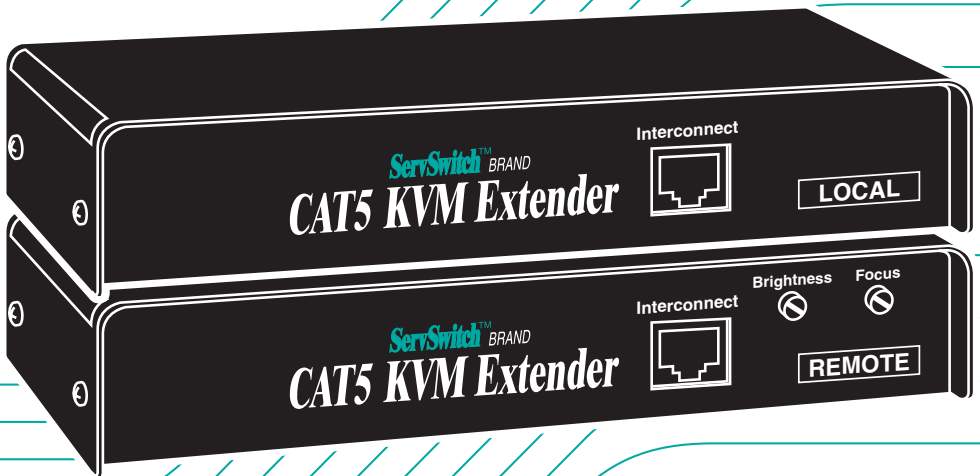


ServSwitch™ BRAND
CAT5 KVM Extender



ACU1001A
ACU1009A
ACU1049A

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 3**. The Extender product codes covered in this manual are:

ACU1001A

ACU1009A

ACU1049A

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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 J 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 PC-equipment cables must be used with this equipment to maintain compliance with radio-frequency energy-emission regulations and to 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 Industry Canada.

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This product complies with the following harmonized standards:

- EN55022 (1994), EN55024 (1998)
- EN61000-3-2 (1995), EN61000-3-3 (1995), EN60950 (2000)

When you use this product in environments that have high levels of electromagnetic interference, you might experience some slight disturbance in its operation. If this occurs, please refer to the Troubleshooting chapter of this manual or call technical support.

To maintain compliance, use only cables supplied (or recommended) for use with this product.



NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Quick Start Guide

Configuring the Extender

Configuring the ServSwitch™ Brand CAT5 KVM Extender involves setting some internal controls. Read the next couple of paragraphs, and if you find that you'll need to change configuration settings, follow the procedure that's listed afterward. (If you're not certain which Extender model you're working with, refer to **Chapter 3**.) Here's what you need to consider:

- With all models, **how far will the CAT5 cabling run between the Extender's Local and Remote Units?** If it will be 100 m (330 ft.) or less, you don't need to set anything. If it will be 100 to 200 m (330 to 655 ft.), install jumpers on the three *right-hand* post pairs in each set of three cable-length jumper posts (JP3 through JP5) in the Remote Unit. If it will be 200 to 300 m (655 to 1000 ft.), install jumpers on the three *left-hand* post pairs in each of these sets of cable-length jumper posts. See Figure 5-1 in **Section 5.1**.
- With the Switching Extender (ACU1049A) only, **what key do you want to use as the "hotkey" to trigger the Extender's keyboard commands?** The choices are left-[Ctrl] and right-[Ctrl]. Right-[Ctrl] is the default setting because many of the KVM switches that can be attached to the Extender use left-[Ctrl] as *their* hotkey. But you might want to use left-[Ctrl] instead, particularly if a computer you'll be attaching to the Extender is a workstation (Compaq® Alpha®, HP®, etc.) whose right-[Ctrl] key is actually the [Compose] key that's required by many application programs. To have the Extender use left-[Ctrl] for its hotkey, move position 2 of DIP switch SW1 in the Remote Unit to ON. Refer to **Section 5.2.3**.
- With all models *except* the Switching Extender, **does your application require the Scroll Lock key?** If not, you don't need to set anything. If it does, you need to set Position 4 of DIP-switch SW1 in the Remote Unit to OFF. (Be aware that this will disable the Extender's reset function and, on the Dual-Access model, will disable the "Private Mode" feature as well. Refer to **Section 5.2**.)
- With the Dual-Access (ACU1009A) model only: If you don't want the remote monitor to be blanked in Private Mode, set Position 1 of DIP-switch SW1 in the Remote Unit to ON. If you want to lengthen the inactivity timeout for automatic Local/Remote switching to 15 seconds, set Position 2 to OFF. If you want automatic switching to be triggered by mouse activity as well as keyboard activity, set Position 3 to OFF.

To get at the internal controls, open the Extender Unit while it is powered off—taking all reasonable precautions against static electricity—by unscrewing the four screws on its case and lifting off the top half of the case. For more information about configuration, refer to **Chapter 5**.

Installing the Extender

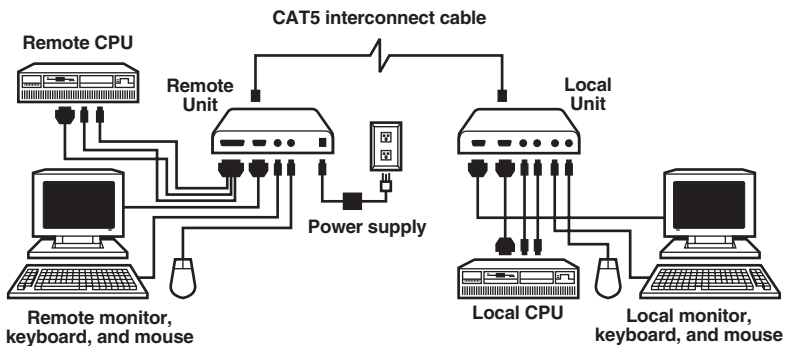
To install your Extender system, refer to the illustration below. (A Switching model is shown; the Dual-Access model won't have the remote CPU, and the Single-Access model won't have the remote CPU *or* the local user station.) Take these steps:

1. Use the included three-to-three extension cables to attach the CPU to the Local Unit.
2. *Dual-Access and Switching models:* Plug the local keyboard, monitor, and mouse directly into the Local Unit.
3. Plug the remote keyboard, mouse, and monitor directly into the Remote Unit.
4. *Switching models:* Use the included three-to-one extension cable to attach the CPU to the Remote Unit.
5. Connect the Local and Remote Units with straight-pinned four-pair CAT5 cable.
6. Power the Remote Unit with its included power supply.

For more information about installation, or if you're attaching any KVM switches to the Extender, refer to **Chapter 6**.

Operating the Extender

For the most part, your Extender system should operate automatically and transparently. Some functions, though—including switching between the CPUs with a Switching Extender—are handled with keyboard commands. **Appendix C** summarizes these commands, while **Section 7.3** describes them in detail.



2. Specifications

- Cable Required:** Between Local and Remote Units: Category 5 solid unshielded or shielded twisted pair (UTP or STP), wired to the EIA/TIA-568A or (preferred) -568B standard, terminated with RJ-45 male connectors; for pinning/pairing, see **Appendix A**
- Compliance:** CE Class B, FCC Part 15 Subpart J Class A, IC Class/ classe A
- Compatibility:** Video: VGA, SVGA, XGA, XGA-2, or RGB (sync on green), although if your system has monitor ID-bit requirements, you might need to call Black Box for technical support;
Keyboard: IBM PC/AT or PS/2 compatible (PC/AT types require connector adapter);
Mouse: IBM PS/2 compatible two-button, Microsoft IntelliMouse, or Logitech PS/2 compatible 3-button
- Interfaces:** Video: VGA;
Keyboard and mouse: IBM PS/2 compatible;
Between units and (on ACU1049A) to remote CPU:
Proprietary composite
- Video Bandwidth (to -3 dB):** Local Unit: 150 MHz;
Remote Unit: 300 MHz;
Across 100 meters (328 feet) of UTP: 95 MHz (with equalization)
- Resolution:** Up to 1600 x 1280 noninterlaced at up to 60 m (200 ft.);
Up to 1280 x 1024 noninterlaced at up to 120 m (400 ft.);
Up to 1024 x 768 noninterlaced at up to 300 m (1000 ft.)
- Video I/O**
- Signal Levels:** 0.7 volts peak-to-peak
- Video Compensation:** 3-stage continuously variable
- Synchronization:** H/V or composite, TTL signal levels; sync polarity is preserved

Video Coupling: DC

Maximum

Distance: 5 m (16 ft.) from the Local Unit to the attached CPU or KVM-switch user port;
5 m (16 ft.) from the Remote Unit to the attached monitor, keyboard, and mouse or KVM-switch CPU port;
300 m (1000 ft.) between Local and Remote Units;
ACU1009A only: 5 m (16 ft.) from the Local Unit to the attached keyboard and mouse or KVM-switch CPU port; 30 m (100 ft.) to the attached monitor;
ACU1049A only: 5 m (16 ft.) from the Remote Unit to the attached CPU or KVM-switch user port

NOTE

With high-quality cables, it might be possible to run farther than 5 m (16 ft.) from the Extender to attached equipment.

User Controls: Remote Unit:
(2) Front-mounted dials: Brightness and Focus;
(3) Internal video-distance (cable-length) jumpers;
(1) Internal 4-position DIP switch for various options

Indicators: None

Connectors: On Local Unit:
(1) Front-mounted RJ-45 female for local/remote interconnection;
Rear-mounted:
(1) HD15 male for video input from local computer;
(2) 6-pin mini-DIN female for keyboard and mouse output to local computer;
ACU1009A and ACU1049A only:
(1) HD15 female for video output to local monitor;
(2) 6-pin mini-DIN female for input from local keyboard and mouse;

**Connectors
(continued):**

On Remote Unit:

(1) Front-mounted RJ-45 female for local/remote interconnection;

Rear-mounted:

(2) 6-pin mini-DIN female for input from keyboard and mouse;

(1) 2.5-mm center-positive barrel jack for power;

ACU1049A only: (1) DB25 female for composite I/O to/from the keyboard, mouse, and video ports of the remote CPU

Temperature**Tolerance:** 32 to 104°F (0 to 40°C)**Humidity****Tolerance:** 5 to 90% noncondensing**Enclosure:**

Steel

Power:

Local Unit:

5 VDC at up to 120 mA from CPU's keyboard port;

Remote Unit:

From desktop power supply (certified to the relevant international safety standards):

Input: 100 to 240 VAC at 50 to 60 Hz from utility-power outlet, through detachable power cord and IEC 320 male inlet, to external transformer;

Output (isolated from mains ground): 9 VDC regulated, at up to 1 amp, from transformer to Extender

CAUTION!

If you ever need to replace the Remote Unit's power supply, the replacement power supply must have identical output characteristics. Using a power supply with different output—even if it's "almost the same"—could damage your Remote Unit and the attached equipment.

Size: 1.4"H x 8.8"W x 4"D (3.6 x 22.4 x 10.2 cm)**Weight:** Shipping, complete package: Approx. 4.8 lb. (2.2 kg);
Net, each Local or Remote Unit: 1.1 lb. (0.5 kg)

3. Introduction

By using the Local and Remote Units that together make up the ServSwitch™ Brand CAT5 KVM Extender, you can place your VGA monitor, keyboard, and mouse as far as 300 meters (1000 ft.) from a PC CPU. The Local and Remote Units are interconnected with a single industry-standard Category 5 UTP or STP 4-pair cable. All keyboard, mouse, and video signals are fully buffered to ensure consistent remote operation of your PC.

