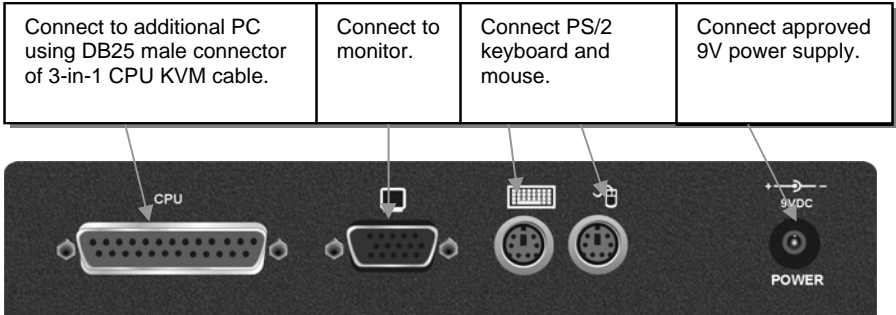


Figure 3 Switching Remote Unit (ACUREMSW – also supplied with ACU1049A kit) – rear view

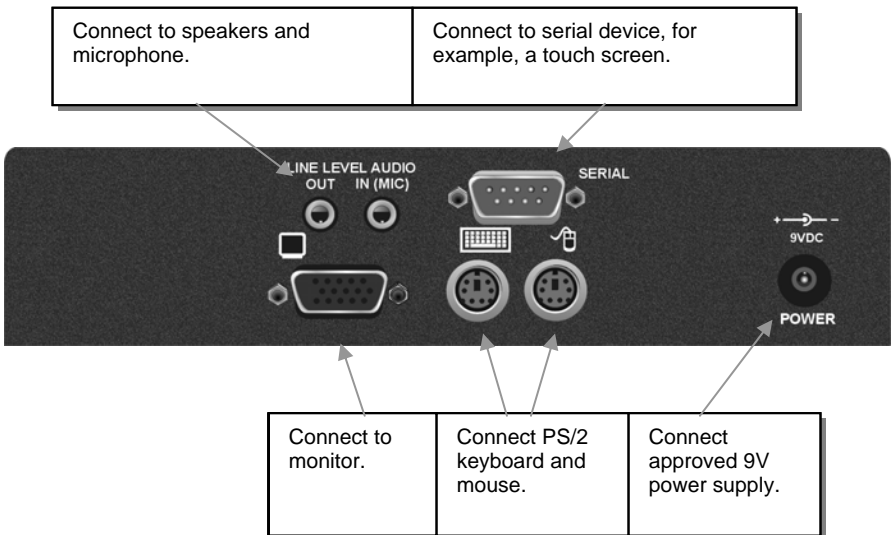


Figure 4 Audio Remote Units (ACUVREM – also supplied with ACU1022A and ACU1028A kits) – rear view

Interconnect – carries video and data signals. Connect to Interconnect port on Local Unit using CATx cable.

Brightness – adjusts image brightness

Focus – compensates video for smearing or over-sharpness

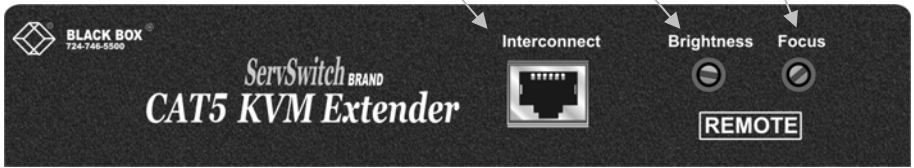


Figure 5 Remote Unit - front view

3.5 Local Unit Installation

To install a Local Unit:

1. Switch off the PC and any peripheral devices before connection.
2. Using the supplied CPU KVM cable(s), connect the keyboard, monitor(s) and mouse connectors on the computer (or KVM switch) to the corresponding connectors on the Local Unit as shown in Figure 6.

Ensure that you attach the keyboard and mouse connectors to the correct ports. The keyboard connector is purple; the mouse connector is green.



If your PC does not have a PS/2 mouse port, an active serial converter will be required - Model No: AC244A.

3. If you have a dual access system, connect the keyboard, mouse and monitor for the local console to the appropriate ports on the Local Unit. The ports may also be used to feed into a KVM switch.
4. If you have an audio-enabled unit, connect the audio cables between the computer and Local Unit as follows:

<i>Computer</i>	<i>Local Unit</i>
Audio Out (green)	Audio In
Audio In/Microphone (pink/blue)	Audio Out

5. If you have a serial-enabled unit, connect the supplied serial cable between the serial port on the computer and the Local Unit.
6. Connect the CATx cable to the INTERCONNECT socket on the front of the Local Unit (see Figure 7).
7. Power up the PC.



The Local Unit normally takes power through the PC's keyboard port. In video only applications, this connection is not used and an external PSU is required.

Please contact Technical Support to obtain a suitable power supply.

