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November 2009

ServSwitch™ BRAND

CAT5 KVM Micro Extender



ACU3001A
ACU3009A
ACU3022A
ACU1007A
ACUMREM
ACUWREM
ACU1006MRA
ACU1006MRVA

BLACK BOX®
NETWORK SERVICES

Welcome to the ServSwitch™ Family!

Thank you for purchasing a BLACK BOX® ServSwitch™ Brand CAT5 KVM Micro 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 Micro 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:

ACU3001A
ACU3009A
ACU3022A
ACU1007A
ACUMREM
ACUWREM
ACU1006MRA
ACU1006MRVA

User Guide Revision: 2.0 (November 2009)

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The manufacturer cannot accept liability for damage due to misuse of the product or due to any other circumstances outside the manufacturer's control (whether environmental or installation related). The manufacturer shall not be responsible for any loss, damage, or injury arising directly, indirectly, or consequently from the use of this product.

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 connectado 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 fisica 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 lineas de energia.
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 objectos liquidos 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: 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.

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.
- 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 CAT5 link interface (RJ45) to any other products, especially telecommunications or network equipment.

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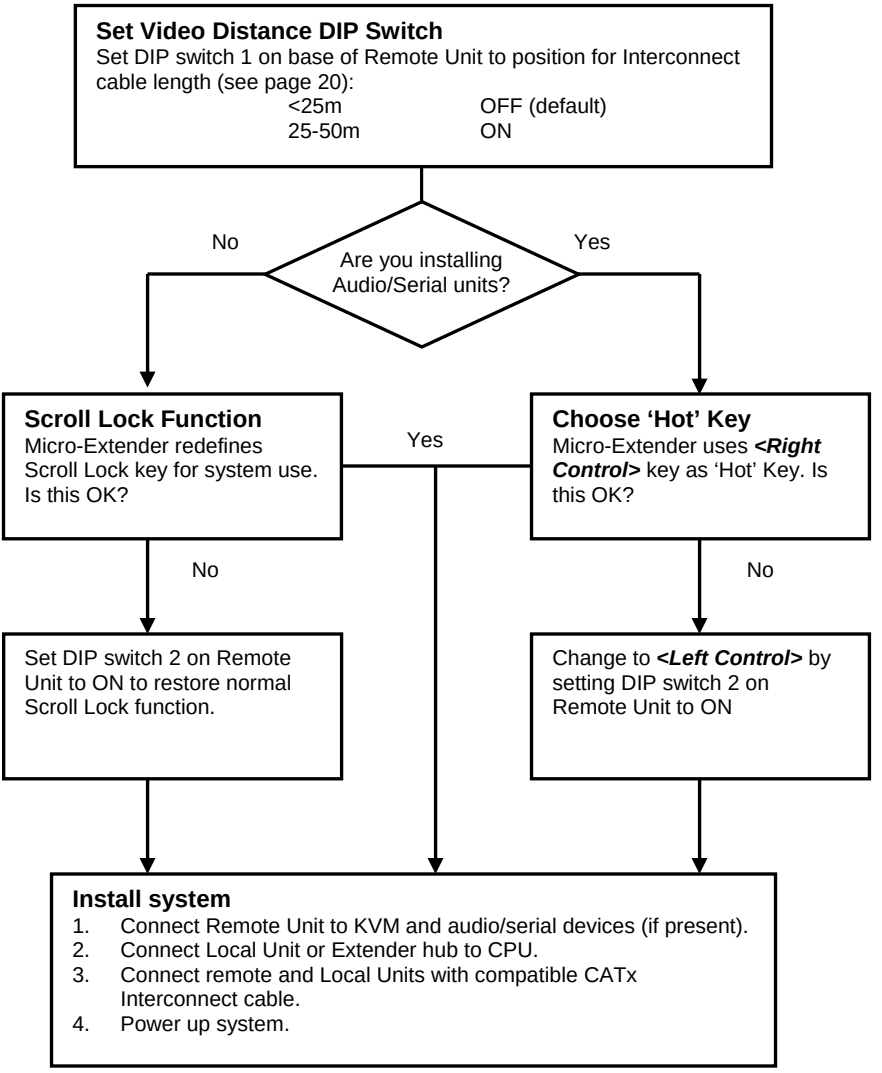
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1. Quick Setup

This section briefly describes how to install your KVM Micro 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.



Any Problems? See Installation and Troubleshooting sections.

Note: *The above chart is not applicable to ACU1007A*

1.1 Command Summary

The implementation of commands in the Micro Extender family differs in Standard and Audio/Serial systems:

Standard Units

ACU3001A, ACU3009A, ACUMREM and ACU1006MRA only

Standard and Dual Access Micro Extenders redefine the Scroll Lock key for issuing system commands:

Command	*Key Sequence*
Reset Keyboard and Mouse Devices	<Scroll Lock>
Mouse Recovery	<Scroll Lock> + Left and Right Mouse buttons
Dual Access Systems Only (for example, ACU3009A):	
Activate Console (local or remote console)	Any key or mouse action Only operates if other console has been inactive for at least 2s
Start/End Private Session (local console only)	<Scroll Lock> also resets keyboard and mouse. To do so without starting Private session, press <Scroll Lock> twice.

Audio/Serial Units

ACU3022A, ACUWREM and ACU1006MRVA only

After pressing and releasing an initial 'hot' key, normally ***<Right Control>***, on the remote keyboard, you can issue a number of commands:

Command	*Key (after pressing 'hot' key)*
Reset Local Keyboard and Mouse	<Num-Pad Up Arrow>
Mouse Recovery	<Num-Pad Left Arrow>
When used with compatible Dual Access Audio/Serial Local Units/Hubs (for example, ACU1006DVRA):	
Activate Console	Any key or mouse action Operates if other console has been inactive for >2s
Start/End Private Session at remote console	<Scroll Lock>

*Change the 'hot' key to **<Left Control>** by setting DIP switch 2 to ON.*

2. Overview

2.1 Introduction

TheServSwitch™ Brand CAT5 KVM Micro Extender products described in this manual enable high-resolution video, PS/2 keyboard and mouse and, optionally, stereo audio and serial port signals to be communicated up to 150 ft (50m) over CATx (Category 5, 5e, 6 or higher) 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.
- 6-port Remote Hubs in a rack mount chassis.