- The Single-Access (ACU1001A) model of the Extender is designed to perform KVM extension only.
- With the Dual-Access (ACU1009A) model, you can attach an additional monitor, keyboard, and mouse to the Local Unit; the PC can then be operated from either the local or remote user station (they share access on a “first-come, first-served” basis—see **Section 7.3.3**).
- With the Switching (ACU1049A) model, you can attach both a monitor, keyboard, and mouse to the Local Unit *and* a CPU to the Remote Unit, and the remote user can switch between the local and remote CPUs.

The Extender is simple to operate and works with all operating systems—no software is required. Once you’ve made sure you have everything you’ll need (see **Chapter 4**) and you’ve configured all of your Extender Units (see **Chapter 5**), just connect the Local and Remote Units to each other and to your equipment as described in **Sections 6.1** through **6.3**, adjust your video compensation as necessary (see **Section 6.4**), and you’re ready to work!

Because the Extender performs complete PS/2® keyboard and mouse emulation, you can boot any attached PC without having a keyboard or mouse attached to it. The PC(s) will boot even if no keyboard or mouse is connected to the Local or Remote Unit.

3.1 Compatibility

The Extender is designed to operate in various environments and with a mix of hardware from different manufacturers. During development, this product was extensively tested with a wide variety of hardware. However, please note that it is impossible for us to guarantee that the Extender will interoperate correctly with every keyboard, mouse, monitor, and motherboard variant currently on the market; if you suspect that you're having incompatibility problems, please call Black Box Technical Support.

In general, the Extender is compatible with the following types of equipment:

- **CPU:** IBM® PC/AT®, PS/2, and 100% compatible clones. These should be desktop machines; laptops and docking stations are not supported.
- **Monitor:** VGA, SVGA, XGA, XGA-2, or RGB (sync on green). Be aware that a few monitors and graphics cards might not work with the Extender because they exchange monitor IDs or VESA DDC (Display Data Channel) information. Call Black Box Technical Support for help with “ID bit” problems. As for DDC, the Extender supports it at the local user station but not the remote user station, so either (a) do not use a DDC monitor at your remote station, or (b) go into the settings of each PC's graphics card, turn DDC off, and manually configure the card for your monitor.
- **Keyboard:** Standard PS/2 type (101- or 102-key) or enhanced PS/2 type (104- or 105-key, designed for use with versions of Windows® starting with Windows 95). Also supports PC/AT type keyboards with 5-pin DIN connectors, but you'll need keyboard and keyboard-port adapters such as our product codes FA211 and FA212 to attach such keyboards and their native CPUs to the Extender. Some older PC/XT™ or PC/AT type autosensing keyboards might not be compatible with the Extender. If a keyboard or keyboard port you want to use is some other type or has some other type of connector, call Black Box Technical Support.

For information about keyboard typematic support, see **Section 7.2**.

- **Mouse:** Standard PS/2 type, Microsoft® IntelliMouse® compatible, or Logitech® 3-button PS/2 compatible mouse and standard PS/2 type mouse ports. The Extender is *not* compatible with serial mice, bus mice, or CPUs with bus-mouse ports. If you need to attach a PC with a PC/AT type serial mouse port, run a PS/2 mouse-extension cable to the CPU, then use a mouse-port adapter such as product code AC244A to connect the cable to the PC's serial mouse port.

If a mouse or mouse port you want to attach is some other type or has some other type of connector, call Black Box Technical Support.

3.2 Key Features

The Extender has a number of useful features which contribute to the transparent remote operation of your PC. Some of the more important ones are:

- **Distance up to 300 m (1000 ft.)**
Operate your PC from almost anywhere in the same building.
- **Fully adjustable video equalization**
Compensates for the loss of image quality caused by the signal passing through such a long run of cable.
- **Fully buffered signals**
Remote operation of the PC is consistently smooth and transparent.
- **Intelligent PS/2 keyboard and mouse emulation**
With this, the PC boots and operates correctly under most circumstances, and you can freely detach and reconnect the keyboard and mouse as necessary (the Extender automatically initializes the keyboard and mouse as soon as it detects that you've reattached them).
- **Microsoft IntelliMouse compatibility**
Use this and compatible "wheel mice" with confidence. On the Dual-Access model, you can even use a standard PS/2 mouse at one user station and an IntelliMouse at the other.
- **Rackmountable**
You can use our Rackmount Kit (product code RMK19U) to place Extender Units in 1U of vertical space in a 19" rack. See **Appendix B**.
- **Dual-Access model also supports a local station**
With the Dual-Access (ACU1009A) model, you can operate the PC either locally or remotely (but not both at the same time).
- **Switching model also supports both local station and remote CPU**
The Switching (ACU1049A) model not only has a local user station, it also supports attaching a CPU to the remote unit, so that the remote user can switch between local and remote CPUs.

We recommend that you read the remainder of this manual before you install the Extender in order to fully familiarize yourself with the product.

4. Checklist of System Components

4.1 The Complete Package

These items should be included with your ServSwitch™ Brand CAT5 KVM Extender package. Please contact Black Box if any are missing or damaged.

- (1) Extender Local Unit.
- (1) Extender Remote Unit.
- (1) 9-VDC 1-amp power-supply transformer and output cord.
- (1) Power-supply input cord suitable for your country or region.
- (1) Copy of this manual.
- Keyboard-, video-, and mouse-extension cabling that will run from your (local) CPU to the Local Unit. This might be three separate cables, or it might be a single bonded cable with three connectors at each end. In either case, the cabling will be 5 to 6 ft. (1.5 to 1.8 m) long and will have the proper connectors to extend PS/2 keyboard (6-pin mini-DIN male to male), PS/2 mouse (also 6-pin mini-DIN male to male), and VGA video (HD15 male to female) interfaces.
 - If your system uses 5-pin DIN keyboard connectors, you'll also need keyboard adapters—one of product code FA211 and one FA212—to respectively attach (a) the keyboard to any Extender user port and (b) the CPU's keyboard port to the Local Unit's CPU port.
 - As mentioned in **Chapter 3**, the Extender doesn't support serial mice; if your system is designed for a serial mouse, you'll have to attach a PS/2 mouse to the Remote Unit instead, and use an AC244A mouse-port adapter to attach the mouse-extension cabling to one of the PC's serial ports.
- The Switching model (ACU1049A) should also come with a 1-m (3.3-ft.) three-to-one CPU cable that will run from the Remote Unit to the remote CPU. This cable has a DB25 male connector on the Extender end and an HD15 male and two 6-pin mini-DIN male connectors on the CPU end.

4.2 The Cables You'll Need

If you are using the Extender to get greater distance between a CPU and a VGA monitor, PS/2 keyboard, and PS/2 mouse, your Extender package should have included everything you'll need except for your CAT5 cable, which you'll have to order separately. Read **Sections 4.2.1, 4.2.3, and 4.2.5** carefully, then proceed with **Chapter 5**.

If you are using the Extender to get greater distance between a ServSwitch family KVM switch and a CPU, a user station (monitor/keyboard/mouse), or a compatible switch, you might need additional non-included cabling. Read the relevant sections on the next few pages, from **Section 4.2.1** through **Section 4.2.5**.

If you are using any equipment with PC/AT style connectors, you might also need to order some combination of these adapters:

- To attach a CPU or KVM switch with a 5-pin DIN female keyboard connector to the Extender: A keyboard-port adapter such as product code FA211.
- To attach a CPU or KVM switch with an RS-232 serial DB9 male mouse connector to the Extender: A mouse-port adapter such as product code AC244A. (If the mouse port is DB25 rather than DB9, you'll also need an FA521A serial adapter.)
- To attach a keyboard or KVM switch with a 5-pin DIN male keyboard connector to the Local or Remote Unit: A keyboard adapter such as product code FA212.

4.2.1 TO CONNECT A CPU TO A CPU PORT ON THE EXTENDER

We've included extension cabling with the Extender that you can use to connect the CPU to the CPU port of a Local Unit or Switching Remote Unit. As mentioned in the bulleted paragraphs above, you might also need port adapters if your CPU has PC/AT type ports.

4.2.2 TO CONNECT A SERVSWITCH FAMILY KVM SWITCH TO A CPU PORT ON THE EXTENDER

You would do this to extend the distance you can run from the KVM switch to a monitor, keyboard, and mouse. (You could also do this to extend the distance you can run between two cascaded switches, but for this to work, each switch *must* be either a ServSwitch Jr. or one of the ServSwitch family models with compatible composite interfaces listed in **Section 4.2.2.B**.)

The Local Unit's CPU port consists of the HD15 female and 6-pin mini-DIN connectors on its rear panel collectively labeled "TO CPU." Which cables you'll use to connect the KVM switch to this port will depend on what type of user ports the switch model has, as detailed in the three subsections on the next page.

4.2.2.A Switches Whose User Ports Are a Set of Separate Interfaces

The user ports of some ServSwitch family KVM switches are a set of separate interfaces: Each user port consists of separate interfaces/connectors for video, keyboard, and mouse communication. At the time of this writing, some of the important ServSwitch family models in this category are:

- ServSwitch™ Duo
- ServSwitch™ Wizard, Wizard LP, Wizard Pro
- ServSwitch™ Jr.
- Personal ServSwitch™
- ServSelect™
- ServSwitch™ Multi Base Unit or MX (“local console” user port only)

To attach a user port on one of these switches to a CPU port of a Local Unit or Switching Remote Unit, you can use the extension cabling included with the Extender.

4.2.2.B Switches with DB25 Composite User Ports

The user ports of several ServSwitch family KVM switches are specially pinned DB25 connectors that function as composite (all-in-one) interfaces. At the time of this writing, some of the important ServSwitch family models in this category are:

- ServSwitch™
- ServSwitch™ Ultra
- Matrix ServSwitch™
- ServSwitch™ Affinity
- ServShare™

To attach a user port on one of these switches to the Local Unit’s CPU port, you’ll need a three-to-one ServSwitch User Cable (product code EHN054B for standard or EHN283 for coaxial), *plus* the extension cabling included with the Extender. Refer to **Section 6.2.2.B** for a description of how this cabling fits together.

To attach a user port on one of these switches to the Switching Remote Unit’s CPU port, you’ll need a ServSwitch to ServSwitch Expansion Cable (EHN284).

4.2.2.C ServSwitch Multi (HD62 Composite User Ports)

The user ports on User Cards installed in the ServSwitch Multi are HD62 female connectors that function as composite (all-in-one) interfaces. To attach one of these ports to the CPU port of a Local Unit or Switching Remote Unit, you’ll need a many-to-one ServSwitch Multi User Cable such as product code KV2505, *plus* the extension cabling included with the Extender. Refer to **Section 6.2.2.B** for a description of how this cabling fits together.

4.2.3 TO CONNECT A MONITOR, KEYBOARD, AND MOUSE TO A USER PORT ON THE EXTENDER

You can plug the monitor, keyboard, and mouse directly into the user port on these Units.