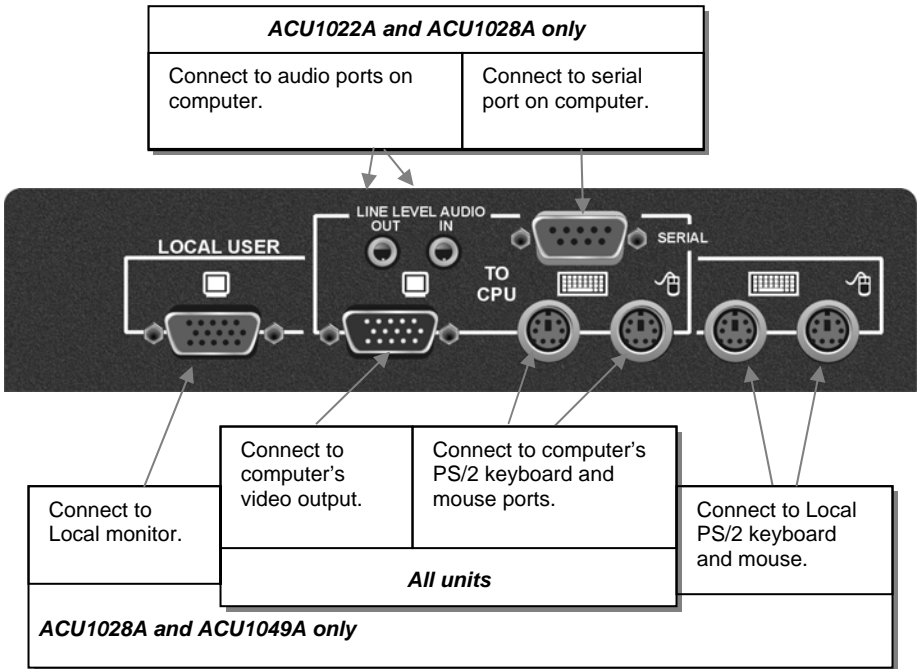


Figure 6 Standard Local Unit - rear view

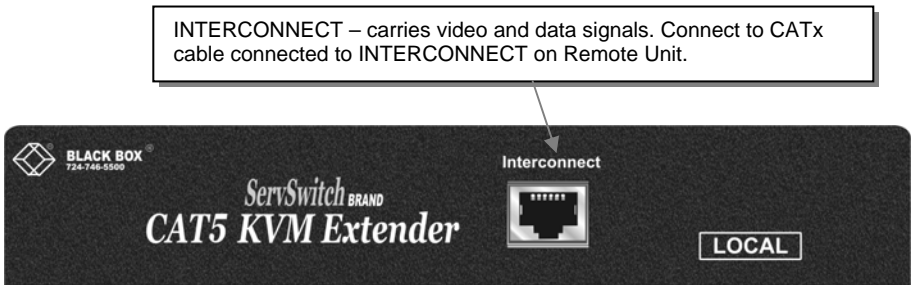


Figure 7 Local Unit – front view

3.6 Connection to Local Hubs

Remote Units are compatible with ServSwitch™ Brand CAT5 KVM Extender Local Hubs belonging to the same family:

<i>Remote Units</i>	<i>Compatible Local Rack Hubs</i>
ACUREMSW	ACU1006RA, ACU1006DRA, ACU1012RA
ACU1022A, ACU1028A, ACUVREM	ACU1006VRA, ACU1006DVRA

A simple example of the use of a Local Hub Unit in which an ACUVREM Remote Unit is connected to each hub port, is shown in Figure 8. For more complex examples showing the use of Local Hubs with ServSwitch™ Brand CAT5 KVM Extender Remote Units in efficient ways, see **Appendix A: Example Applications**, page 40.



Individual Local Hub operation is not covered in this guide. Please refer to the documentation supplied with your Local Hub unit.

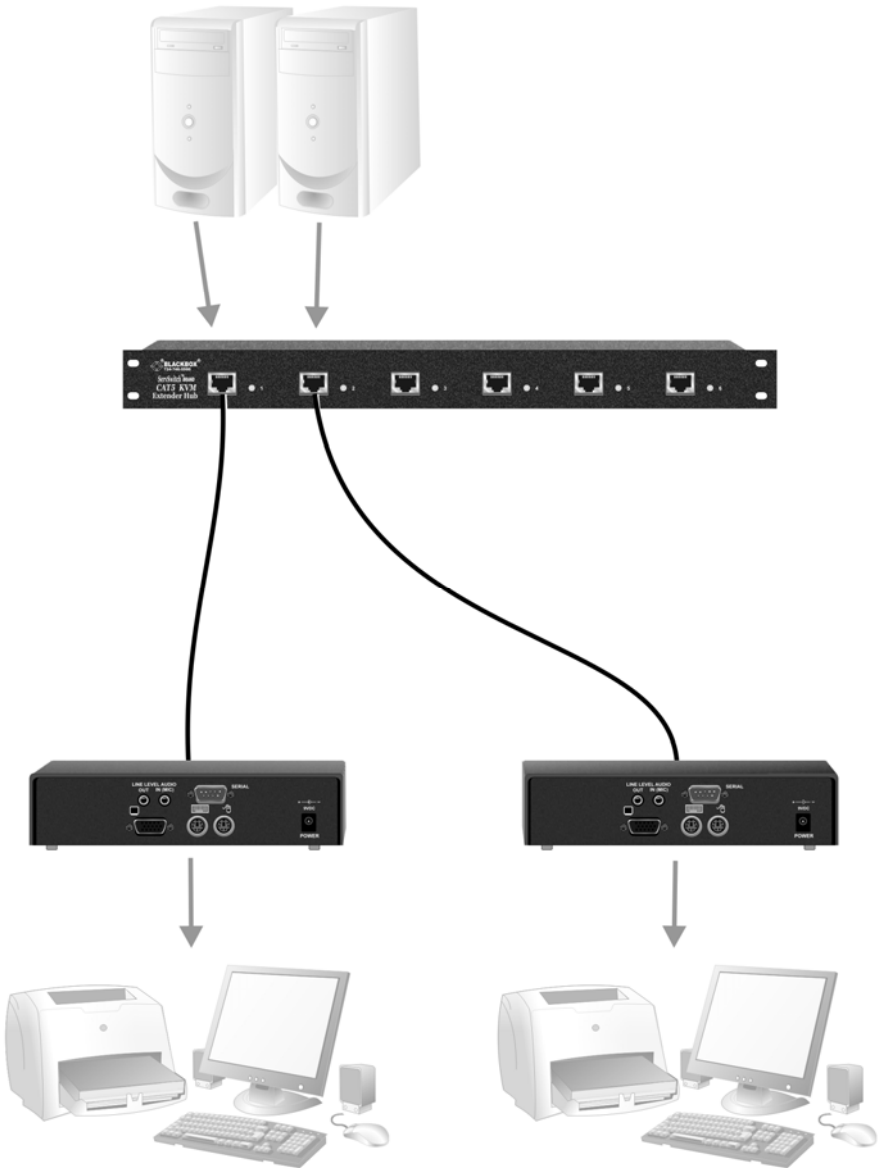


Figure 8

Simple system using ACU1006VRA Hub and ACUVREM Remote Units to extend audio, serial and KVM for up to six PCs

4. Remote Unit Configuration & Operation

Cat5/5e cables are specifically designed for networking applications and not for transmitting analog video. Your CATx KVM extender includes, and requires, advanced technology to enable its use at high screen resolutions. This section describes how to optimize the video signal, configure the Extender system and operate the Remote Unit.

4.1 Video Configuration Overview

To get the best out of your extender system it is *essential* that you configure it correctly and tune the video signal. Tuning is necessary because of distortions that occur in a video signal when it is transmitted over lengthy CAT5/5e cables. Generally, you only need to carry out this procedure after installation.

When you have installed your extender system, run an application that requires a high screen resolution. Examine the video image on the remote console's monitor. You may see some of the following distortion effects:

Smearing



Black smearing at the right edge of large horizontal objects such as title bars.

Loss of Sharpness



Blurring and lack of detail, edges appearing too bright and sharp.

Color Separation or Skew



Displacement of individual colors (caused by timing differences in RGB signal reception).

Brightness



Image appears brighter or darker than the original.

The Remote Unit's **Focus** control allows you to correct smearing and loss of sharpness effects. The **Brightness** control adjusts video image brightness.