2.2 Glossary

The following terms are used in this guide:

CATx	Any Category 5, 5e, 6 or higher cable.
PSU	Power Supply Unit.
KVM	Keyboard, Video and Mouse.
Console	A keyboard, monitor, and mouse, plus optional serial devices.
Dual Access	A system allowing connection of local and remote user consoles.
Single Head	An extender system that supports one monitor.
Dual Head	An extender system that supports two monitors.

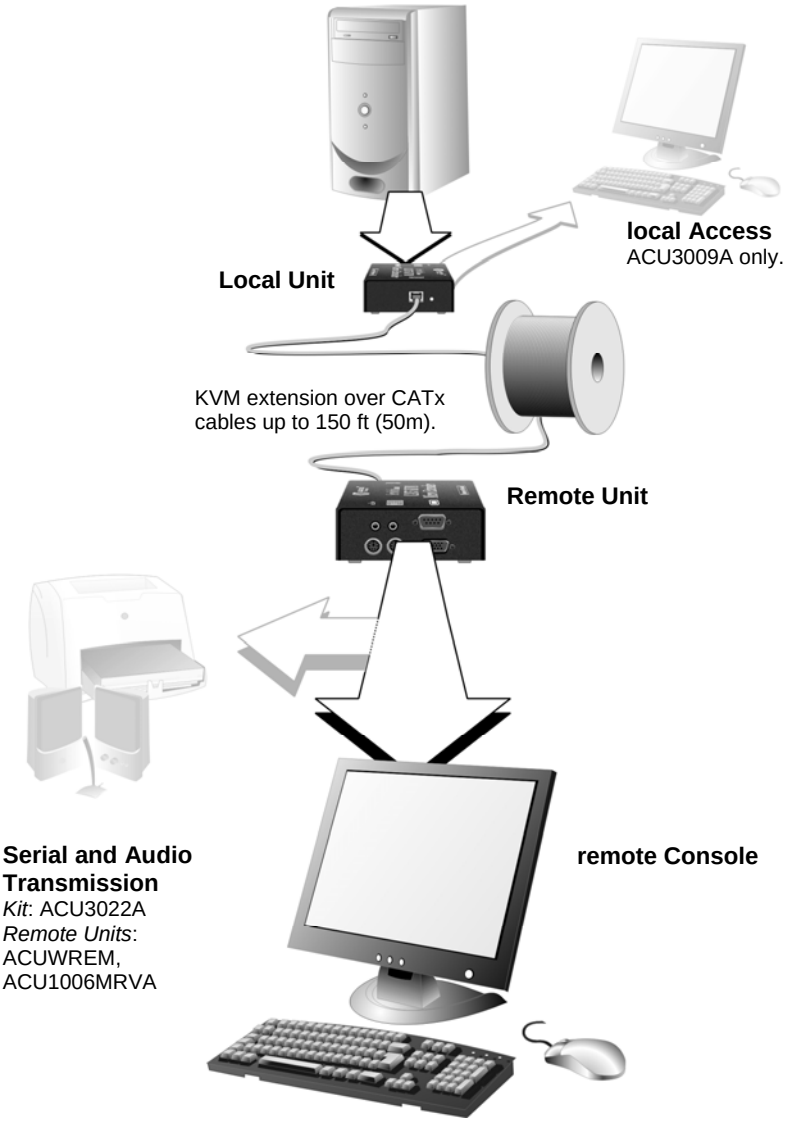


Figure 1 **ServSwitch™ Brand CAT5 KVM Micro Extender system**

2.3 Features

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

- Support for high video resolution over extended distances: 1280x1024@75Hz up to 150 ft (50m).
- Video equalization circuitry 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
- 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 versions only*: Transparent serial port 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 versions only*: Bi-directional stereo audio (16-bit digitized) support on certain models enables high-quality audio extension.
- Local Units are normally powered directly by the PC (or switch).
- Private Mode on dual-access models allows user to lock out remote console.
- Small footprint chassis.
- Rack mount options available.
- Surge protection on each RJ45 port.
- Micro Extender Remote Units are fully compatible with Servswitch™ Brand CAT5 Extender Local Hubs.
- CPU KVM cables included (certain models).



ACU1007A extends PS/2 keyboard and mouse only over distances of up to 1000 ft (300m.)

2.4 Product Range

There are eight products in the ServSwitch™ Brand CAT5 KVM Micro Extender range:

Kits for KVM Extension Only	
ACU3001A	Single Video Channel, PS/2 KB & Mouse Local Unit (Single Access) + Remote Unit
ACU3009A	Single Video Channel, PS/2 KB & Mouse Local Unit (Dual Access) + Remote Unit
Kits for KVM, Audio and Serial Extension	
ACU3022A	Single Video Channel, PS/2 KB & Mouse, Audio and Serial Local Unit (Single Access) + Remote Unit
Kit for PS/2 Extension Only (up to 300m)	
ACU1007A	PS/2 KB & Mouse Local Unit (Single Access) + Remote Unit
Remote Units Only	
ACUMREM	Single Video Channel, PS/2 KB & Mouse
ACUWREM	Single Video Channel, PS/2 KB & Mouse, Audio and Serial
ACU1006MRA	6-port Micro Extender Hub, 1U rack Each port: Single Video Channel, PS/2 KB & Mouse
ACU1006MRVA	6-port Micro Extender Hub, 1U rack Each port: Single Video Channel, PS/2 KB & Mouse, Audio and Serial

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 D: Specifications**, page 47).

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.

Family	***CAT5***	***CATx***	***Micro***	***Hubs***
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 Audio/Serial members of the ServSwitch™ Brand CAT5 KVM Micro 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 or Hub*, ensure that it is compatible with your Local Unit or hub (see **Extender Compatibility**, page 16).

For information about connection and installation, see **Installation**, page 18.

Interconnection Cable

You will need CATx cable, terminated with RJ45 plugs, to connect the Local and Remote Units (see **Interconnection Cable Requirements**, page 19).

Adjusting Video

Video signals become distorted when transmitted over CATx cables. 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 Operation**, page 29.

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 Micro 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 C: Calling Black Box**, page 46.

- Micro Extender Remote Unit (or Hub).
- 9V DC universal power supply for Remote Unit.
  All except ACU1007A.
- 5V DC universal power supply for Remote Unit.
  ACU1007A only.
- Micro Extender Local Unit.
  Only included in extender kits.
- 3ft (1.0m) KVM CPU combination cable with PS/2 (6-pin MiniDIN male) keyboard and mouse connectors, VGA video (HD15 male) connector, and 25-way (DB25 male) extender connector.
  Not included with Remote Units or ACU1007A.
- Two 6ft (1.8m) keyboard and mouse CPU cables with PS/2 (6-pin MiniDIN male) connectors.
  ACU1007A only.
- 3ft (1.0m) Serial cable, DB9 male/female connectors, 1:1 connections).
  ACU3022A only.
- 3ft (1.0m) Dual audio cable, 3.5mm stereo plugs.
  ACU3022A only.
- Rack mount brackets
  ACU1006MRA and ACU1006MRVA 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.