4.2.4 TO CONNECT A SERVSWITCH FAMILY KVM SWITCH TO A USER PORT ON THE EXTENDER

You would do this to extend the distance you can run from the KVM switch to a CPU. (You could also do this to extend the distance you can run between two cascaded switches, but for this to work, each switch *must* be one of the ServSwitch family models listed in **Section 4.2.4.B.**)

On the Remote Unit, the user port consists of the HD15 and 6-pin mini-DIN connectors collectively labeled “USER CONSOLE.” On the the Dual-Access Local Unit, the user port consists of the HD15 and 6-pin mini-DIN connectors collectively labeled “LOCAL USER.” Which cable(s) you’ll use to connect the KVM switch to this port will depend on what type of CPU ports the switch model has, as detailed in the following three subsections.

4.2.4.A Switches Whose CPU Ports Are a Set of Separate Interfaces

The CPU ports of some ServSwitch family KVM switches are a set of separate interfaces: Each CPU port consists of separate interfaces/connectors for video, keyboard, and mouse communication. At the time of this writing, some of the important ServSwitch family models in this category are:

- ServSwitch™ Duo
- ServSwitch™ Wizard, Wizard LP, Wizard Pro
- Personal ServSwitch™

You can use the extension cabling included with the Extender to attach a CPU port on one of these switches to the user port on the Remote Unit or Dual-Access/Switching Local Unit. If you’ll need that cabling to attach a CPU or KVM switch to the Local Unit’s CPU port, get additional KVM-extension cabling: either one VGA extension cable (product code EVNPS05-MM) plus two PS/2 extension cables (EVMPS03-MM) or a single bonded three-to-three KVM-extension cable (EHN408).

4.2.4.B Switches with Regular ServSwitch Style DB25 Composite CPU Ports

The CPU ports of the regular ServSwitch and several other ServSwitch family KVM switches are specially pinned DB25 connectors that function as composite (all-in-one) interfaces. At the time of this writing, some of the other important ServSwitch family models in this category are:

- ServSwitch Ultra
- Matrix ServSwitch
- ServSwitch Affinity
- ServSwitch Jr.
- ServShare

(Note: The ServSelect also has DB25 composite CPU ports, but they are pinned differently. See **Section 4.2.4.C.**)

To attach a CPU port on one of these switches to the user port on a Remote Unit or Dual-Access/Switching Local Unit, you'll need a ServSwitch CPU Cable (product code EHN051 for standard or EHN282 for coaxial).

4.2.4.C Switches with Other Types of Composite CPU Ports

The CPU ports of some ServSwitch family KVM switches are composite (all-in-one) interfaces that are not the same as those on the regular ServSwitch, but the principle for connecting them is the same:

- The CPU ports on CPU Cards installed in the ServSwitch Multi are HD44 female connectors. To attach one of these CPU ports to the user port on a Remote Unit or Dual-Access/Switching Local Unit, you'll need a ServSwitch Multi CPU Cable such as product code KV2020-R2.
- The CPU ports on the ServSelect are DB25 connectors pinned *differently from* the DB25 connectors on the regular ServSwitch. To attach one of these CPU ports to the user port on a Remote Unit or Dual-Access/Switching Local Unit, you'll need a ServSelect Cable (product code EHN056).

4.2.5 TO CONNECT THE LOCAL UNIT TO THE REMOTE UNIT

To interconnect the Extender's Local and Remote Units, you'll need industry-standard structured cabling (Category 5 UTP or STP, 4-pair) terminated with RJ-45 plugs. This cable is not included with the Extender. Order CAT5 patch cables such as our product code EYN737MS or CAT5 bulk cable such as our EYN840A. The bulk cable should be terminated with high-quality RJ-45 plugs such as those included in our FM732 25-pack.

CAUTION!

This cable *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 must be in accordance with EIA/TIA-568A or (preferably) EIA/TIA-568B. (Refer to the wiring chart in Appendix A. Please note that failure to wire the twisted pairs correctly will dramatically impair video quality and possibly prevent correct operation.)

You might be able to use some makes of CAT5e cable (rated for 155 Mbps) between Extender Units at distances up to 120 m (400 ft.). In general, however, *avoid* using CAT5e, "Level 6" or "Level 7" cables, or other types of cable rated for data rates higher than 100 Mbps (bandwidths higher than 100 MHz). This is because the wires in these cables are twisted much more tightly than those in regular CAT5, which is great for high-speed data but *really bad* for video signals.

Also, even though your network might use the same type of 4-wire twisted-pair cabling, do *not* connect the Extender to 10BASE-T Ethernet devices or *any* other network equipment. Doing so will virtually destroy the Extender's circuitry and could also damage the attached equipment.

The Extender is designed for use up to a maximum cable length of 300 m (1000 ft.) At this length the video quality should be acceptable even at a screen resolution of 1024 x 768 and a refresh rate of 75 Hz.

Although a single continuous length of interconnect cable is preferable, it's possible to operate an Extender system if the Local and Remote Units are connected through multiple patch panels. However, the more patch panels the cable is routed through, the greater the probability that the video signal will be degraded.

NOTE

The Extender has been tested and found to work, *in certain situations*, with 4-pair Category 3 cable or with four pairs of 25-pair UTP trunk cables instead of 4-pair Category 5 cable. We do not recommend such installations; if you want to experiment with them, do so at your own risk.

5. Configuration

The configuration controls for the ServSwitch Brand CAT5 KVM Extender are internal, but should only need to be set once. To get at them, first open the Unit by unscrewing the four screws on its case and lifting off the top half of the case. When you've finished setting them, close the Unit by replacing the top half of the case and screwing the screws back in.

CAUTION!




The Extender's circuit boards can be damaged by static electricity, so take every reasonable precaution against it. At the very least, discharge yourself on a metallic surface before opening the Extender; if possible, stand on an anti-static mat and wear a grounding strap or anti-static gloves.

5.1 Setting the Remote Unit's Cable-Length Jumpers

The Remote Unit of the KVM Extender contains video-equalization circuitry which compensates for the loss in image quality that occurs when you drive video across long cables. With cables in the neighborhood of 300 meters (1000 feet) long, this loss is considerable.

There are three jumpers on the circuit board of the Extender's Remote Unit that you can use to select an equalization-adjustment range appropriate to the length of the interconnect cable you'll be running between the Local and Remote Units. (Figure 5-1 on the next page shows where these jumpers are.) Once you set them, you can alter the compensation level with the two rotary controls on the Remote Unit's front panel while the Extender is operating in order to "tune in" the image more precisely (see **Section 6.4**).

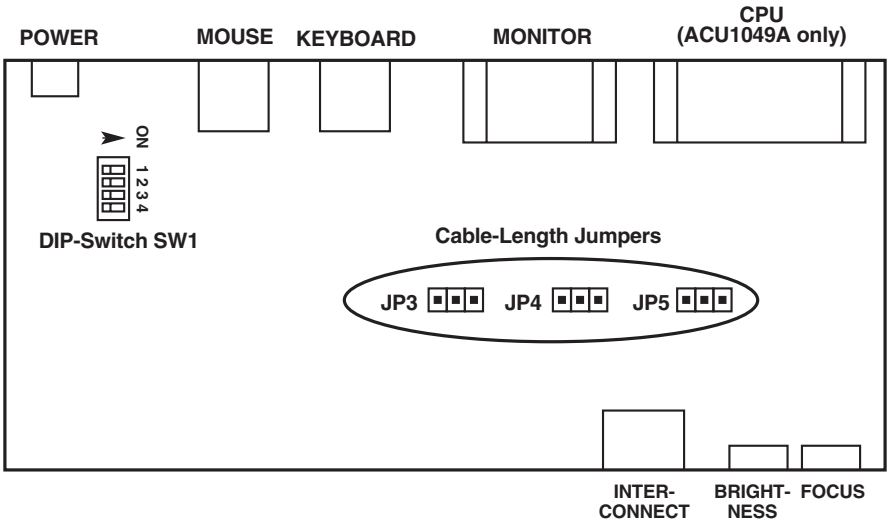
The three cable-length jumpers should be set as follows (*all three jumpers must be set the same way*):

| Cable Length in Meters (Feet) | Jumper Position |
|-------------------------------|---|
| 0 to 100 (0 to 330) | Off  (factory default) |
| 100 to 200 (330 to 655) | A  |
| 200 to 300 (655 to 1000) | B  |

NOTE

If you will be running cable to near the limit of one of these cable-length ranges, say as far as 80 m (260 ft.), and you will be using high-resolution (1024 x 768 or higher) video, you might be able to achieve more accurate video compensation (see Section 6.4) by selecting the higher cable length range (the 100-to-200-m range in this case).

If you are conducting a same-room test prior to your final installation, as we recommend—see **Section 6.1**—set the jumpers as appropriate for the length of the test cable first; then, if the Units pass the test, reset the jumpers for your actual installation length.



- For cable lengths of 0 to 100 m (0 to 330 ft.), set all three to OFF ().
- For cable lengths of 100 to 200 m (330 to 655 ft.), set all three to A ().
- For cable lengths of 200 to 300 m (655 to 1000 ft.), set all three to B ().

Figure 5-1. The Remote Unit's PCB, showing the cable-length jumpers and DIP switch.

5.2 Setting the Remote Unit's DIP Switch

You'll also find a four-position DIP switch labeled SW1 on the circuit board inside the Extender's Remote Unit. The functions of this DIP switch are different for each Extender model. (For directions on opening and closing the Remote Unit's case, including the static-electricity precautions you should take, see the start of **Chapter 5**.)

5.2.1 ON THE SINGLE-ACCESS (ACU1001A) MODEL

Only position 4 of this DIP switch is meaningful; don't change the settings of any of the other switch positions. (Position 4 is the bottom one, or the rightmost one if you hold the Remote Unit by its left end.) When position 4 is in its factory-default ON setting, the Extender resets the keyboard and mouse (see **Section 7.3.1**) when you press Scroll Lock. But if you need the Scroll Lock key for some other function, you can force the Extender to pass Scroll Lock through to the PC (disabling the reset function) by setting position 4 to OFF.

5.2.2 ON THE DUAL-ACCESS (ACU1009A) MODEL

Each of the DIP switch's four positions controls a configuration setting:

- **Position 1:** When position 1 (the topmost jumper, or the leftmost if you hold the Remote Unit by its left end) is in its factory-default OFF setting, the remote monitor is blanked while the Extender is in Private Mode (see **Section 7.3.4**) so that users at the remote station can't see what the user at the local station is doing. However, if you want to prevent the remote monitor from being blanked during Private Mode—so that users at the remote station can still see what's going on—set position 1 to ON.
- **Position 2:** When position 2 (the second one from the top, or second from the left if you hold the Remote Unit by its left end) is in its factory-default ON setting, the inactivity timeout (see **Section 7.3.3**) is set to two seconds: Once the local or remote keyboard and mouse have been idle for two seconds, the user at the other station can take control. If you suspect that the system will be switched too quickly with that setting, move position 2 to OFF to set the timeout to 15 seconds instead.
- **Position 3:** When position 3 (the third one from the top, or third from the left if you hold the Remote Unit by its left end) is in its factory-default ON setting, users have to press a key on their keyboard to take control of the Extender system when it becomes idle; see **Section 7.3.3**. If you want users to be able to take control by typing at their keyboard *or* by moving their mouse, move position 3 to OFF.