Skew only tends to be a problem at high screen resolutions with long interconnect cables. We recommend the use of low skew CAT5/5e cable for all applications. Please contact Technical Support for more information.



*With some cables, video performance may be improved by using a crossover patch cable at each end, an alternative RJ45 pin-out or an external skew correction device (see **Appendix C: Advanced Cabling Issues (Skew)**, page 45).*

The alternative ServSwitch™ Brand CATx KVM Extender range has been specifically designed for the extension of high screen resolutions (1600x1200) over long CATx cables (300m). ServSwitch™ Brand CATx KVM Extenders have fully integrated skew compensation and independent control of low frequency (LF) and high frequency (HF) cable equalization.

4.2 Video Adjustments

Remote Units feature a number of correction tools to simplify video optimization. This procedure is straightforward and only needs to be carried out once.



Please note that cable equalization cannot be exact – the remote image will never be as sharp as the original. The KVM Extender's equalization system produces good results for short to medium length cables (<150m).

Adjusting Video

Use the following step-by-step procedure to optimize the video image on the remote console:

1. If possible, view the online test card at:

<ftp://ftp.blackbox.com/connectivity/ServSwitch/>

This is an image (see Figure 9) created and used by the manufacturer for video optimization purposes. It is particularly useful for observing skew. If you are unable to view the test card, display some text in a large font on a white background.



You should also open up other application windows to check the clarity of text in tool bars and icons on the desktop.

2. Turn the **Brightness** and **Focus** controls on the Remote Unit fully anti-clockwise. The image quality may be poor at this point.
3. Use the **Focus** control to adjust video equalization. If the video signal is under-compensated, you will notice black smearing on the right-hand edge of large horizontal objects such as title bars. If it is over-compensated, horizontal edges may become bright and too sharp. Rotate the **Focus** control clockwise until these effects disappear. The compensation is now adjusted correctly for the length of cable.



If you are at the top end of a cable range, for example, 80m (250ft), and you are using a high screen resolution (1024x768 or higher), you may achieve better quality video compensation by selecting the next cable length range using the cable length jumpers (see page 19). Use the **Brightness** control to adjust the brightness of the overall picture. After adjusting this control, you may need to re-adjust the **Focus** control.

- If you are using a flat panel monitor at the remote console, carry out auto-adjustment as described in the monitor's documentation. Sometimes manual adjustment of clock and/or phase is also required for optimum results and minimization of jitter.

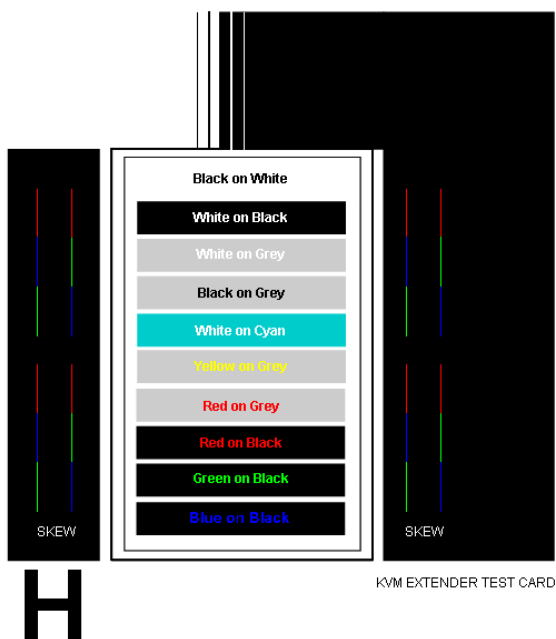


Figure 9

On-line test card available at
<ftp://ftp.blackbox.com/connectivity/ServSwitch/>

4.3 Other Remote Configuration & Operation Options

Keyboard 'hot' keys are used to carry out various functions on both Remote and Local Units.

To enter these commands:

1. Press and release the initial 'hot' key.
By default, the initial 'hot' key is **<Right Control>**
2. Press and release the command key.

Changing the Initial Hot Key

The initial 'hot' key for both Remote and Local Units may be changed from **<Right Control>** to **<Left Control>** using a DIP switch on the Remote Unit's main circuit board (see Figure 10).

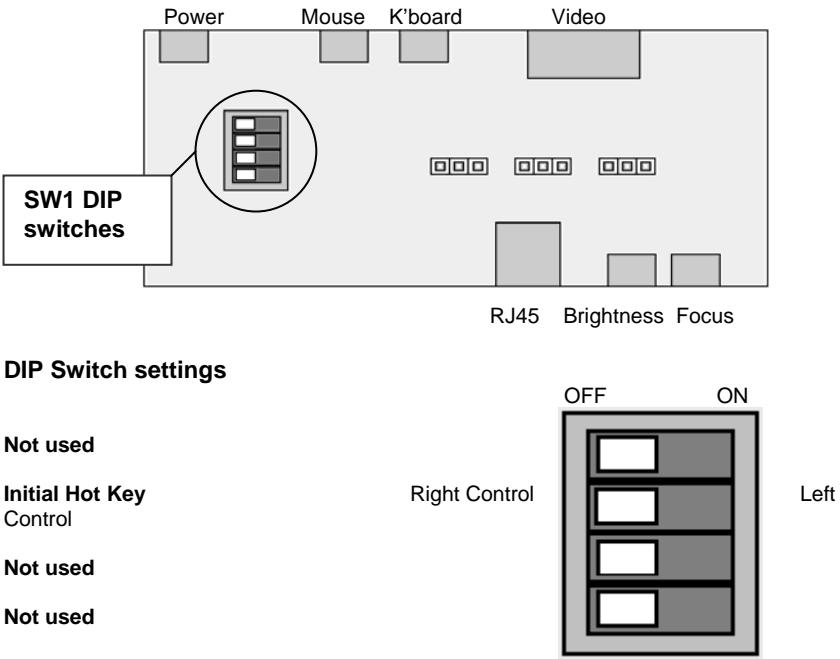


Figure 10 Remote Unit DIP switches on Audio/Serial/Switching CAT5/5e KVM Extenders

Hot Key Commands

After pressing the initial 'hot' key on the remote keyboard, you can issue a number of commands by pressing additional keys. These commands allow you to start a private mode session on the remote console or to reset the keyboard and mouse.