Cable Pinning/Pairing

The following table illustrates which RJ45 connector pins the extenders use for various signals. It also details the standard EIA-568B wiring scheme that is recommended for most installations.

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

Pin*	***Color (EIA-568B)***	***Signal***
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.



***Technical Note:** Although skew (color separation) can be an issue on some CATx cables, it would not normally be observed on cables <50m. Even so, we still recommend the use of low skew cables with Micro Extenders.*

3.3 Remote Unit Installation

Setting the Cable Length Jumpers

If your application uses a CATx cable less than 80 ft (25m) in length, or you have an ACU1007A, 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 CATx cables. At the factory, Remote Units are configured to optimize the video signals for Interconnect cables up to 80 ft (25m) in length.

If you intend to use cables of 80-150 ft (25-50m) in length:

1. Locate the DIP switches on the underside of the Remote Unit. On a 6-port Micro Extender hub, there are six pairs of DIP switches, also located on the underside, in line with each port.

2. Set DIP Switch 1 as follows:

Interconnect Cable Length	***DIP Switch 1 Position***
0 - 80 ft (0 - 25m)	OFF (default)
80 - 150 ft (25 - 50m)	ON

If you are carrying out a test placement prior to final installation, set the DIP switch to the position appropriate to the test cable's length. When your tests are complete, set the DIP switch to the position appropriate for the CATx cable length used in the full installation.

*For information about DIP switch 2, see **Remote Unit Operation**, page 29.*

Attaching Rack Mount Brackets

ACU1006MRA and ACU1006MRVA only

You can mount 6-port Micro Extender Remote Hubs in a 19" rack using the supplied brackets. To attach the brackets:

1. Remove the two screws on each side of the Remote Hub case.
2. Match up the holes on a bracket to the vacant screw holes on the Remote Hub case.
3. Fasten the bracket to the Remote Hub using the original screws.
4. Repeat the procedure with the other bracket.
5. Fit the assembly into your 19" equipment rack and fasten using appropriate screws, cage nuts or bolts (not supplied).

3.4 Connecting the Remote Unit

To install a Remote Unit:

1. Switch off all devices.
2. Connect your keyboard, monitor(s) and mouse to the Remote Unit/Hub port as shown in Figure 2 (Standard) and Figure 3 (Serial/Audio).

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

Remote Unit	***Audio Device***
Audio Out	Speakers
Audio In (MIC)	Microphone

See **Appendix B: Audio/Serial Ports**, page 44 for further information.

4. Connect the CATx cable to the INTERCONNECT socket on the front of the Remote Unit/Hub port as shown in Figure 4.
5. Connect the PSU to power the unit.

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

   NEVER CONNECT A REMOTE UNIT'S POWER SUPPLY TO A LOCAL UNIT OR HUB. THIS COULD DAMAGE THE EXTENDER SYSTEM.

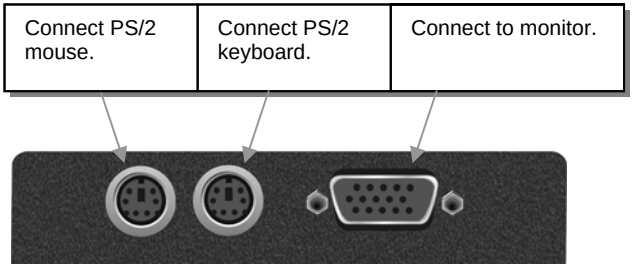


Figure 2 **Standard Remote Unit/Hub Port – rear view (ACUMREM, ACU3001A, ACU3009A, ACU1006MRA)**

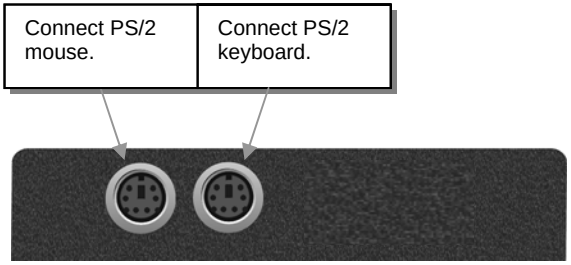


Figure 2A **ACU1007A Remote Unit - rear view**

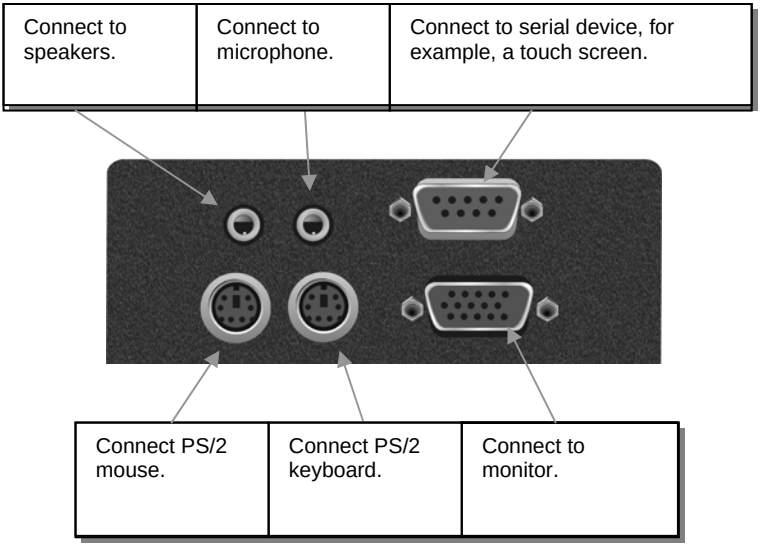


Figure 3 **Audio Remote Unit/Hub Port– rear view (ACUWREM, ACU3022A, ACU1006MRVA)**

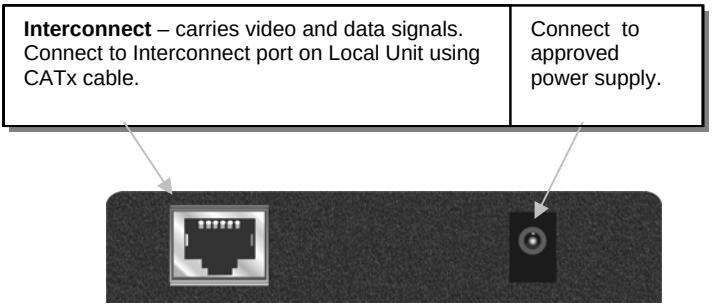


Figure 4 **Remote Unit/Hub Port - front view (Hub has single power supply connector on rear)**

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 5 (Standard) and Figure 6 (Audio/Serial).