- **Position 4:** When position 4 (the bottom one, or the rightmost one if you hold the Remote Unit by its left end) is in its factory-default ON setting, the Extender resets the keyboard and mouse (see **Section 7.3.1**) when you press Scroll Lock. But if you need the Scroll Lock key for some other function, you can force the Extender to pass Scroll Lock through to the PC (disabling the reset function) by setting position 4 to OFF. Be aware that disabling Scroll Lock reset *also* affects the *Local Unit's* keyboard and mouse, and disables Private Mode (see **Section 7.3.4**) as well.

5.2.3 ON THE SWITCHING (ACU1049A) MODEL

Only position 2 of this DIP switch is meaningful; don't change the settings of any of the other switch positions. (Position 2 is the second one from the top, or second from the left if you hold the Remote Unit by its left end.) It controls the Extender's keyboard-command hotkey (see **Section 7.3**), the character that you can send from either attached keyboard to cue the Extender to expect to receive a command. Each time you press the hotkey, it will be absorbed by the Extender if it's followed by a valid command character.

The hotkey can be either left-[Ctrl] or right-[Ctrl]. In position 2's factory-default OFF setting, right-[Ctrl] is the hotkey, because many of the KVM switches that can be attached to the Extender use left-[Ctrl] as *their* hotkey. But you might want to use left-[Ctrl] instead, particularly if a computer you'll be attaching to the Extender is a workstation such as a Compaq® Alpha®, HP®, etc. Instead of a standard right-[Ctrl] key, these workstations' keyboards have a [Compose] key, which shouldn't be absorbed by the Extender because it's required for use with some of the software written for these workstations. To have the Extender use left-[Ctrl] for its hotkey, move position 2 to ON.

6. Installation

To install your ServSwitch™ Brand CAT5 KVM Extender, first test-place it (if you want to) as described in **Section 6.1**, attach devices as described in **Section 6.2**, then finish your installation as described in **Section 6.3**. Finally, adjust the video compensation as described in **Section 6.4**.

6.1 Test-Placing the Extender System (Optional)

We recommend testing your Extender system with a test setup confined to a single room; that way, if any components are bad, you can find out before you run cable halfway across your campus. If you want to do this, gather your equipment in your test site; otherwise, place the Extender's Local and Remote Units, and the equipment you'll be attaching to them, in your desired locations. (If you'd like to rackmount a Unit, see **Appendix B**.)

6.2 Attaching Devices

For instructions on making device connections, refer to these subsections:

- **Section 6.2.1** for attaching a CPU to an Extender Unit's CPU port.
- **Section 6.2.2** for attaching a KVM switch to an Extender Unit's CPU port.
- **Section 6.2.3** for attaching a monitor, keyboard, and mouse to an Extender Unit's user port.
- **Section 6.2.4** for attaching a KVM switch to an Extender Unit's user port.

As you attach devices to the Extender, here are some things to keep in mind:

- Each powered device should be powered OFF when you attach it.
- Make sure you don't attach a keyboard and mouse, or any keyboard and mouse extension cabling, backwards.
- Some of the illustrations in this section assume that the extension cabling included with the Extender is three separate cables, while others assume that it's the single bonded extension cable. In either case, the principle is the same—run the video, keyboard, and mouse cable or cable strands between the devices' video, keyboard, and mouse connectors respectively. (The keyboard and mouse connectors on the bonded cable have different colors and icon labels for easy identification.)

- *Dual-Access and Switching Local Units:* Remember that the CPU port is labeled “TO CPU” and the user port is labeled “LOCAL USER.”
- *Use caution if you plan to run an Extender from one KVM switch to another:* Different ServSwitch family KVM-switch models use different proprietary signaling between cascaded switches. The only ServSwitch family switch models whose cascade signals the Extenders can carry are those with a regular ServSwitch type composite interface (see the list in **Section 4.2.4.B**), so these are the only models for which you can install an Extender between two cascaded (master and submaster) switches.

Under no circumstances should you ever try to use an Extender to connect two incompatible ServSwitch models. Having an Extender between them will not make them compatible.

6.2.1 ATTACHING A CPU TO AN EXTENDER UNIT'S CPU PORT

Run the included extension cabling from the PC's video, keyboard, and mouse ports to the matching connectors of the Extender Unit's CPU port. Figure 6-1 shows a connection to a Local Unit; Figure 6-2 shows a connection to a Switching Remote Unit with its three-to-one CPU cable.

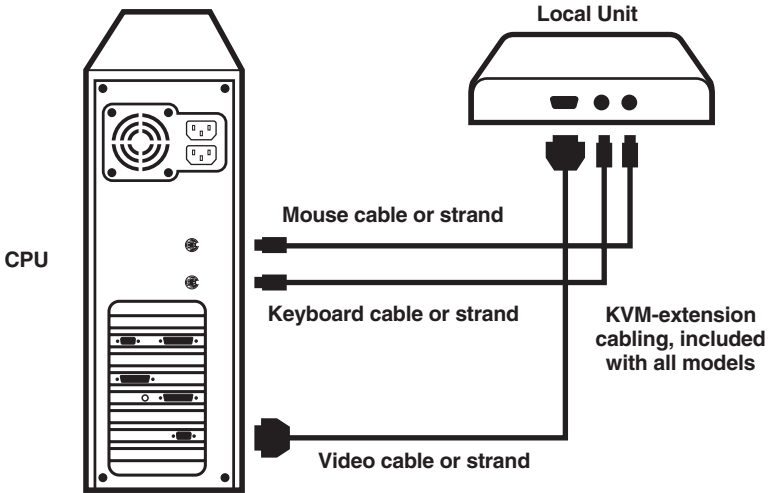


Figure 6-1. Attaching a CPU to the Local Unit (Single-Access model shown).

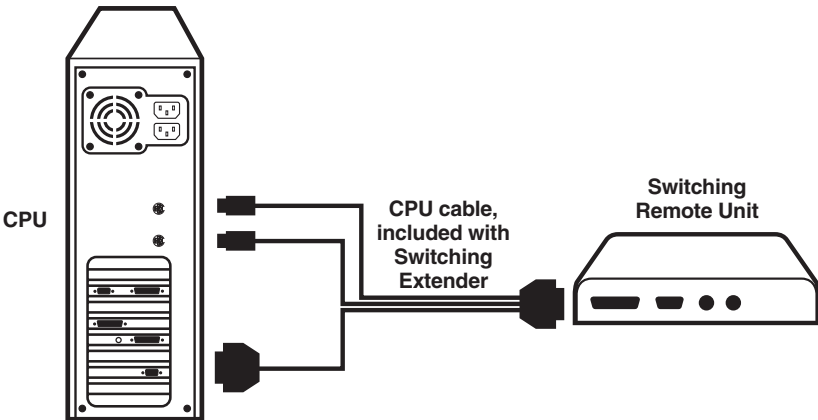


Figure 6-2. Attaching a CPU to the Switching Remote Unit.

6.2.2 ATTACHING A SERVSWITCH FAMILY KVM SWITCH TO AN EXTENDER UNIT'S CPU PORT

The way you'll do this will depend on what kind of user ports the KVM switch has: multiple connectors (see **Section 6.2.2.A**) or single connectors (see **Section 6.2.2.B**). (Refer to the listings in **Section 4.2.2** for which ServSwitch family models are in which category.)

6.2.2.A Attaching a Switch with Multiple User-Port Connectors

Run the included extension cabling from the video, keyboard, and mouse connectors in the Extender Unit's CPU port to the matching connectors in one of the KVM switch's user ports.

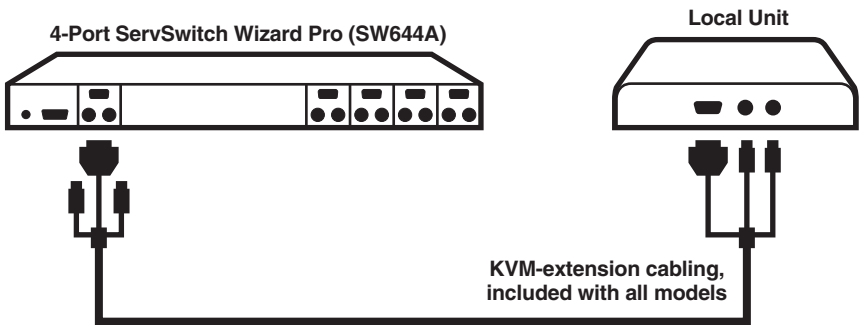


Figure 6-3. Attaching a KVM switch with multiple user-port connectors to the Local Unit's CPU port (Single-Access model shown).

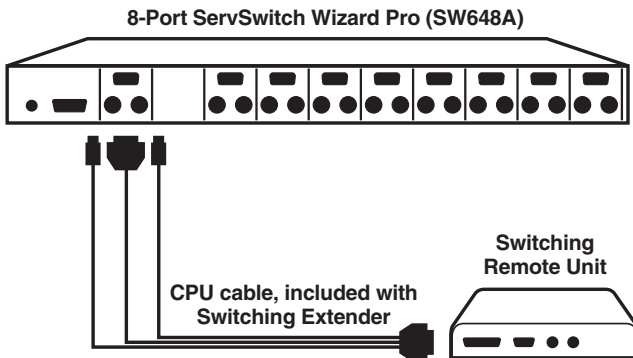


Figure 6-4. Attaching a KVM switch with multiple user-port connectors to the Switching Remote Unit's CPU port.

6.2.2.B Attaching a Switch with a Single Composite User-Port Connector

If you're attaching a switch with DB25 user ports to a Switching Remote Unit's CPU port, run a ServSwitch to ServSwitch Expansion Cable (EHN284) from the Remote Unit's CPU port to the switch's user port.

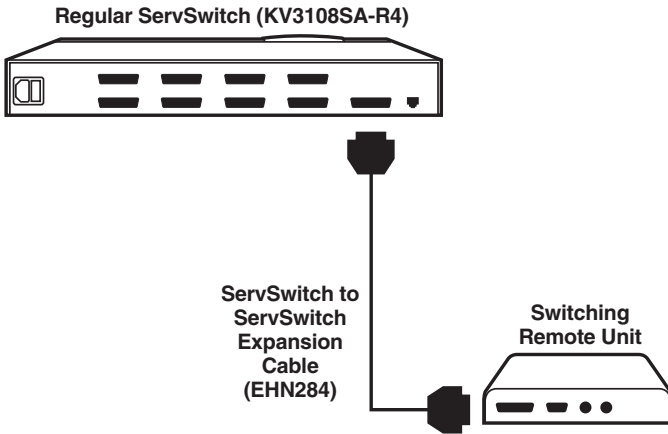


Figure 6-5. Attaching a KVM switch with a single DB25 user-port connector to the Switching Remote Unit's CPU port.

In all other situations, first plug the included extension cabling into the Extender Unit. Then plug a User Cable designed for the switch (see Sections 4.2.2.B and 4.2.2.C for product codes) into one of the switch's user ports. Connect the matching ends of the extension cabling and User Cable together as shown in Figure 6-6 below and Figures 6-7 and 6-8 on the next page.