<i>Command</i>	<i>Key Sequence</i>
<i>Private Mode</i> (<i>ACU1028A, ACU1049A, ACUVREM, ACUREMSW only</i>)	<i><Scroll Lock></i>
Audio/Serial Local Units that feature dual access allow the remote user to lock out the local console by triggering a 'Private Mode' function. This prevents the local console from being used even if a two second inactivity timeout period expires. During a Private Mode session, the extender system: <ul style="list-style-type: none">• Flashes the Scroll Lock LED on the remote keyboard.• Illuminates all three LEDs on the local keyboard.• Displays a blank image on the local console's monitor.• Locks the local console's keyboard and mouse.	
<i>Reset Keyboard and Mouse</i>	<i><Num-Pad Up Arrow></i>
Reset the remote console's keyboard and mouse. You may need to do this if you have hot-plugged a keyboard or mouse and it has not initialized correctly.	
<i>Mouse Recovery</i>	<i><Num-Pad Left Arrow></i>
Use this command if you experience erratic movement of the mouse pointer or you have lost mouse movement after hot plugging the Local Unit into the CPU. In the case of erratic mouse movement, you may need to enter the command a number of times to re-synchronize the mouse signal. Alternatively, stop moving the mouse for a few seconds and the operating system's mouse drivers may automatically re-synchronize the signal. If the Local Unit has been hot-plugged, this command will issue a request to the OS to initialize the mouse. <i>Use this command with care.</i>	
<i>Switch to other PC</i> (<i>ACU1049A and ACUREMSW only</i>)	<i><Num-Pad + ></i>
Toggles KVM switch in Remote Unit so that the remote console controls either the second PC (connected directly to the Remote Unit) or the extended PC. <i>Note: On power-up, the Remote Unit will switch to the first active CPU.</i>	

5. Local Unit Operation

5.1 Overview

You need to read this section if you have purchased an extender system kit containing both a Local and Remote Unit.

For more information about serial/audio port operation, see **Appendix D: Audio/Serial Ports**, page 47.

Keyboard and Mouse Emulation

Local Units have keyboard and mouse emulation. The attached PC operates normally without requiring a keyboard or mouse to be attached to either the Remote or Local Units (in the case of a dual access system). You can therefore replace any keyboard or mouse attached to the extender system without disrupting the operation of the computer.

Power Requirements

Local Units normally take power from the keyboard connection to the computer. For video only applications, you must apply external power through this port. Use an external 5V PSU with PS/2 connector (Model: PSU1001E-LOCAL).

Contact Technical Support for further information.

5.2 Operation of Dual Access Local Units

Models ACU1028A and ACU1049A offer dual access with a second console at the Local Unit. This operates on a first-come, first-served basis. When one console is in use, the system blocks out the other console until there is no keyboard or mouse use at the active console for a set time: the *Inactivity Timeout Period*. This is fixed at two seconds. Thereafter, any keyboard or mouse action at the other console switches console activity.



When the PC is booted, the local console is active. When you are activating a console, the first key or mouse press is not passed to the PC.

ACU1028A only: When the local console is in Private Mode, audio transmission to the Remote Unit is stopped but the serial link is maintained

Hot Key Commands

With dual access systems, keyboard hot keys are used to carry out various functions at the local console.

To enter these commands:

1. Press and release the initial 'hot' key.
By default, the initial 'hot' key is **<Right Control>**.
2. Press and release the command key.

With these systems, the Scroll Lock operates as normal unless you have pressed the initial hot key.

Changing the Initial Hot Key


The Local Unit's initial 'hot' key may be changed from **<Right Control>** to **<Left Control>** using a DIP switch on the Remote Unit's main circuit board (see Figure 10).

Local Console Commands

After pressing the initial ‘hot’ key on the local keyboard, you can issue a number of commands by pressing additional keys. These commands allow you to start a private mode session on the local console or to reset the keyboard and mouse.



These commands only apply to Local Units having firmware versions ‘S50’ and above.

<i>Command</i>	<i>Key Sequence</i>
<p><i>Private Mode</i> (ACU1028A and ACU1049A only)</p> <p>Audio/Serial Local Units that feature dual access allow the local user to lock out the remote console by triggering a ‘Private Mode’ function. This prevents the remote console from being used even if the two second inactivity timeout period expires.</p> <p>During a Private Mode session, the extender system:</p> <ul style="list-style-type: none"> • Flashes the Scroll Lock LED on the local keyboard. • Illuminates all three LEDs on the remote keyboard. • Displays a blank image on the remote console’s monitor. • Locks the remote console’s keyboard and mouse. • Stops audio transmission. • Switches to remote CPU (ACU1049A only). 	<p><i><Scroll Lock></i></p>
<p><i>Reset Keyboard and Mouse</i></p> <p>Reset the local console’s keyboard and mouse. You may need to do this if you have hot-plugged a keyboard or mouse and it has not initialized correctly.</p>	<p><i><Num-Pad Up Arrow></i></p>
<p><i>Mouse Recovery</i></p> <p>Use this command if you experience erratic movement of the mouse pointer or you have lost mouse movement after hot plugging the Local Unit into the CPU. In the case of erratic mouse movement, you may need to enter the command a number of times to re-synchronize the mouse signal. Alternatively, stop moving the mouse for a few seconds and the operating system’s mouse drivers may automatically re-synchronize the signal. If the Local Unit has been hot-plugged, this command will issue a request to the OS to initialize the mouse. <i>Use this command with care.</i></p>	<p><i><Num-Pad Left Arrow></i></p>
<p> <i>The ACU1049A Local Unit allows the local console to operate the local CPU and the remote console to operate the remote CPU at the same time.</i></p>	

6. Troubleshooting & FAQ

6.1 Video

The image is not sharp, or is badly smeared.

Have you adjusted the video equalization? Follow the instructions on page 29.

Check the Interconnect cable between the Remote and Local Units. Is it of the recommended type (see page 17)? Is it intact along its entire length and securely connected at both ends? Is it wired correctly?

Ensure that all video connections throughout the system are attached securely.

Are you using an LCD panel? You need to adjust its clock and/or phase.

Colors appear to be separated and there are colored borders on text and icons.

Check that the compensation jumper setting is correct for the length of your Interconnect cable (see page 19).

Check the Interconnect cable between the Remote and Local Units. Is it of the recommended type (see page 17)? Is it intact along its entire length and securely connected at both ends? Is it wired correctly?

See **Appendix C: Advanced Cabling Issues (Skew)**, page 45.

I only need video extension – not keyboard or mouse - but I can't get a picture

Have you powered the Local Unit? The Local Unit gets its power from the CPU through the keyboard connection and it will not operate without it. Use an external 5V PSU as described on page 33.

The monitor sometimes goes blank for a second or two.

Check that the interconnect cable is not routed near power lines or other sources of electrical interference. Use shielded STP/FTP cable instead of UTP cable ensuring that the shield connection is maintained between the extender units.