   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/serial unit, connect the audio serial cables between the computer and Local Unit. Connect the audio cables as follows:

Computer	***Local Unit***
Audio Out (green)	Audio In
Audio In/Microphone (pink/blue)	Audio Out

5. Connect the CATx cable from the Remote Unit to the INTERCONNECT socket on the front of the Local Unit (see Figure 7).

6. Power up the PC and Remote Unit. The green LED on the Local Unit indicates the powered status of the PC and Remote Unit, and the integrity of the CATx connection:

LED off	PC not powered or keyboard PS/2 cable to Local Unit disconnected.
LED on continuously	Remote Unit not powered, CATx cable disconnected, or PC in BIOS boot sequence.
LED flashing	Remote Unit powered, data link operating correctly.

   The Local Unit normally takes power through the PCs 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.

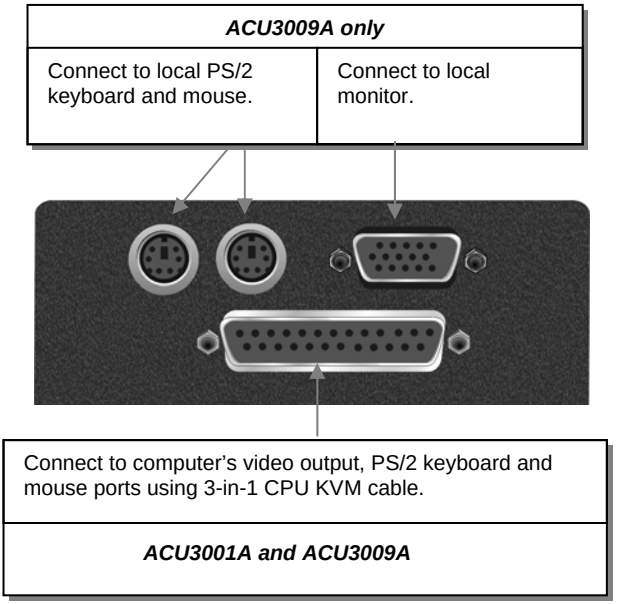


Figure 5 **ACU3001A and ACU3009A Local Units - rear view**

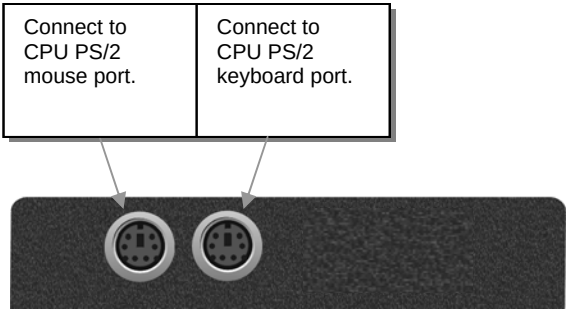


Figure 5A **ACU1007A Local Unit - rear view**

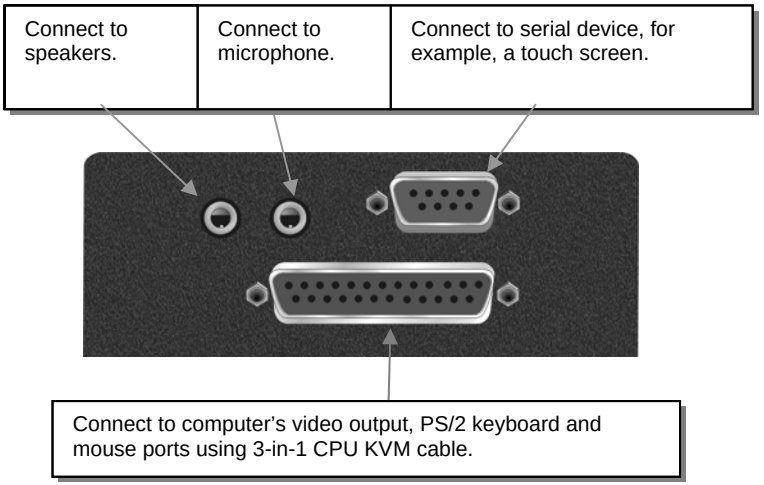


Figure 6 ACU3022A Local Unit - rear view

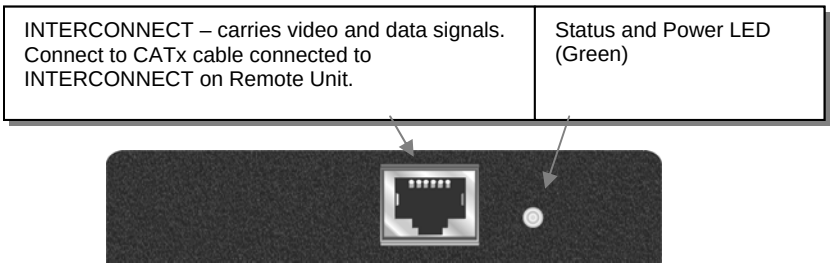


Figure 7 Local Unit – front view

3.6 Connection to Local Hubs

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

Remote Units	*Compatible Local Rack Hubs*
ACU3001A, ACU3009A, ACUMREM, ACU1006MRA	ACU1006RA, ACU1006DRA, ACU1012RA
ACU3022A, ACUWREM, ACU1006MRVA	ACU1006VRA, ACU1006DVRA

A simple example of the use of a Local Hub unit, in which an ACUMREM 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 Micro Extender Remote Units/Hubs in efficient ways, see **Appendix A: Example Applications**, page 39.