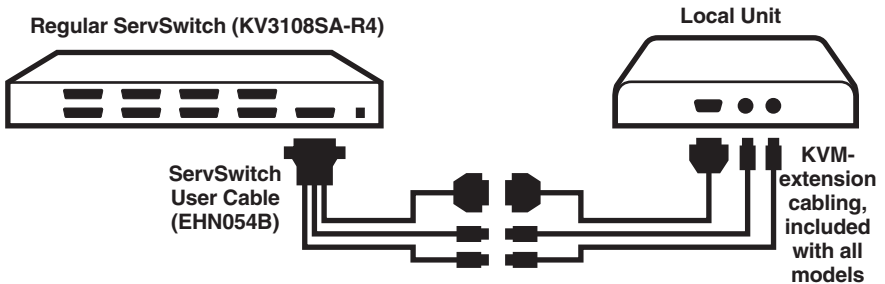


Figure 6-6. Attaching a KVM switch with a single DB25 user-port connector to the Local Unit's CPU port (Single-Access model shown).

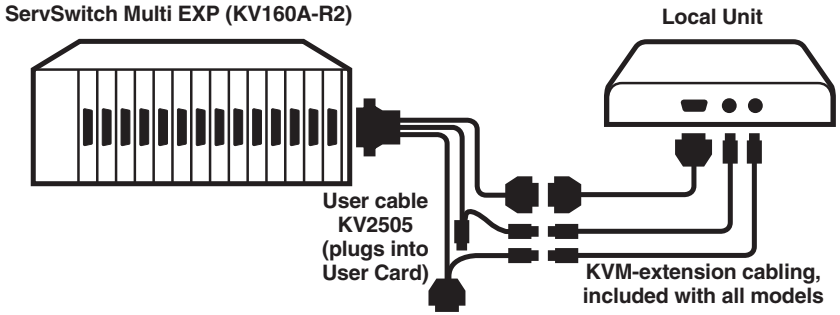


Figure 6-7. Attaching a ServSwitch Multi to the Local Unit's CPU port (Single-Access model shown).

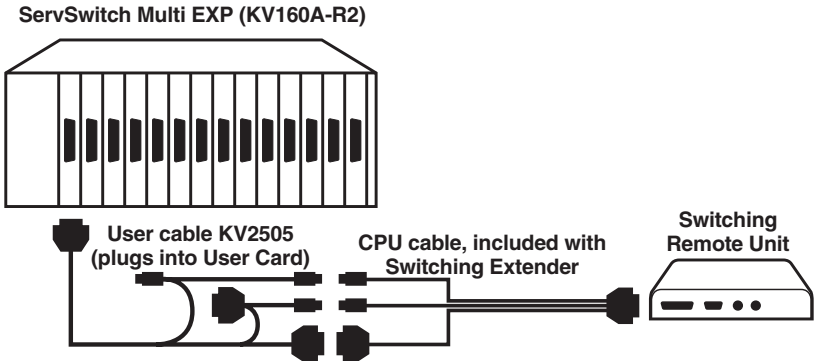


Figure 6-8. Attaching a ServSwitch Multi to the Switching Remote Unit's CPU port.

6.2.3 ATTACHING A MONITOR, KEYBOARD, AND MOUSE TO AN EXTENDER UNIT'S USER PORT

Plug the monitor, keyboard, and mouse directly into the matching connectors in the Extender Unit's user port.

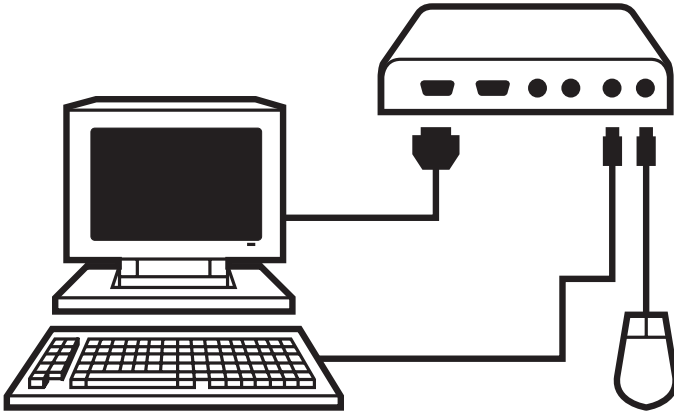


Figure 6-9. Attaching a monitor, keyboard, and mouse to the user port on an Extender Unit (Dual-Access Local Unit shown).

6.2.4 ATTACHING A SERVSWITCH FAMILY KVM SWITCH TO AN EXTENDER UNIT'S USER PORT

The way you'll do this will depend on whether the switch's CPU ports are multiple connectors (see **Section 6.2.4.A**) or single connectors (see **Section 6.2.4.B**). (Refer to the listings in **Section 4.2.4** for which switch models are in which category.)

6.2.4.A Attaching a Switch with Multiple CPU-Port Connectors

Attach one end of the included extension cabling (or equivalent cabling—see **Section 4.2.4.A**) to the CPU-port monitor, keyboard, and mouse connectors on the KVM switch. Attach the other end of the cabling to the Extender Unit's matching user-port connectors.

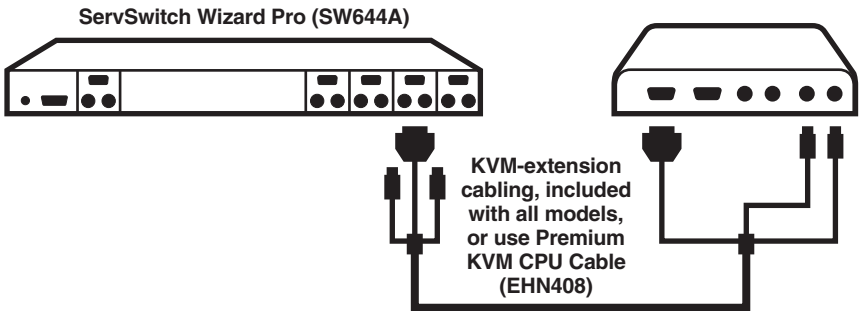


Figure 6-10. Attaching a KVM switch with multiple CPU-port connectors to the user port on an Extender Unit (Dual-Access Local Unit shown).

6.2.4.B Attaching a Switch with Single Composite CPU-Port Connectors

Run a CPU cable designed for the KVM switch—refer to **Sections 4.2.4.B** and **4.2.4.C** for product codes—from one of the switch's CPU ports to the user-port connectors on the Extender Unit, as shown in Figure 6-11.

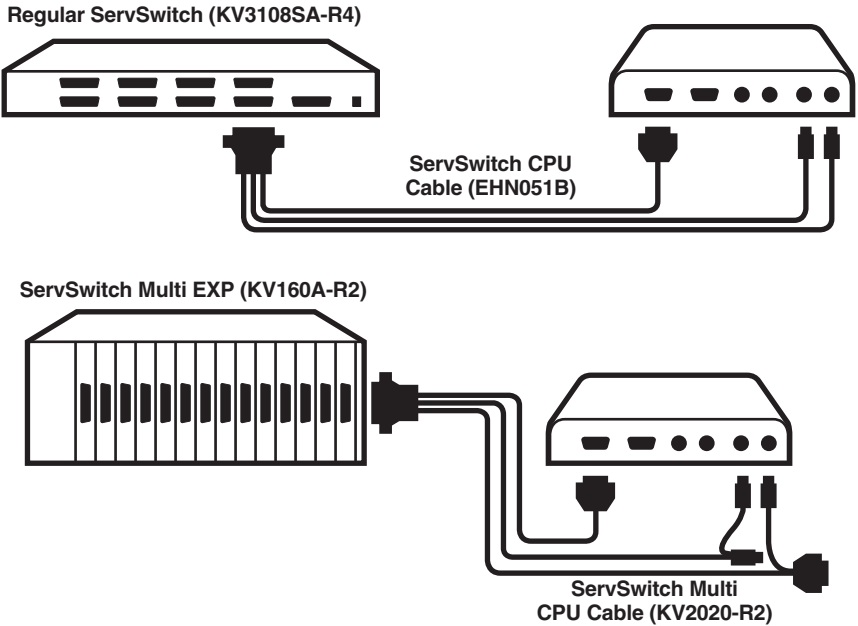


Figure 6-11. Two examples of attaching a KVM switch with composite CPU-port connectors to an Extender Unit's user port (Dual-Access Local Unit shown).

6.3 Finishing Your Installation

To finish installing an Extender after attaching devices to it as described in **Section 6.2**, take these steps:

1. Interconnect the Local and Remote Units by running CAT5 cable between their front-panel modular “Interconnect” jacks. Refer to the guidelines for this cable in **Section 4.2.5**.

CAUTION!

It is theoretically possible to connect the Remote Unit of a Switching (ACU1049A) Extender to the Local Unit of a Single-Access (ACU1001A) or Dual-Access (ACU1009A) Extender. However, the Switching Extender’s firmware is more advanced than the Single- and Dual-Access firmware, and the two versions are not 100% compatible. This incompatibility will cause the Scroll Lock LED not to light on the remote keyboard, although the Scroll Lock key will still work. More importantly, do *not* use Private Mode in a system with a Switching Remote attached to a Dual-Access Local Unit—you will not be able to turn Private Mode off! We *strongly recommend* that you upgrade the firmware at least to version S5.0 on any older Single- or Dual-Access Local Unit that you want to attach to a Switching Remote Unit. Call Black Box Tech Support if you want to do this.

2. Turn the Brightness and Focus dials on the Remote Unit counterclockwise, by hand or with a screwdriver, as far as they will go.
3. Attach the output cord of the Remote Unit’s power supply to the power jack on the back of the Unit. Then plug the IEC 320 end of the power supply’s input cord into the IEC 320 inlet on the power supply’s transformer. Finally, plug the other end of the input cord into a utility (mains) power outlet. The Remote Unit should power up immediately; it has no ON/OFF switch. (If the Remote Unit is in the location you want it to be, you can leave it plugged in and powered up more or less indefinitely.)

CAUTION!

If you ever need to replace the power supply of the Remote Unit, the replacement power supply must have identical output characteristics (see the “Power” specification in Chapter 2.) Using a supply with different output—even if it’s “almost the same”—could damage your equipment.

4. Power ON the PC CPU or KVM switch attached to the Local Unit’s CPU port. Like the Remote Unit, the Local Unit has no ON/OFF switch; it will start up immediately if the CPU or switch provides enough keyboard-line DC voltage. *Switching Extender systems:* Power ON any CPU or switch attached to the Remote Unit’s CPU port.

5. Power ON the monitor or KVM switch attached to the Remote Unit's user port. *Dual-Access systems:* Power ON any monitor or switch attached to the Local Unit's user ports.
6. Make sure that the remote keyboard functions and that you're getting video at the remote site. (Be aware that even though equipment attached to the Local Unit is usually powered and enabled right away, the remote monitor, keyboard, and mouse might take up to several seconds to be properly initialized; see **Section 7.3.3**. Note also that the video quality might be poor at this point if your interconnect cable is longer than 25 m [80 ft.])
7. Make sure the remote mouse functions. (If your PC normally boots up in DOS, you will need to run Windows or some application that supports the mouse.)
8. Make sure that the audio devices attached to any of your Remote Units are working.

If everything works in your test setup, repeat the procedures in **Section 6.2** and **6.3** for your actual installation. (For information about rackmounting a Remote Unit, see **Appendix B**.) If everything works in the actual installation, you can proceed to adjust the remote site's video (see **Section 6.4**). For pictures of complete installations, see Figure 6-12 below and Figures 6-13 through 6-15 on the next page.