Check system grounding. The Remote Unit has an isolated power supply and relies on obtaining a ground reference through the connected monitor. Some monitors on the market have an external PSU which itself may be isolated from power ground. If this is the case, and you are experiencing monitor blanking, you may need to consider grounding the Remote Unit chassis (to power ground) or replacing the monitor's power supply with a non-isolated model.

If this is a persistent problem, contact Technical Support.

The PC won't boot into the correct graphics mode

The extender includes DDC emulation for all standard resolutions and there should not normally be any issues.

For non-standard resolutions, you will need to explicitly set the resolution in your operating system configuration ignoring the DDC data read from the Local Unit.

Contact Technical Support if you have problems selecting your required graphics mode.

Can the extender be used with RGB video?

Yes.

6.2 Audio

The audio is very quiet.

The audio I/O is line-level and requires amplified speakers and connection to devices providing line-level I/O.

The audio is loud but distorted.

Check that the audio input is not greater than line level (4V peak-to-peak). The KVM extender accepts line-level audio input only.

The microphone output is barely audible.

See **Appendix D: Audio/Serial Ports**, page 47.

6.3 Serial

My serial device does not function.

The extender supports serial devices at data rates not exceeding 19.2K Baud (although 38.4K operation might be possible with certain equipment).

Check the type of flow control used by the device and CPU. The extender supports RTS, CTS, DTR, and DSR. Some systems may require a wiring adapter to transfer RI and DCD.

Attach the device directly to the serial port on the PC and test whether the problem is a PC or extender problem.

Some serial devices cannot be hot-plugged. Try connecting the device to a powered Remote Unit prior to booting the system.

6.4 Keyboard & Mouse

When I am typing, I get wrong or missing characters on the screen.

Your keyboard may be in the wrong mode. Use the appropriate commands to reset the keyboard and mouse as described in the sections covering local and remote operation.

The PC comes up with 'keyboard error'.

Press <F1> or <ESC>. If the keyboard now operates correctly, you need to adjust the BIOS setup to disable keyboard testing during booting.

The system does not detect a PS/2 mouse.

If connecting the Local Unit to a live system, connect the mouse cable to the CPU *before* keyboard connection to ensure the mouse is enabled correctly. Try issuing the Mouse Recovery command.

Check that the mouse cable is connected properly and securely. Reboot the system.

The mouse pointer moves erratically.

Reset the keyboard and mouse.

Issue the Mouse Recovery command up to three times.

Ensure that you have the latest driver for your mouse.

If you are using the extender with a KVM switch, command the switch to reset the mouse.

Quit and restart the application. Reboot the PC.

When I 'hot-plug' the Local Unit, the mouse no longer moves.

When connecting the Local Unit to a live system, connect the mouse cable to the CPU *before* keyboard connection to ensure the mouse is enabled.

Try issuing the Mouse Recovery command.

Some of the mouse buttons don't work.

The Extenders support standard 2/3-button mice (with or without a wheel).

Additional buttons will not operate.

I have an enhanced keyboard with extra keys and indicators. Everything works apart from these additional features.

The extender emulates a generic PS/2 keyboard. To support other keyboards (or cascaded KVM switches), special firmware offering a *transparent mode* may be required. Please contact Technical Support to discuss your application.

6.5 General Questions

Is it possible to use a cable longer than 300m?

It might be possible to use a cable of up to 500m at lower resolutions. However, we do not recommend this and cannot guarantee that it will work.

Can the extender be daisy chained?

In certain circumstances, it is possible to cascade extenders, though we do not recommend doing so. Careful consideration needs to be given to extender setup, and the electrical environment. If you plan to cascade extenders, please contact Technical Support.

Which interconnection cable is best?

The extender will operate with either shielded (STP/FTP) or unshielded (UTP) CATx cable. However, correctly installed shielded cable is preferred, especially in electrically noisy environments, because it resists interference more strongly, limits ground potential differences, and reduces emissions. To benefit from shielded cable the shield connection *must* be maintained from end to end through any intervening patch cables, panels and RJ45 connectors.

Please note that shielded cable is advised in order to maintain regulatory EMC compliance.

Can the extender system be used between buildings?

No. Ground loops could damage the extender system and attached equipment.

Can multiple Local/Remote Units be used by swapping the interconnection cable?

Local Units provide full keyboard and mouse emulation, so it is possible to swap or switch the local-remote interconnection to create a KVM matrix-switch system. Sometimes you may need to reset the keyboard and mouse (by entering the appropriate command) after a swap or switch. Please call Technical Support before deploying such a system.

Can the extender be connected into our network?

Absolutely not. Regardless of the cable similarities, the data signals and voltages used by the extender are different from those used by Ethernet and other types of networks. Connecting the extender to a LAN hub, switch, repeater, or other network device, or exposing it to the signal levels present on network data lines may damage the extender and other devices.

Appendix A: Example Applications

This section illustrates three specific applications using ServSwitch™ Brand CAT5 KVM Extender units:

- Six remote serial touch screens with local access through a KVM switch (Figure 11).
- Information distribution system sharing a single PC at up to six remote locations (Figure 12).
- ACU1049A extender kit allows remote user to switch between remote and local CPUs (Figure 13).

For more information about these, or any other complex applications, please discuss suitable extension architecture with Technical Support.