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

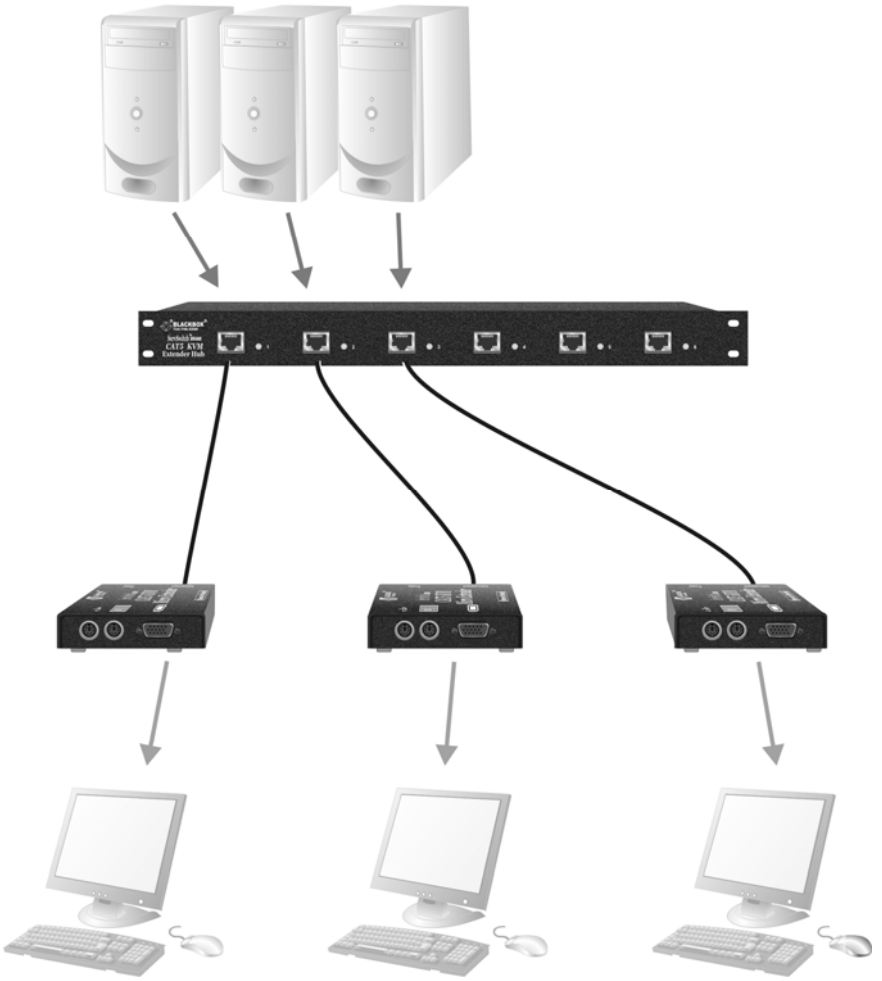


Figure 8 **Simple system using ACU1006RA Hub and ACUMREM Remote Units**

4. Remote Unit Operation

The operation of Standard and Audio/Serial Remote Units is slightly different. Please read the section appropriate to your system.

For information about serial/audio port operation, see **Appendix B: Audio/Serial Ports**, page 44.

4.1 Operating Standard Units

Micro Extender kits: ACU3001A, ACU3009A, ACU1007A
Micro Extender Remote Unit: ACUMREM
Micro Extender 6-port Remote Hub: ACU1006MRA

Scroll Lock Function

Standard Remote Units use the Scroll Lock key for system commands. The following table lists the commands available at a Standard remote console:

Command	*Key Sequence*
Reset Keyboard and Mouse *All except ACU1007A*	***<Scroll Lock>***
Reset the remote console's keyboard and mouse. You may need to do this if you have plugged a keyboard or mouse into a powered Remote Unit and it has not initialized correctly.	
Mouse Recovery	*Hold down* ***Left and Right Mouse buttons*** *then press and release* ***<Scroll Lock>***
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. *Use this command with care.*	
Activate Console *ACU3009A only*	***Any key or mouse action***
Gain control of CPU from local console. Only operates if local console has been inactive for at least 2s.	

You can restore normal Scroll Lock activity by setting switch 2 on the DIP switch block to ON. If you do this on a Dual Access system (ACU3009A, for example):

- Private Mode operation is disabled.
- To reset the keyboard and mouse, you will need to re-power the Remote Unit or hot-plug the keyboard and mouse on the Local Unit.



4.2 Operating Audio/Serial Remote Units

Micro Extender kits: ACU3022A
Micro Extender Remote Unit: ACUWREM
Micro Extender 6-port Remote Hub: ACU1006MRVA

With these systems, keyboard hot keys are used to carry out keyboard and mouse reset functions.

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>** by moving switch 2 on the Remote Unit's DIP switch block to the ON position.



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 reset the keyboard and/or mouse.

Command	*Key Sequence*
Reset Keyboard and Mouse	***<Num-Pad Up Arrow>***
Reset the remote console's keyboard and mouse. You may need to do this if you have plugged a keyboard or mouse into a powered Remote Unit and it has not initialized correctly.	
Mouse Recovery	***<Num-Pad Left Arrow>***
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. *Use this command with care*.	

Dual Access Commands

The Micro Extender range does not include a Dual Access Audio/Serial Local Unit. However, if you use an Audio/Serial Micro Extender Remote Unit with a compatible Dual Access Audio/Serial Local Unit/Hub (for example, ACU1006DVRA), the following commands are available at the remote console:

Command	*Key Sequence*
Activate Console	***Any key or mouse action***
Gain control of CPU from local console. Only operates if local console has been inactive for at least 2s.	
Start/End Private Session at Remote Unit	***<Scroll Lock>***

Start/End 'Private Mode' at remote console. This prevents the local console from being used even if the inactivity timeout period expires.

During a Private Mode session, the extender system:

- Slowly flashes the Scroll Lock LED on the remote keyboard.
- Lights all three LEDs on the local keyboard.
- Locks the local console's keyboard and mouse.
- Displays a blank image on the local console's monitor.

To end the Private Mode session, press the Scroll Lock key on the remote console a second time.

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, **Appendix B: Audio/Serial Ports**, page 44.

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

Micro Extender kit: *ACU3009A only*

Dual Access 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 2 seconds. Thereafter, any keyboard or mouse action at the other console switches console activity.

Scroll Lock Function

The Remote Unit supplied with the ACU3009A Micro Extender kit redefines the function of the Scroll Lock key (on both the local and remote console keyboards) for system use (see page 29).

You can restore normal Scroll Lock activity by setting switch 2 on the Remote Unit's DIP switch block to ON (see page 29). In Dual Access systems, this will disable Private Mode operation. In addition, if you need to reset/recover a console's keyboard and mouse, you may need to reboot the system.