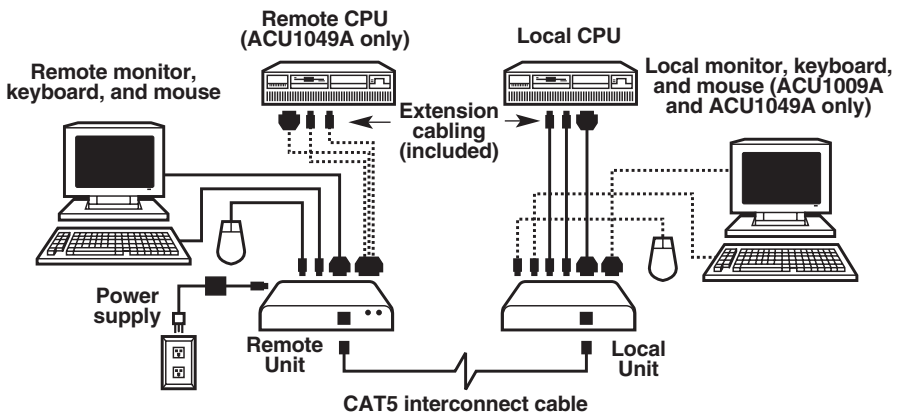


Figure 6-12. An Extender-system installation, front view.

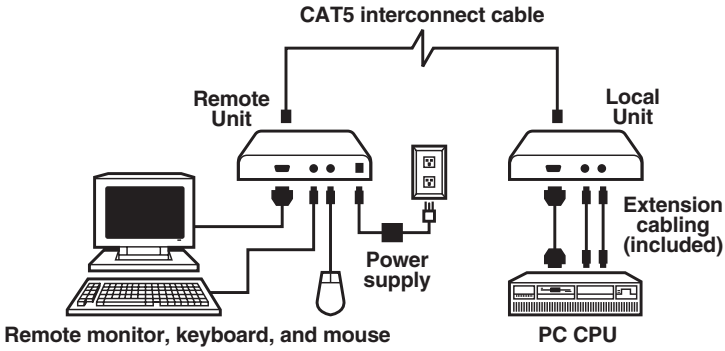


Figure 6-13. A Single-Access Extender-system installation, rear view.

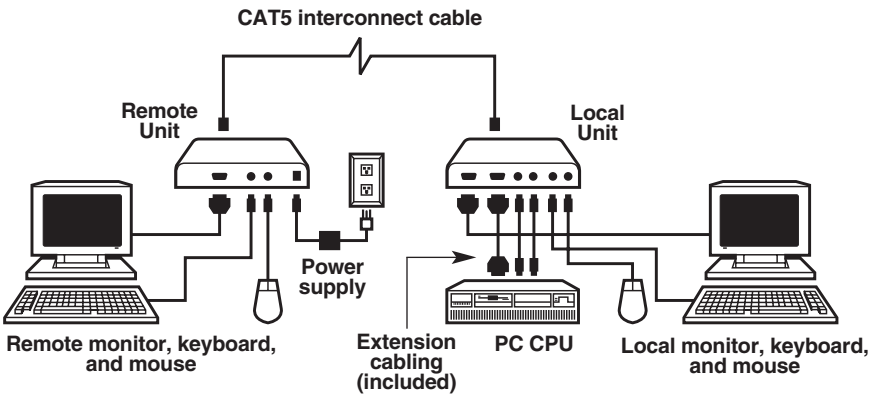


Figure 6-14. A Dual-Access Extender-system installation, rear view.

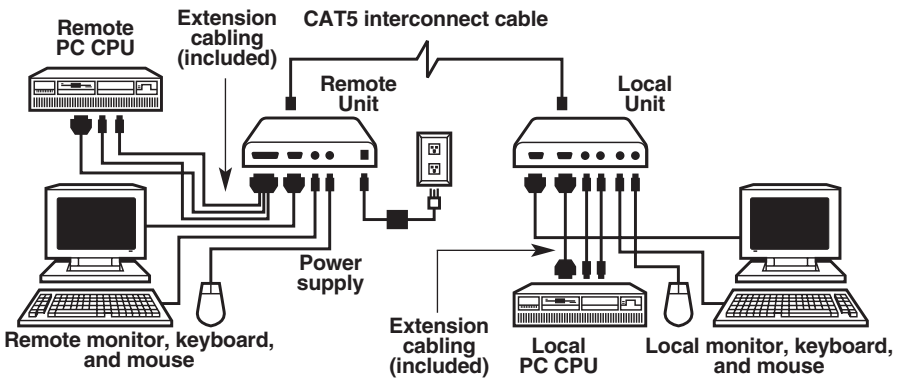


Figure 6-15. A Switching Extender-system installation, rear view.

6.4 Adjusting the Video Compensation

You should only need to take the steps in this section if the interconnect cable between your Local and Remote Units is longer than 25 m (80 ft.). If it isn't that long, but the video at the remote site still looks awful, first try adjusting the Remote Unit's Brightness and Focus dials. If the video looks bad no matter how you set these dials, the problem is almost certainly being caused by bad wiring in your interconnect cable. Compare its pinning and pairing with those shown in **Appendix A**.

NOTES

For all practical purposes, cable equalization cannot be exact: The remote video image will never be as sharp as the original. The Remote Unit's equalization system is designed to produce very good results on short or medium-length cables and acceptable quality across very long cables (those over 150 m [500 ft.] in length).

At any cable range, you can see how the video would appear without any compensation at all by turning the Focus dial counterclockwise as far as it will go.

1. Run an application you intend to use that requires a high screen resolution, such as a Windows art or design program, a word processor or desktop-publishing package, or even a graphics-intensive game.
2. If the video reaching the remote monitor is "undercompensated," you will notice black smearing on the right-hand edge of large horizontal objects such as title bars. The degradation becomes more noticeable as cable length increases.
3. Keep your eyes on a part of the image where the smearing is evident. Now, turn the Remote Unit's Focus dial clockwise, by hand or with a screwdriver, until the smearing disappears and the edge becomes very bright and too sharp. At this point and beyond the video is "overcompensated."
4. Turn the Focus dial back slightly until you reach a point where the edge looks as it should be (no smearing or over-sharpness). The compensation is now adjusted correctly for the length of interconnection cable used. (If you can't seem to get the compensation close enough, and you're running high-res video to near the limits of the cable length that the Remote Unit is configured for, see the Note in **Section 5.1**.)
5. Use the Brightness dial to adjust the brightness of the overall picture. After you do so, you might need to make a further slight adjustment with the Focus dial.

One you've finished polishing up the video, your Extender system should be ready for continuous operation.

7. Operation

7.1 Keyboard and Mouse Emulation

The ServSwitch™ Brand CAT5 KVM Extender uses a microprocessor to emulate the presence of a directly connected keyboard and mouse for any attached PC. This means that you don't have to connect a keyboard or mouse to the PC in order for it to boot; in fact, the PC will boot with only an Extender Unit connected.

This feature makes several other things possible:

- Your local PC can operate continuously regardless of whether or not the Extender's Remote Unit is powered, connected, or even present.
- You can “hot-plug” or “hot-swap” the remote or local keyboard and mouse at any time; that is, you can unplug and replug the keyboard and mouse without disrupting the operation of any attached PC.
- You can connect the Local Unit of one Extender system to the Remote Unit of a different Extender system—effectively creating a KVM-switching matrix—by swapping the systems' interconnection cables. (If you feel that you need to do this, please call Black Box for technical support first. Also refer to the first Caution notice in **Section 6.3**.)

7.2 Normal Operation and Keyboard Typematic Rate

With the exception of the shared-access features of the Dual-Access and Switching models (see **Sections 7.3.3** through **7.3.5**), the Extender should operate continuously and transparently, maintaining the long-distance connection between the local CPU or KVM switch and the remote user station or KVM switch. Note that the remote keyboard's typematic rate—the rate at which a held-down character will repeat—is fixed at 30 characters per second, which is also the default typematic value for Windows.

7.3 Keyboard Commands and Related Functions

This section describes Extender functions that can be controlled with commands that users can type in at the user-station keyboards, as well as some related functions. The different Extender models have different command formats:

- The Single- and Dual-Access Extenders use Scroll Lock as a single multipurpose “command key”—pressing and releasing it different numbers of times, sometimes while pressing the mouse buttons, causes the Extender to do various things.
Very few of today’s software applications make use of the Scroll Lock key, but if you’re using such an application on the PC attached to the Extender, you can force the Extender to ignore the Scroll Lock character and pass it through to the PC. Do this by setting position 4 of the Remote Unit’s internal DIP-switch SW1 to OFF (see **Section 5.2.1** or **5.2.2**). Turning off Scroll-Lock recognition will disable the Extender’s reset command (see **Section 7.3.1**), and on Dual-Access models it will disable Private Mode as well (see **Section 7.3.4**).
- The Switching Extender uses either left-[Ctrl] or right-[Ctrl] as a “hotkey” that will trigger the Extender to expect an additional command character. Right-[Ctrl] is the default hotkey, but you can change it to left-[Ctrl] if necessary by moving position 2 of the Remote Unit’s internal DIP-switch SW1 to ON (see **Section 5.2.3**).

For a quick summary of all of the Extender’s keyboard commands, see **Appendix C**.

7.3.1 RESETTING THE KEYBOARD AND MOUSE

When an Extender system is set to its factory defaults, or if a keyboard or mouse attached to the Extender ever lock up, you can reinitialize a user station’s keyboard and mouse by typing in a reset command at the keyboard of a user station attached to the Extender:

- With a Single-Access Extender, press and release the Scroll Lock key *once*.
- With a Dual-Access Extender, press and release the Scroll Lock key *once* at the Remote Unit or *twice* at the Local Unit.
- With the Switching Extender, press and release the hotkey, then press and release the up-arrow (number 8) key on the keyboard’s numeric keypad (*not* the number 8 on the top row of the keyboard).

Note that the Extender will automatically reinitialize the keyboard and mouse whenever you attach them. If a reset doesn’t help your remote keyboard or mouse, try cycling power to the Remote Unit.

7.3.2 CORRECTING THE PS/2 MOUSE IF IT GETS OUT OF SYNC

On rare occasions, you might notice that, instead of behaving normally, your mouse pointer is moving and jumping erratically all over the screen (and possibly selecting things at random). This is usually a sign that the PS/2 mouse has gotten “out of sync” with the Extender or that the Extender has gotten out of sync with the CPU’s PS/2 mouse port.

PS/2 mice send mouse data in 3- or 4-byte packets. As long as the CPU knows which bytes mark the start and end of each packet—which it virtually always does as long as the mouse is directly connected to it—it can correctly interpret the mouse signals. But when mice are disconnected and reconnected, or when mouse signals pass through other devices on their way to the CPU, it is sometimes possible for the CPU or the intervening devices to lose track of where the mouse-data packets begin and end, with the result that the cursor/pointer begins behaving bizarrely.

If this happens in some mouse extender/switch systems, the only solution is to either kill and reload the mouse driver or reboot the PC. But the Extender has a feature you can use to painlessly recover from this kind of glitch. First try to reset the mouse as described in **Section 7.3.1**. If this doesn’t work, send the “Null Mouse Command” in order to resynchronize the CPU’s mouse port. If your Extender is a Switching model, press and release the hotkey, then press and release the left-arrow (number 4) key on the keyboard’s numeric keypad (*not* the number 4 on the top row of the keyboard). If your Extender is a Single- or Dual-Access model, take these steps:

1. Press and hold down both the left and right mouse buttons.
2. Press and release the Scroll Lock key on the associated keyboard, then release the mouse buttons.
3. Check mouse operation.
4. If the mouse isn’t yet operating correctly, repeat steps 1 through 3 as many as two more times. (If this still doesn’t help, call Black Box Technical Support.)