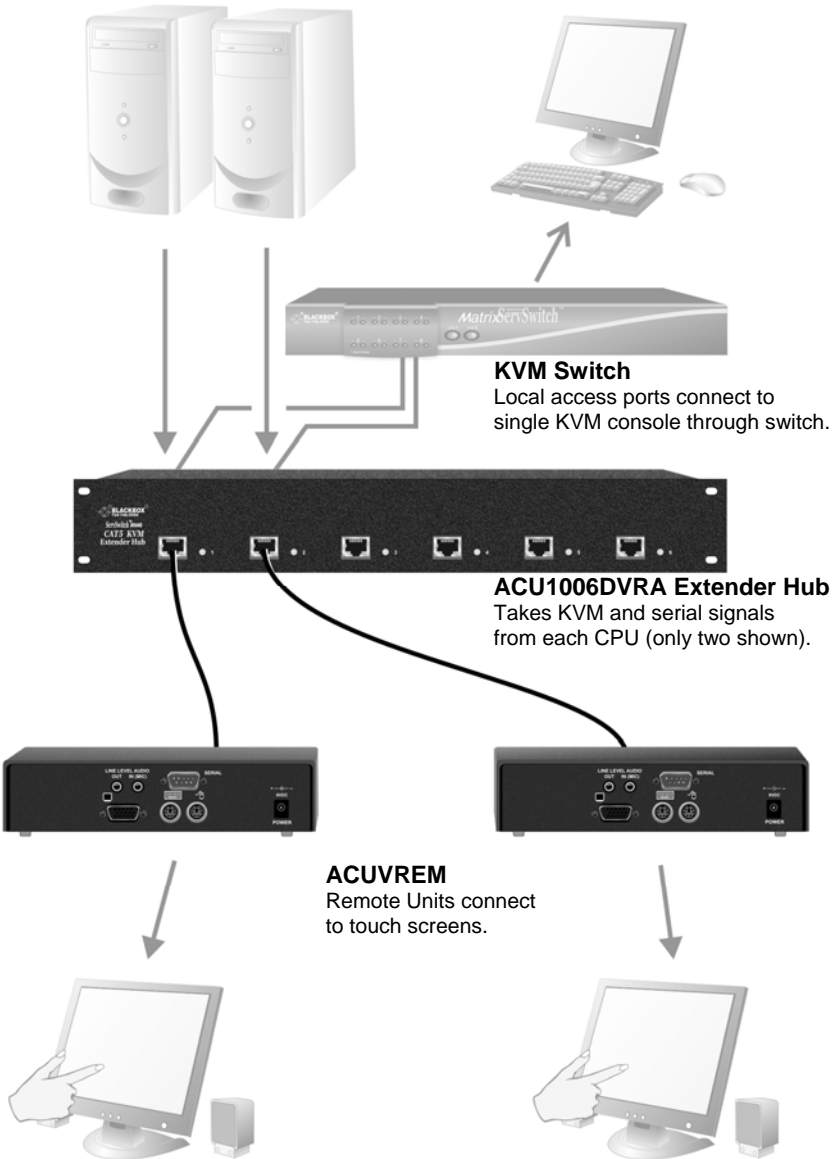


Figure 11 Touch screen network with local access to CPUs through KVM switch.