Command Summary

On a dual access system, you can issue the following commands at the local console:

Command	*Key Sequence*
Activate Console	Any key or mouse action
Gain control of CPU from remote console. Only operates if remote console has been inactive for at least 2s.	
Start/End Private Mode	***<Scroll Lock>***
Start/End 'Private Mode' at local console. This prevents the remote console from being used even if the inactivity timeout period expires. During a Private Mode session, the extender system: • Lights the Scroll Lock LED on the local keyboard. • Lights the Scroll Lock LED on the remote keyboard. • Locks the remote console's keyboard and mouse. • Displays a blank image on the remote console's monitor. To end a Private Mode session, press the Scroll Lock key on the local console a second time. Remember that each press of the local console's Scroll Lock key also resets the keyboard and mouse.	
Reset Keyboard and Mouse *press key twice to avoid starting/stopping Private Mode session*	***<Scroll Lock>***
Reset the remote console's keyboard and mouse. You may need to do this if you have plugged a keyboard or mouse into a powered Remote Unit and it has not initialized correctly.	
Mouse Recovery *(press keys simultaneously)*	*Hold down* ***Left and Right Mouse buttons*** *then press and release* ***<Scroll Lock>***
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. *Use this command with care.*	

6. Troubleshooting & FAQ

6.1 Video

The image is not sharp, or is badly smeared.

Check that the cable length DIP switch is correct for the length of your Interconnect cable (see page 20).

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 the Interconnect cable between the Remote and Local Units. Is it of the recommended type (see page 19)? Is it intact along its entire length and securely connected at both ends? Is it wired correctly?

Are you using low skew cable (see page 19)?

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 32.

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. If your remote monitor has an external PSU you may need to consider grounding the Remote Unit chassis (to power ground)..

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.

Jitter is evident on video.

Adjust the clock and/or phase on your flat-panel. Contact Technical Support if this fails to improve the situation.

Are you testing a system using a coiled drum of CAT5 cable? Try uncoiling the cable. If this solves the video jitter, you should not have a problem after full installation.

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). Micro Extenders accepts line-level audio input only.

The microphone output is barely audible.

See **Appendix B: Audio/Serial Ports**, page 44.

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 as described in the previous sections.
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 (see page 34).

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 50m?

It might be possible to use a cable of up to 100m at lower resolutions. However, we do not recommend this and cannot guarantee that it will work.

The ACU1007A will work with cables up to 300m in length.

Can the micro extender be daisy chained?

No, we do not recommend doing this.

Which interconnection cable is best?

The extender will operate with either shielded (STP/FTP) or unshielded (UTP) CAT5/5e 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 four specific applications using ServSwitch™ Brand CAT5 KVM Micro Extender units:

- Simple system using ACU1006VRA Hub and ACUWREM Remote Units to extend audio, serial and KVM for up to six PCs (Figure 9).
- Six remote serial touch screens with local access through a KVM switch (Figure 10).
- Integration of two ACU3009A kits with KVM matrix (Figure 11).
- ACU1006MRA 6-port Micro Remote Hub used with ACU1006RA local rack for 'three desk', dual video extension (Figure 12).