When the Extender receives the Null Mouse Command, it sends a “null byte” of mouse data to the CPU; this has no effect other than to get the CPU “caught up” with the mouse. You might have to issue the command as many as three times in order to get a PC with a 4-byte mouse back on track. Note that, unless your mouse driver is an auto-correcting type, sending this command while the mouse is in sync will throw it out of sync.

If the PS/2 mouse frequently gets out of sync in your system, and you’re running Windows 95/98/2000, Windows Me®, Windows NT®, or Windows XP®, we

recommend that you install a Microsoft IntelliMouse driver on your PC, regardless of whether you're actually using an IntelliMouse or not. The Extender will translate the mouse signals for this driver, and the driver will auto-correct the synching problem if you let go of the mouse for a second or two.

7.3.3 THE INACTIVITY TIMEOUT (DUAL-ACCESS AND SWITCHING EXTENDERS ONLY)

Because two user stations (one local, one remote) can be directly attached to them, the Dual-Access and Switching Extenders have “shared access” features, including Private Mode (see **Section 7.3.4**) and an “inactivity timeout.” While the inactivity timeout isn't controlled by a keyboard command per se, it responds to general keyboard activity.

The two stations attached to the Extender normally contend for access. When there has been no keyboard or mouse activity on one station for the duration of the “inactivity timeout” period, the Extender will switch to the first station from which it detects user activity. On the Switching Extender, both keyboard keypresses and mouse movements always register as user activity. The default behavior of the Dual-Access Extender is to register only keyboard keypresses as user activity, but you can set it to register mouse movements as well if you want to (see **Section 5.2.2**).

The “inactivity timeout” prevents a user at the other station from interrupting work in progress at the active station. On the Switching Extender, the timeout is fixed at two seconds. This is also the default timeout length of the Dual-Access Extender, but you can set it to fifteen seconds if control is being switched too quickly (see **Section 5.2.2**).

Here's how it works: A user station is activated by pressing a key on its keyboard or by moving the mouse. This first keypress, or the first packet of mouse data, is absorbed by the Extender and is not passed on to the PC. The Extender “latches onto” this user station; users at the other station can see what's happening on their monitor, but can't control the PC with their keyboard or mouse while the active station is in use. Once the active station's keyboard and mouse are idle for the length of the “inactivity timeout,” the Extender “lets go” of that station, and will switch to whichever station it next detects keyboard input from.

When the Switching Extender boots up, it gives the local user station control of the local CPU and the remote user station control of the remote CPU, as long as a remote PC is attached and powered up. But when the Dual-Access Extender boots up, it gives control (and its total attention) to the local station for at least a portion of the inactivity-timeout period. This means that the remote monitor in a Dual-Access system might be blank, and the remote keyboard and mouse inactive, for up to several seconds.

7.3.4 PRIVATE MODE (DUAL-ACCESS AND SWITCHING EXTENDERS ONLY)**CAUTION!**

Do *not* use private mode if you have a Switching (ACU1049A) Remote Unit attached to a Single-Access (ACU1001A) or Dual-Access (ACU1009A) Local Unit with firmware version lower than S5.0. See the first Caution notice in Section 6.3.

For applications in which one station is not in a secure location, or must be temporarily kept from accessing the local PC, users at one station in a Dual-Access or Switching Extender system can trigger the Extender's "Private Mode," which prevents the other station from taking control of the local PC even if the inactivity timeout (see **Section 7.3.3**) expires. Private Mode is handled differently by the two models:

- With the Dual-Access Extender, the local user station can go into Private Mode and lock out the remote station, but not vice versa. When users at the local station have control of the Extender, they can force it into Private Mode (taking exclusive control of the PC) by pressing Scroll Lock *once* on the local keyboard. The Scroll Lock LED will light on *both* the local *and* remote keyboards. Other than this indication, the remote station is almost completely disabled: The monitor goes blank and the keyboard and mouse stop working. (If you don't want the remote monitor to be blanked during Private Mode, set DIP-switch position 1 to ON—see **Section 5.2.2**.)

Local users must press Scroll Lock again to re-enable the remote user station; when they do so, the Extender also reinitializes the local keyboard and mouse. (To reset the local keyboard and mouse without going into Private Mode, quickly press and release Scroll Lock *twice*, as directed in **Section 7.3.1**.)

- With the Switching Extender, either station can go into Private Mode, taking exclusive control of the local PC and locking out the other. When users at either the local or remote station have control of the local PC, they can force the Extender into Private Mode by pressing and releasing the hotkey at their keyboard, then pressing and releasing Scroll Lock. The Scroll Lock LEDs on their keyboards will flash to show that Private Mode is active.

If the *remote* station goes into Private Mode and locks out the *local* station, the local monitor's screen will be blanked, the local keyboard and mouse will be disabled, and all three of the local keyboard's LEDs (Num Lock, Caps Lock, and Scroll Lock) will light to show that the station is locked out and can't access the local PC. The local station will be unusable until the remote station exits Private Mode. In the meantime, the Scroll Lock LED on the remote keyboard will continue to flash as long as the remote user has the local PC selected. The remote user can switch to the remote PC (see **Section 7.3.5**), during which time the Scroll Lock LED will behave normally, but Private Mode

will remain in effect: The local user will still not have access to the local PC, and the remote keyboard's Scroll Lock LED will resume flashing as soon as the remote user selects the local PC again. To exit Private Mode, the remote user must select the local PC, press and release the hotkey, then press and release Scroll Lock.

If the *local* station goes into Private Mode and locks out the *remote* station, the remote station will be automatically switched to any attached and powered remote PC. (If a remote PC isn't attached and powered, the remote monitor's screen will be blanked, the remote keyboard and mouse will be disabled, and all three of the local keyboard's LEDs [Num Lock, Caps Lock, and Scroll Lock] will light to show that the station is locked out and can't access the local PC. In that situation, the remote station will be unusable until the local station exits Private Mode or the remote PC is switched ON—if the remote PC is switched ON, the remote user will be able to switch to it.) In the meantime, the local keyboard's Scroll Lock LED will continue to flash and the local user will have exclusive use of the local PC; the remote user will be able to access the remote PC as normal, but the Extender won't allow the remote user to switch back to the local PC while Private Mode is in effect. To exit Private Mode, the local user must press and release the hotkey, then press and release Scroll Lock.

The Extender will not go into Private Mode unless there's a powered PC attached to the Local Unit.

7.3.5 SWITCHING BETWEEN CPUs (SWITCHING EXTENDER ONLY)

If the local user isn't using the local PC, the remote user in a Switching Extender system is able to switch back and forth between the local and remote PCs and access either of them as necessary. To do this, the remote user must press and release the hotkey, then press and release the plus key (“[+]”) on the keyboard's numeric keypad (*not* the plus/equals key on the top row of the keyboard). The keyboard's Num Lock, Caps Lock, and Scroll Lock LEDs will flash to show which PC is selected: once for the remote PC, twice for the local PC. (When the Extender is in Private Mode, switching might be constrained and the LEDs will behave differently; see **Section 7.3.4**.)

Be aware that automatic switching can happen at startup. When the Remote Unit powers up, it will search for a powered PC. If powered PCs are attached to both the Local and Remote Units, it will connect the remote station to the remote PC, so that the remote user can use the remote PC and the local user can use the local PC. However, if the only powered PC attached to the Extender is attached to the Local Unit, the remote user will be automatically switched to the local PC instead (see **Section 7.3.3**).

8. Troubleshooting

8.1 Common Problems

This section discusses difficulties that people sometimes have with the ServSwitch™ Brand CAT5 KVM Extender, and suggests possible remedies. If the recommended actions don't help, if you don't see your problem here, or if your problem keeps recurring, call Black Box Technical Support as directed in **Section 8.3**.

8.1.1 KEYBOARD

The PC boots correctly with no error messages, but the keyboard does not work at all.

1. Check the keyboard cable and (if necessary) the keyboard portion of the extension cabling to your CPU or KVM switch; if it's loose, or if you have the keyboard and mouse cabling reversed (plugged into each other's Extender-port connectors), plug the cabling in properly and reset the keyboard as described in **Section 7.3.1**.
2. Check the interconnect cable between the Extender's Local and Remote Units. Is it intact along its length and securely connected at both ends? And is it wired correctly? (Compare its wiring with that shown in **Appendix A**.)
3. If your PC is a Pentium® class machine, see the entry for the "My Pentium class PC..." problem in **Section 8.1.3**.
4. Try a different model of keyboard. If the new keyboard works, the original one might be incompatible (some older autosensing keyboards don't work with the Extender).

When I press keys on my keyboard, the wrong characters appear.

1. Your keyboard might be in the wrong mode. Try resetting it as described in **Section 7.3.1**.
2. Power down and reboot the entire system.

The PC always comes up with "Keyboard Error."

1. If the system appears to work fine after you press [F1] or [ESC], adjust your BIOS setup so that the PC doesn't test the keyboard.
2. If your PC is a Pentium class machine, see the entry for the "My Pentium class PC..." problem in **Section 8.1.3**.

Connecting a keyboard to the Remote Unit has an adverse effect on the remote video.

Try using a newer keyboard. (Some older keyboards require too high a current for the Remote Unit to properly drive the video signal.)

When I don't use a keyboard, the Extender doesn't work at all.

See **Section 8.1.5**.

8.1.2 MOUSE

There is a mouse cursor on the screen, but the mouse does not work.

1. Reset the mouse as described in **Section 7.3.1**.
2. Check the mouse cable and (if necessary) the mouse portion of the extension cabling to your CPU or KVM switch; if it's loose, or if you have the keyboard and mouse cabling reversed (plugged into each other's Extender-port connectors), plug the cabling in properly and reset the mouse as described in **Section 7.3.1**.
3. If your PC is a Pentium class machine, see the entry for the "My Pentium class PC..." problem in **Section 8.1.3**.
4. Check the interconnect cable between the Extender's Local and Remote Units. Is it intact along its length and securely connected at both ends? And is it wired correctly? (Compare its wiring with that shown in **Appendix A**.)
5. Try powering the Remote Unit OFF and then ON again.
6. Try using a different model of mouse.

The system does not detect a PS/2 mouse, or the application cannot find the mouse.

1. Check the mouse cable and (if necessary) the mouse portion of the extension cabling to your CPU or KVM switch; if it's loose, or if you have the keyboard and mouse cabling reversed (plugged into each other's Extender-port connectors), plug the cabling in properly and reset the mouse as described in **Section 7.3.1**.
2. Make sure that the cable running from the keyboard port of the CPU or KVM switch to the Extender's Local Unit is intact and securely attached, so that it provides power to the Local Unit.
3. If your PC is a Pentium class machine, see the entry for the "My Pentium class PC..." problem in **Section 8.1.3**.
4. Reboot the PC.

The mouse is behaving erratically.