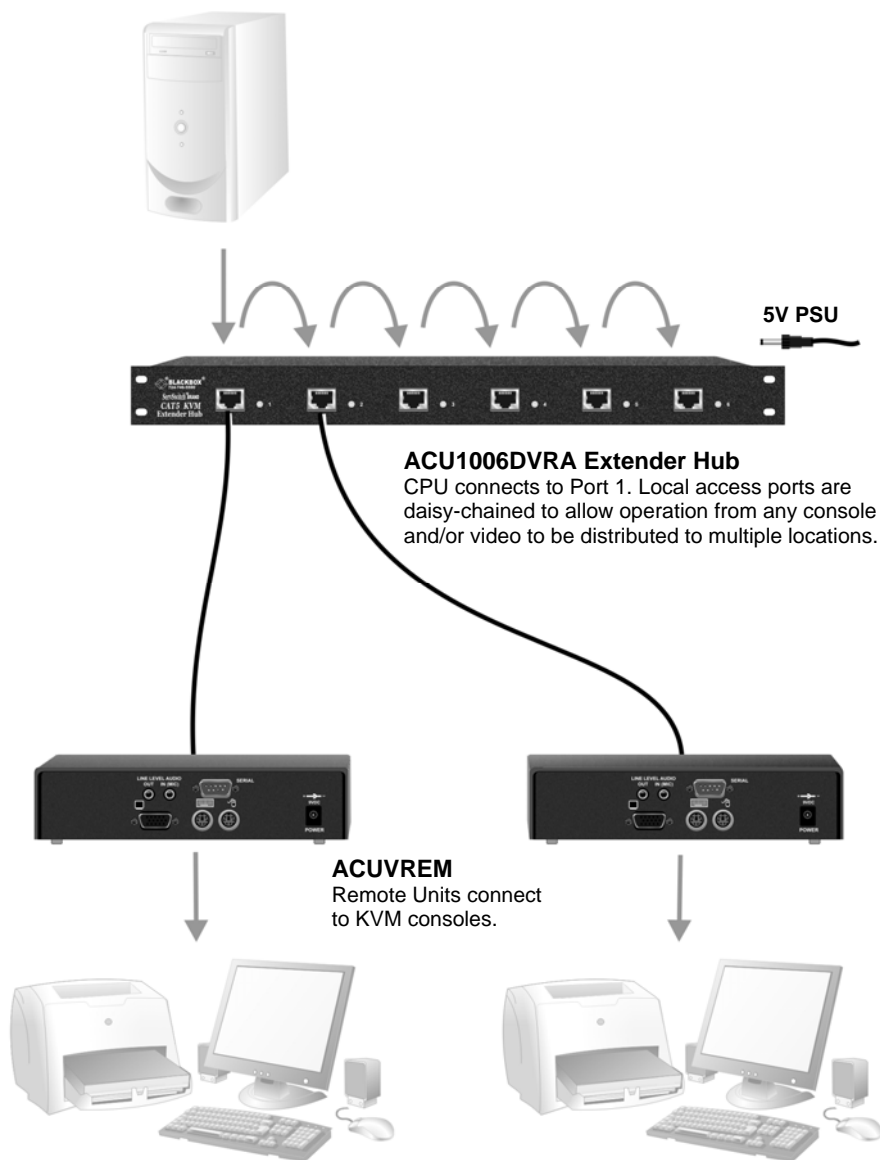


Figure 12 Information distribution system sharing a single PC

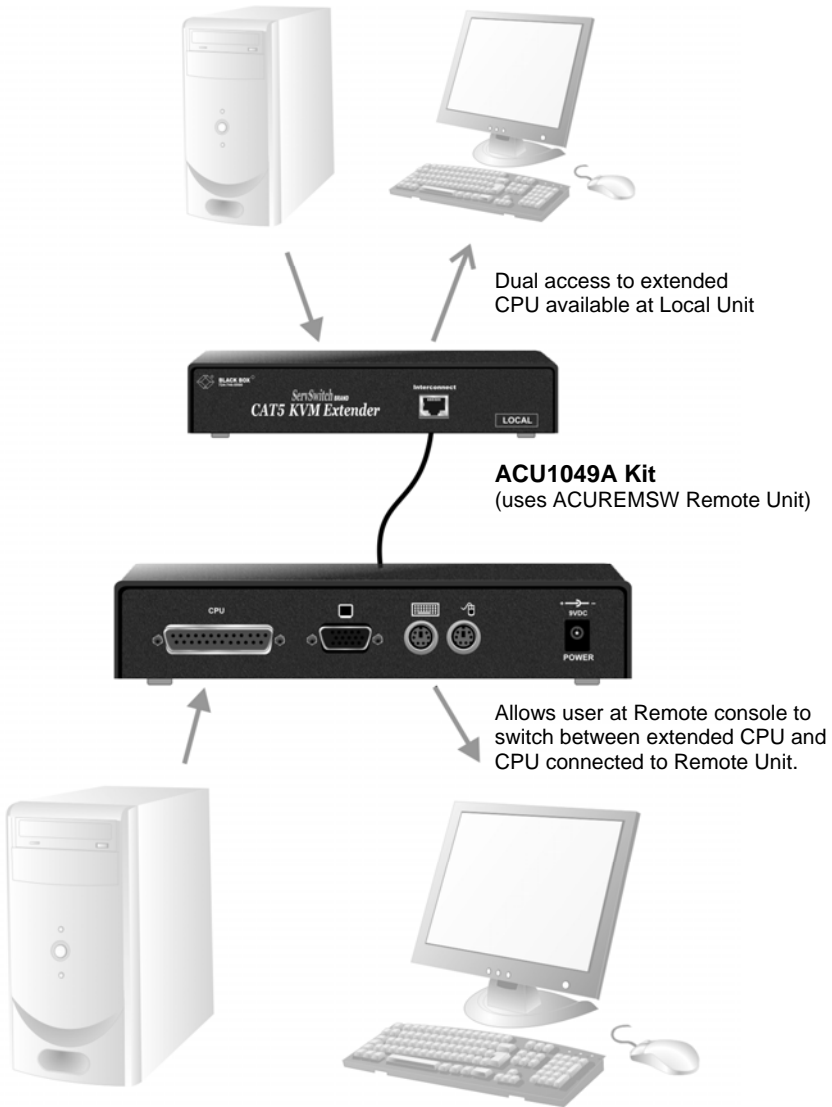


Figure 13 ACU1049A kit with switching Remote Unit

Appendix B: Rack Mount Options

Extender units can be mounted in a 19" rack using the mounting kit::RMK19U-R2.

Each kit consists of two angled brackets.

To mount a unit:

1. Remove the two screws from one side of the unit.
2. Match up the lower pair of holes on a bracket with the vacant screw holes on the side of the unit.
3. Using the original screws, fasten the mounting brackets to the side of the unit.
4. Repeat this procedure on the other side of the unit.
5. Fasten the assembly to the rack unit.

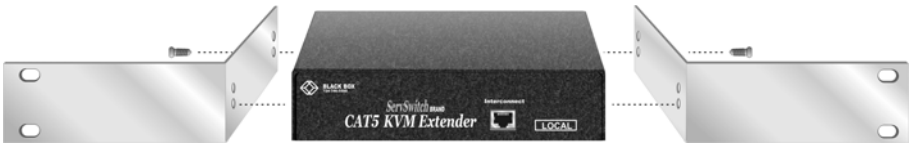


Figure 14 RMK19U-R2 Mounting Kit

Appendix C: Advanced Cabling Issues (Skew)

This section discusses skew and how to minimize its effects.

What is Skew?

Each color in the RGB (Red, Green, Blue) video signal is sent down a separate pair of wires in the Interconnect cable. On many cables, the twist rates differ and this leads to each color arriving at a slightly different time and therefore spreading out on the screen.

Certain CATx cables can show noticeable skew when operating at high video resolutions over longer lengths of cable (see page 28). Skew problems are best avoided by using 'low skew' cable. This is CATx cable with closely matched twist rates. Please contact Technical Support for recommendations.

Correcting Skew

If a change in cable is not possible, or if you still observe color separation when using low skew cable, you could try one of the techniques described in this section:

- Optimizing pairs (to match pairs for RGB video)
- Patch cables (to minimize visible distortion)
- Extender with Skew Compensation (to delay fastest signals)

You can check the relative delays in the color signals using the test card, as described on page 29. Skew causes the color bars in the test pattern to be displayed at slightly different horizontal positions on the screen. To fully correct skew, the two color bars furthest to the left require delaying until they align with the color bar on the right (slowest).

Optimizing Pairs

This technique is a general solution for optimizing video transmission along a CATx cable. The aim is to arrange the color and data signals as shown in the following table:

<i>Pins</i>	<i>Pair</i>	<i>Signal</i>
7 & 8	Shortest Pair (Fastest)	Data
1 & 2	3 rd Longest Pair	Blue Video
4 & 5	2 nd Longest Pair	Red Video
3 & 6	Longest Pair (Slowest)	Green Video

You can measure pair lengths with a LAN cabling tester (TDR) or view pairs by stripping back a small piece of cable and viewing how tightly the pairs are twisted. The most tightly twisted pair is the slowest (longest) and the loosest pair the fastest (shortest). You can also observe relative delays using the test card.

Some cables have a '3+1' construction where three pairs closely match. The fourth pair should be used for data and the other pairs sorted as in the above table. Other cables have a '2+2' construction where there are two sets of dissimilar pairs. Put red and green on one set (tightest) and blue & data on the other.

A suitable pair-swapping scheme is easily made using custom wired patch cables at each end of the Interconnect cable.

Extender with Skew compensation

In more extreme cases, you should consider using an alternative extender with an in-built Skew Compensation feature such as the ACU2000 series. This allows you to set independent delay values of up to 42nS on each color signal. Contact Technical Support for details

Patch Cable

To obtain optimal video performance with your existing setup, it is desirable to have the green signal as the reference (slowest). This is because the human eye is extremely sensitive to additional green distortion (introduced by delays).

If your system requires a large delay on the green signal, try using a crossover patch cable at each end of the link (instead of straight patch cables to connect to wall outlets). In many cases, the crossover should transfer the delay requirement to the blue signal rather than green. The human eye is much less sensitive to blue distortion and so video quality appears to be improved. The main cable should be wired according to EIA-568B as shown on page 17. Using a crossover cable (at each end) will put the green video on the orange colored pair and the blue video on the green colored pair.



EIA-568A wiring can also be used to the same effect. Contact Technical Support for details.



The alternative ServSwitch™ Brand CATx KVM Extender range (ACU2000 series) has been specifically designed for the extension of high screen resolutions (1600x1200) over long CATx cables (300m). ServSwitch™ Brand CATx KVM Extenders have fully integrated skew compensation and independent control of low frequency (LF) and high frequency (HF) cable equalization.

Appendix D: Audio/Serial Ports

Operation & Multi-Port Configuration

This appendix describes audio & serial interface operation for:

- ACU1022A
- ACU1028A
- ACUVREM

These extender products contain daughter boards that allow bi-directional stereo audio and a full-duplex serial data link to be sent across the CAT5/5e interconnection cable in addition to PS/2 keyboard, mouse and video.



When a dual access Local Unit is in a Private Mode session, audio transmissions to the Remote Unit are stopped but the serial link remains active.

Set up and Operation

No setting up or user adjustments are required.

The Remote Unit's serial port is wired as DTE - the same as that on a PC. To connect a serial printer or other DTE (rather than DCE device) to the Remote Unit, you will need a Null-Modem crossover cable between the Remote Unit and the printer. Select Xon/Xoff software flow control on the printer and PC.