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

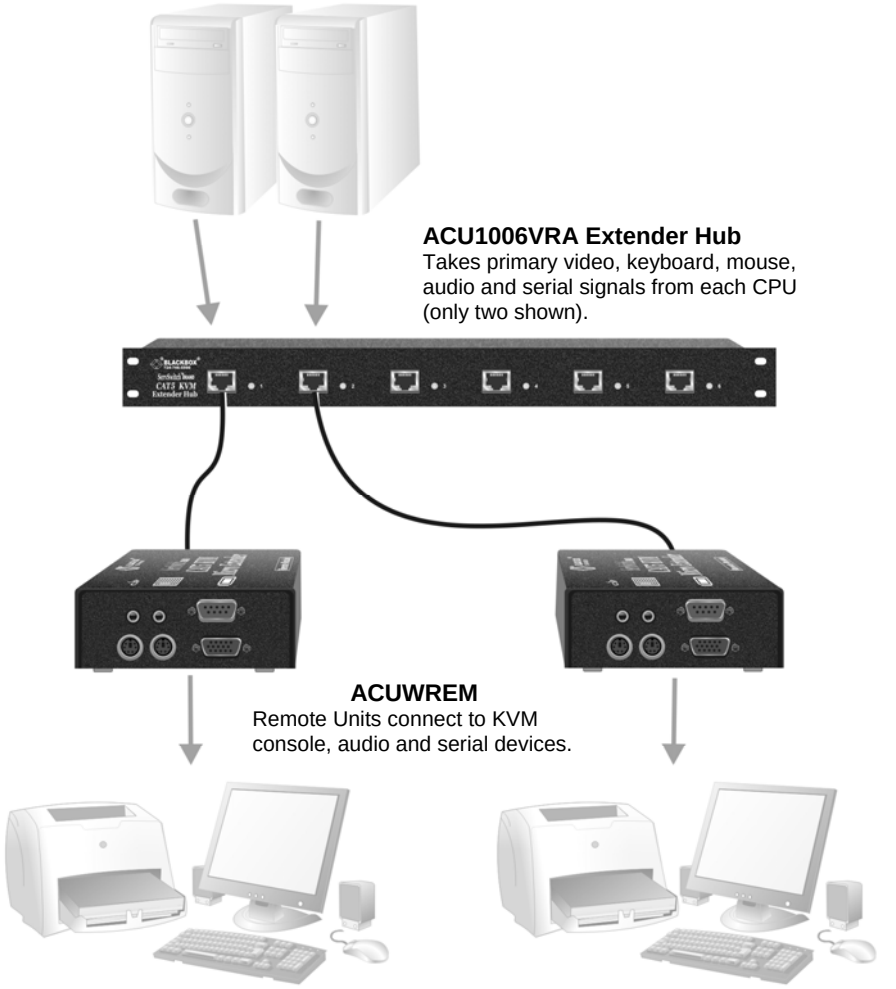


Figure 9 **Serial and audio extension for up to six CPUs**

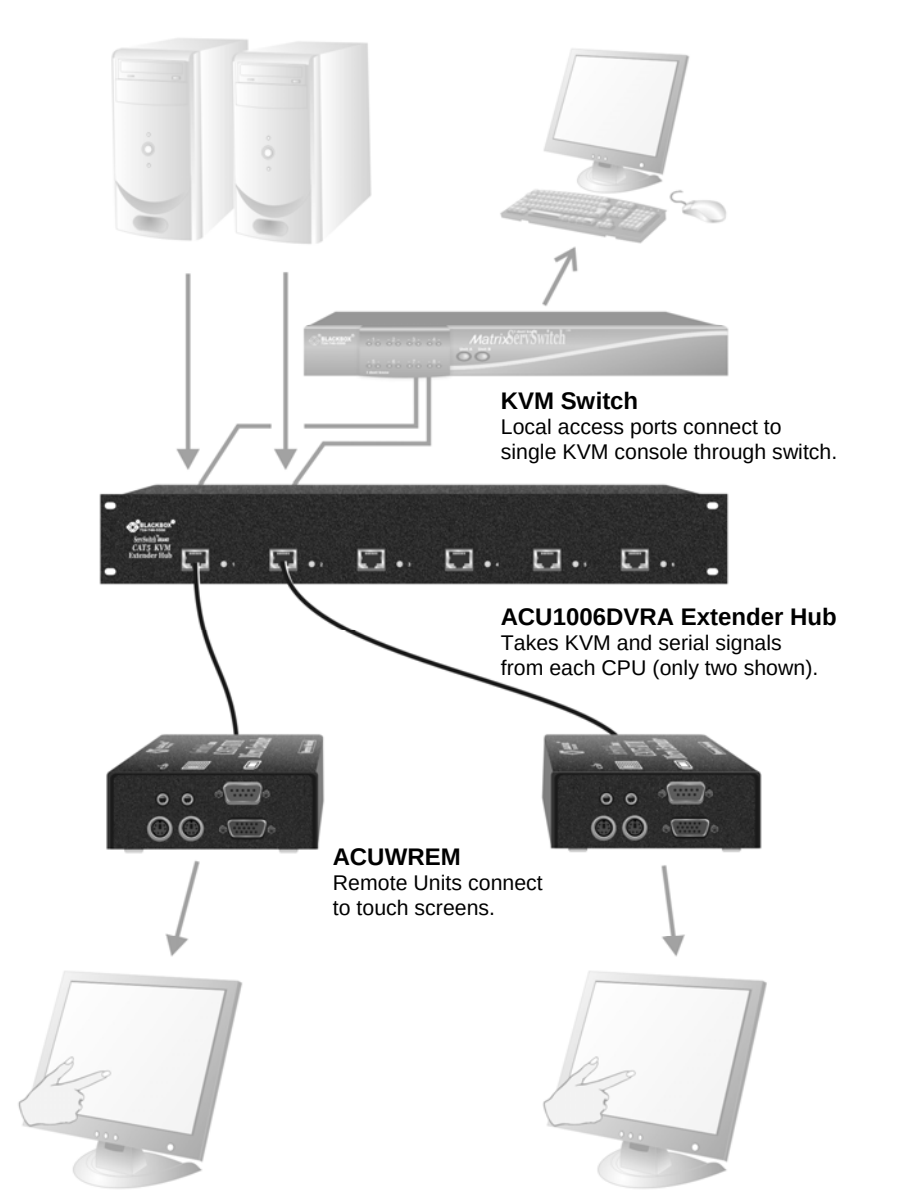


Figure 10 **Touch screen network with local access to CPUs through KVM switch**

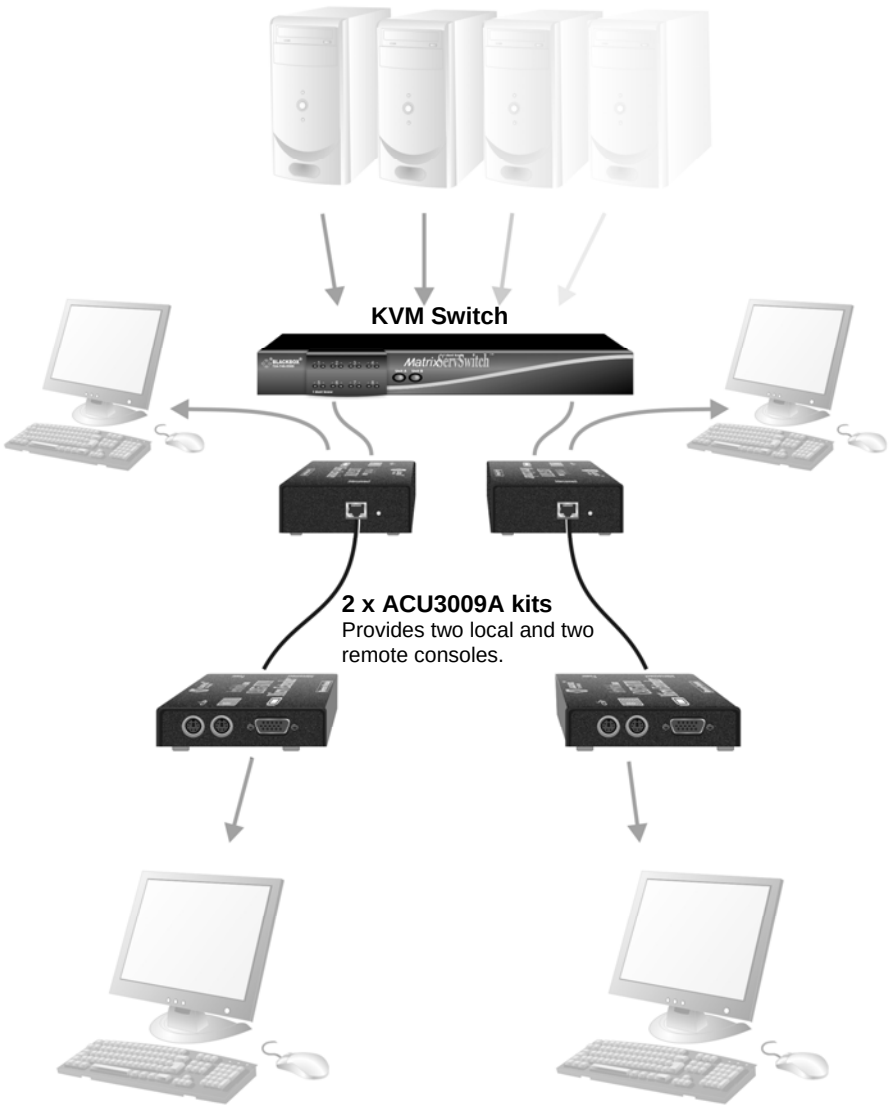


Figure 11 **Extender integration with KVM matrix**

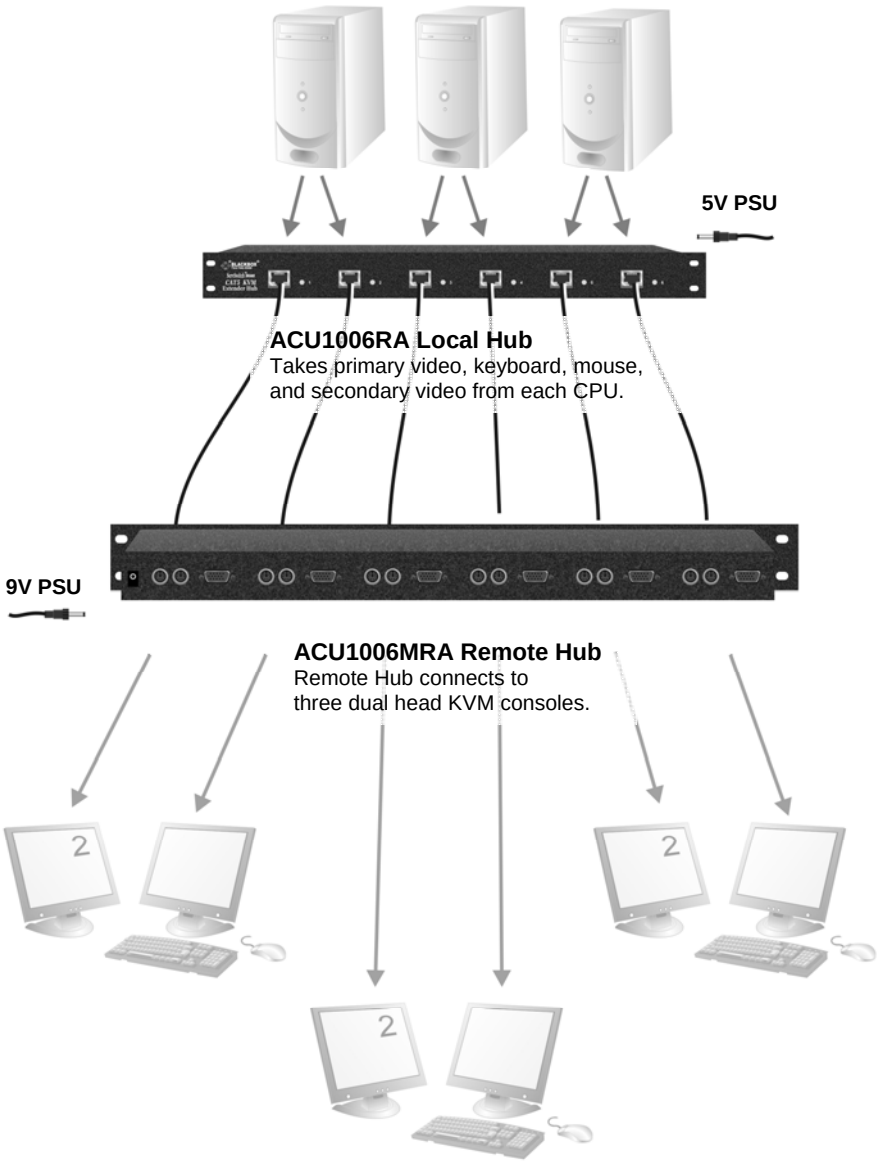


Figure 12 **Dual Head extension using ACU1006MRA Micro Extender Remote Hub**

Appendix B: Audio/Serial Ports

Operation and Multi-Port Configuration

This appendix describes audio & serial interface operation for the following CATx KVM Micro Extenders:

- ACU3022A
- ACUWREM
- ACU1006MRVA

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

Serial Interface Setup and Operation

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.

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 C: Calling Black Box

If you determine that your ServSwitch™ Brand CAT5 KVM Micro 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 Micro 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 Micro 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 D: Specifications

Video

Maximum Resolution	1600x1200@60Hz up to 30m 1280x1024@75Hz up to 50m 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	2-stage
Video Coupling	DC
Sync I/O	Separate/Composite TTL Level Sync Polarity is preserved
Video Input Connectors	DB25 female (CPU KVM)
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	6-Pin MiniDIN Socket DB25 female (CPU KVM)

Serial Interface

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

Audio Interface

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

Power Requirements