A serial touch screen may be plugged directly into the Remote Unit.

Please note that on dual access Local Units, the serial link is always active.

Handling Multiple Serial Devices

The extender's serial interface transmits/receives six signals (3 signals in each direction).

Normally, four of these signals are used for hardware handshaking (in addition to TX & RX). However, because each handshaking line can support signals up to 19,200 Baud it is possible to configure the serial interface to handle up to three simple 2-wire (Tx/Rx only) serial links.

To do this, you will need to construct a custom breakout cable. Please contact Technical Support for further information.

Audio Interface

Set Up and Operation

The audio interface is line-level and is designed to take the output from a sound card (or other line-level) source and be connected to a set of powered speakers at the other end of the link.

Stereo audio may be transmitted either way across the link (simultaneously).

No setup is required unless a microphone is connected to the Remote Unit.

Connect the extender as follows:

- Take the line-level output from your sound card (green connector) and connect to 'Line In' on the Local Unit.
- Connect 'Line Out' on the Remote Unit to a set of powered speakers.

There is no output on the Local Unit to connect a set of speakers. If you require a set of speakers at the local console, use a 3.5mm stereo socket doubler on the audio input to the extender.

Using a Microphone

A microphone may be plugged into the 'Line In' connector on the Remote Unit.

There are two ways of setting up a microphone:

- The Local Unit's 'Line Out' connection should normally be wired to the microphone input (Pink) on your sound card. The sound card should then be set up to provide additional amplification (+17dB). This is the preferred connection method.
- Alternatively, the Remote Unit itself can provide microphone amplification. To set this, open up the Remote Unit and locate the jumper labeled 'MIC' on the daughter board. Connect this jumper across the pins. The Local Unit's 'Line Out' connection should then be wired to 'Line In' (Blue) on your sound card.

If your microphone is already amplified, follow the second method but DO NOT install the amplification jumper in the Remote Unit.

Appendix E: Calling Black Box

If you determine that your ServSwitch™ Brand CAT5 KVM Extender is malfunctioning, *do not attempt to alter or repair it*. 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 firmware-revision level printed on the bottom of the Extender (very important, especially for keyboard and mouse problems); The KVM extender's firmware revision level:

Version Number Format: xxSyy/zz

xx is the hardware revision number

yy is the firmware revision number

zz is the auxiliary revision number.

- The nature and duration of the problem.
- When the problem occurs.
- The components involved in the problem—that is, what type of computers, what type of keyboard, brand of mouse, make and model of monitor, type and make of CAT5 cable, etc.
- Any particular application that, when used, appears to create the problem or make it worse.
- The results of any testing you've already done.

To solve some problems, it might be necessary to upgrade the Extender's firmware. If this turns out to be the case for your difficulty, our Technical Support technicians will arrange for you to receive the new firmware and will tell you how to install it.

Shipping and Packaging

If you need to transport or ship your ServSwitch™ Brand CAT5 KVM Extender:

- Package it carefully. We recommend that you use the original container.
- If you are shipping it for repair, please include the Remote Unit's external power supply. If you are returning it, please include everything you received with it. Before you ship the Extender back to Black Box for repair or return, contact us to get a Return Authorization (RA) number.

Appendix F: Specifications

Video

Maximum Resolution	1600x1280@60Hz up to 65m 1280x1024@75Hz up to 120m 1024x768@75Hz up to 300m Operation at higher resolutions/refresh rates may be possible at shorter distances
Video Compatibility	VGA to UXGA, RGB
Video I/O	0.7V P-P
Video Compensation	3-stage continuously variable.
Video Coupling	DC
Sync I/O	H/V or composite TTL signal levels Sync Polarity is preserved
Video Input Connectors	HD15 (Male) DB25 Female (<i>ACUREMSW - CPU</i>)
Video Output Connectors	HD15 (Female)

Keyboard and Mouse

KB Compatibility	PC/AT, PS/2
Mouse Compatibility	Standard PS/2 two/three button Standard wheel mice Logitech 3-button PS/2
KB/Mouse Connectors (CPU)	6-Pin MiniDIN Socket DB25 Female (<i>ACUREMSW - CPU</i>)
KB/Mouse Connectors (Device)	6-Pin MiniDIN Socket

Serial Interface

<i>Max Baud Rate Supported</i>	19.2K Baud
<i>Serial Data Format</i>	Transparent
<i>Signals Transferred</i>	TX, RX, RTS, CTS, DTR, DSR
<i>Local Unit Connector</i>	DB9 Female (DCE)
<i>Remote Unit Connector</i>	DB9 Male (DTE)

Audio Interface

<i>Description</i>	Bi-directional stereo audio link
<i>Transmission method</i>	Digitized virtually CD quality audio (16-bit, 38.4kHz)
<i>Signal levels</i>	Line level (4 Volts Pk-Pk maximum)
<i>Input Impedance</i>	47k Ω
<i>Local Unit Connectors</i>	2x3.5mm stereo jack socket (Line In & Line Out)
<i>Remote Unit connectors</i>	2x3.5mm stereo jack socket (Line/Mic In & Line Out)
<i>Microphone Support</i>	Microphone may be connected to Remote Unit Pullup resistor provides bias for condenser microphone Option to set microphone amplification to +17dB

Power Requirements

<i>Local Unit</i>	5V at up to 200mA supplied by PCs PS/2 keyboard port. External PSU may also be connected through keyboard port
<i>Remote Power Supply</i>	9V, 2A (18W) Regulated (certified to all relevant safety standards) Universal IEC Input Isolated Output 2.5mm DC Jack (Center Positive)

Size and Shipping Weight

<i>ACUREMSW</i>	Remote Unit: 202x100x36mm Shipping Weight: 1.08 Kg
<i>ACUVREM</i>	Remote Unit: 202x100x44mm (1U) Shipping Weight: 1.14 Kg
<i>ACU1022A</i>	Local Unit: 202x100x44mm (1U) Remote Unit: 202x100x44mm (1U) Shipping Weight: 2.53 Kg
<i>ACU1028A</i>	Local Unit: 202x100x44mm (1U) Remote Unit: 202x100x44mm (1U) Shipping Weight: 2.58 Kg
<i>ACU1049A</i>	Local Unit: 202x100x36mm Remote Unit: 202x100x36mm Shipping Weight: 2.48 Kg

Environmental

<i>Operating Temperature</i>	0 to 40 °C
<i>Storage Temperature</i>	-30 to 65 °C
<i>Relative Humidity</i>	5-90% non-condensing
<i>Chassis Construction</i>	Fully shielded. Black painted steel

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