Local Unit	5V at up to 200mA supplied by PC's PS/2 keyboard port. External PSU may also be connected through PS2 keyboard port
Remote Unit *All except ACU1007A*	9V, 2A (18W) Regulated (certified to all relevant safety standards) Universal IEC Input Isolated Output 2.5mm DC Jack (Center Positive)
ACU1007A Remote Unit	5V, 3A (18W) Regulated (certified to all relevant safety standards) Universal IEC Input 2.1mm DC Jack (Center Positive)

Size and Shipping Weight

ACUMREM	Remote Unit: 3.3”x4.3”x1.0” (84x110x26mm) Shipping Weight: 0.74 Kg
ACUWREM	Remote Unit: 3.3”x4.3”x1.7” (84x110x44mm) Shipping Weight: 0.85 Kg
ACU1007A	Local Unit: 3.3”x4.3”x1.0” (84x110x26mm) Remote Unit: 3.3”x4.3”x1.0” (84x110x26mm) Shipping Weight: 1.20 Kg
ACU3001A	Local Unit: 3.3”x4.3”x1.0” (84x110x26mm) Remote Unit: 3.3”x4.3”x1.0” (84x110x26mm) Shipping Weight: 1.30 Kg
ACU3009A	Local Unit: 3.3”x4.3”x1.7” (84x110x44mm) Remote Unit: 3.3”x4.3”x1.0” (84x110x26mm) Shipping Weight: 1.38 Kg
ACU3022A	Local Unit: 3.3”x4.3”x1.7” (84x110x44mm) Remote Unit: 3.3”x4.3”x1.7” (84x110x44mm) Shipping Weight: 1.82 Kg
ACU1006MRA	6-port remote Hub:17.4”x4.3”x1.7” (442x110x44mm) Shipping Weight: 2.50 Kg
ACU1006MRVA	6-port remote Hub: 17.4”x4.3”x1.7” (442x110x44mm) Shipping Weight: 2.68 Kg

Environmental

Operating Temperature	32 to 104°F (0 to 40 °C)
Storage Temperature	-22 to 149°F (-30 to 65 °C)
Relative Humidity	5-90% non-condensing
Chassis Construction	Fully shielded. Black painted steel

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Customer Support Information:
Order toll-free in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)
For 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 Dr., Lawrence, PA 15055-1018
World-Wide Web: **www.blackbox.com** • Email: **info@blackbox.com**
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