1. Reset the mouse as described in **Section 7.3.1**.
2. Issue the Null Mouse Command up to three times (see **Section 7.3.2**).
3. If your PC is running Windows 95/98/2000, Windows Me, Windows NT, or Windows XP, regardless of what type of mouse you have, install the latest Microsoft driver for a standard mouse or (even if you have a standard mouse) the IntelliMouse. The Extender will translate the mouse signals for this driver, and the driver will auto-correct the synchronization problem if you let go of the mouse for a second or two.
4. If you're using the Extender in conjunction with one of our ServSwitch family of KVM switches, command the switch to reset the mouse.
5. Quit and restart the application.
6. Reboot the PC.

8.1.3 BOTH KEYBOARD AND MOUSE

Neither the keyboard nor the mouse operates, or both have locked up.

1. If they have both locked up, first try to reset the keyboard and mouse as described in **Section 7.3.1**.
2. Reset the PC and try again.
3. If the problem is happening at the remote station, cycle power to the Remote Unit.

My Pentium class PC will not boot properly due to keyboard or mouse problems, or After my Pentium class PC boots, the keyboard and/or mouse don't work.

Try “crossing” the keyboard- and mouse-extension cabling running from the Extender to your PC. That is, plug the keyboard cable or cable strand into the mouse connector and the mouse cable or cable strand into the keyboard connector.

If this works, here's why: The BIOS installed in some machines with Intel Pentium family processors checks the PC's keyboard and mouse ports at boot time. If it detects anything that leads it to suspect that the user has plugged the keyboard and mouse in backwards—that is, into each other's CPU ports—it “remaps” the ports, so that the keyboard port functions as the mouse port and vice versa. BIOS of this type sometimes mistakenly activates port remapping when the PC is attached to an Extender.

8.1.4 VIDEO

The picture is not sharp, or is badly smeared.

1. The video compensation might not be set correctly. See **Section 6.4**.
2. Check the interconnect cable between the Extender's Local and Remote Units. Is it solid-core cable, rated as Category 5? (It might be possible to use CAT5e at distances up to 120 m [400 ft.], but video will degrade if it's run across lengths of CAT5e greater than that.) Is the cable intact along its length and securely connected at both ends? And is it wired correctly? (Compare the cable's specs with those listed in **Section 4.2.5** and its wiring with that shown in **Appendix A**.)
3. Check the video-extension cabling, patch-panel video connections, and other video connections in the system. Make sure everything is properly and securely attached.
4. Are you using an LCD panel? You might need to reduce the refresh rate of your graphics card's output.

Each character has separated into overlapping sets of red, green, and blue pixels; the effect is like trying to watch a 3-D movie without 3-D glasses.

1. Check the interconnect cable between the Extender's Local and Remote Units. Is it solid-core cable, rated as Category 5? Is it intact along its length and securely connected at both ends? And is it wired correctly? (Compare the cable's specs with those listed in **Section 4.2.5** and its wiring with that shown in **Appendix A**.)
2. Check the video-extension cabling, patch-panel video connections, and other video connections in the system. Make sure everything is properly and securely attached.
3. The video compensation might not be set correctly. See **Section 6.4**.
4. Check the settings of the Remote Unit's distance jumpers; you might need to try a higher setting. See **Section 5.1**.

The monitor sometimes loses sync, causing it to go blank for a second or two.

This could happen if your electrical power system is very noisy (particularly on the ground lead). Also, don't route your interconnect cable anywhere near power lines or other powerful sources of interference such as generators, motors, or fluorescent lights. If this is a persistent problem, please discuss it with Black Box Technical Support.

I only need video—not keyboard or mouse control—but I can't get a picture.

Even if you are only using the Extender for video extension—to drive video to a remote monitor—the Extender's Local Unit must still be attached to the keyboard port of a PC or KVM switch, because that's where it gets its power. If your application makes it impossible to connect the Extender to a keyboard port, call Black Box Technical Support about getting an alternative power supply for the Local Unit.

I get a constant vertical wobble down the screen. What is the cause of this interference?

1. The interconnection cable could be located too close to a source of very strong electrical-power interference; reroute the cable if possible.
2. If the wobble forms a standing “beat pattern,” the Extender is probably being affected by a very strong signal from a nearby broadcast transmitter. The solution in this case is to change the vertical refresh rate slightly (for example, from 60 Hz to 70 Hz or vice versa).
3. You might require an alternative power supply for the Remote Unit. Call Black Box Technical Support.

I get black & white instead of color video.

Your CPU probably needs to see monitor ID in order to boot into the correct video mode. Please contact Black Box Technical Support.

Microsoft Windows 3.x, 95, 98, or 2000, Windows Me, Windows NT, or Windows XP will only boot into a low-resolution graphics mode.

1. If your graphics card supports VESA DDC (Display Data Channel), configure the graphics driver by explicitly telling it which make and model of monitor you're using, rather than letting the driver configure itself automatically (and probably erroneously) through DDC, which the Extender doesn't support at the remote station.
2. Your CPU might need to see monitor ID in order to boot into the correct video mode. Please contact Black Box Technical Support.

Connecting a keyboard to the Remote Unit has an adverse effect on the remote video.

Try using a newer keyboard. (Some older keyboards require too high a current for the Remote Unit to properly drive the video signal.)

The Extender doesn't seem to work correctly with my LCD panel.

Try reducing the refresh rate of the video signal that your graphics card is outputting. (The maximum refresh rates supported by most LCD panels are less than those supported by most monitors.)

8.1.5 POWER

I don't need to use a keyboard in my application, but the Extender doesn't work at all unless I have a keyboard line running from the Local Unit to the PC.

The Extender's Local Unit normally operates using the 5 volts of DC power that the attached CPU or KVM switch supplies on its keyboard port. Even if you're not using a keyboard at either the local or remote user station, you should run a cable from the Local Unit's CPU-port keyboard connector to the keyboard port of the CPU or KVM switch in order to power the Local Unit. If this is not possible, call Black Box Technical Support about getting an alternative power supply for the Local Unit.

8.2 General Questions About the Extender

Is it possible to use an interconnection cable longer than 300 meters (1000 feet)?

The Extender has been designed to produce acceptable results with SVGA resolutions at the maximum cable length of 300 m (1000 ft.). Therefore, it *might* be possible for you to run as far as 500 m (1640 ft.) at the standard VGA resolution, 640 x 480. However, we do *not* recommend doing this and *cannot* guarantee that it will work.

Can Extenders be daisy-chained to allow operation across a distance greater than 300 meters (1000 feet)?

Though we do not recommend doing so, you can chain two Extenders in order to operate over longer distances. Using cascaded Extenders (CPU→Local Unit 1→Remote Unit 1→Local Unit 2→Remote Unit 2→monitor, keyboard, and mouse), SVGA operation over 500 m (1640 ft.) and standard VGA operation over 600 m (1970 ft.) is theoretically possible, though not guaranteed. In general, the first CAT5 cable segment (the one between the first Extender's Local and Remote Units) should be about 200 m (655 ft.) long and the remaining distance should be covered by the second segment (the one between the second Extender's Local and Remote Units). Such applications require careful setup of the video equalizers. If you plan to cascade Extenders, please contact Black Box Technical Support to discuss your application.

Can the Extender be used between buildings?

No. Ground loops could destroy the Extender and attached equipment.

Can I use multiple Local or Remote Units by swapping interconnect cables or switching the interconnect link?

Because the Extender performs full keyboard and mouse emulation, it is possible to swap or switch the Local-Remote interconnection to create, in effect, a KVM matrix-switch system; you would just have to remember to always reset the active Remote Unit (and, if it's a Dual-Access model, the Local Unit; see **Section 7.3.1**) after each such swap or switch. Please call Black Box Technical Support to discuss your application before deploying such a system.

Is the Extender VESA DDC compatible?

DDC (Display Data Channel) is a two-way monitor-communication/configuration scheme created by VESA (the Video Electronics Standards Association). CPUs and DDC-compliant monitors pass configuration settings and other information back and forth across dedicated signal lines in the video interface. Because the Dual-Access Extender's Local Unit passes these DDC lines through, your local monitor can use DDC if it's DDC-compliant. However, the Extender does not carry the DDC signals across its interconnect cable, so the remote monitor can't use DDC.

In general, we recommend that you simply turn DDC OFF and manually configure your video card for your monitor.

Can the Extender be used with RGB video?

As long as the video has sync on green (the composite sync signal superimposed on the green color signal), there should be no problem.

Which cable type is better: UTP (unshielded twisted pair) or STP (shielded twisted pair)?

In electrically quiet environments, UTP cable will give the best quality video over long distances because it has less capacitance per unit length. However, STP is usually better in electrically noisy environments, because it resists interference more strongly.

When using UTP, what's the best way to make sure that the system does not suffer from any interference?

The Extender is designed to withstand high levels of interference while driving signals over long stretches of UTP. To further reduce the potential for interference, consider taking these actions:

- a) Make sure that the Extender's Remote Unit, the remote monitor, CPU, and/or KVM switch(es), and the local CPU or KVM switch are all connected to the same utility-power (mains) phase.
- b) Make sure that the AC voltage across the utility-power (mains) grounds (at both the local and remote sites) is less than 2V.
- c) Use a "clean earth" or "clean grounding" system (if your site has one installed).
- d) Route the interconnection cable away from generators, motors, compressors, fluorescent lights, and other cables.
- e) Try STP cable if you think noise could be a problem.

This interconnect cable is exactly like the cable I use on my LAN. Can I connect the Extender to my network?

Absolutely not. Regardless of the cable similarities, the data signals and voltages used by the Extender are totally 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, is a sure way to blow out the Extender, and could damage other devices attached to the Extender as well.

Can I rackmount the Extender?

Yes, using Rackmount Kits that are available separately. See **Appendix B**.

8.3 Calling Black Box

If you determine that your 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 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; and
- 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.

8.4 Shipping and Packaging

If you need to transport or ship your Extender:

- Package it carefully. We recommend that you use the original container.
- If you are shipping it for repair, please include all parts of 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 A:

Cable Pinning/Pairing

The cable you will use to interconnect the Local and Remote Units of your ServSwitch™ Brand CAT5 KVM Extender should be terminated with RJ-45 plugs and should be wired according to the EIA/TIA-568 standard (preferably 568B rather than 568A). See **Section 4.2.5** for a more complete set of cable recommendations.

Looking into the interconnect socket on either Extender Unit, or looking at the cable plug from behind, Pin 1 should be on the left and Pin 8 on the right, and the wires should be arranged this way:

| Pin | Color | Function, Pair |
|-----|--------------|----------------|
| 1 | White/Orange | TX, Pair 2 |
| 2 | Orange/White | RX, Pair 2 |
| 3 | White/Green | TX, Pair 3 |
| 4 | Blue/White | RX, Pair 1 |
| 5 | White/Blue | TX, Pair 1 |
| 6 | Green/White | RX, Pair 3 |
| 7 | White/Brown | TX, Pair 4 |
| 8 | Brown/White | RX, Pair 4 |

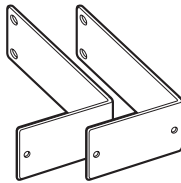
NOTES

The Extender has been tested with all major makes of CAT5 cable including Black Box, Berk-Tek™, Mohawk®, and AT&T®. The Extender has also been tested and found to work, *in certain situations*, with 4-pair Category 3 cable or with four pairs of 25-pair UTP trunk cables instead of 4-pair Category 5 cable. But we do *not* recommend such installations; if you want to experiment with them, do so at your own risk.

You might be able to use some makes of CAT5e cable (rated for 155 Mbps) between Extender Units at distances up to 120 m (400 ft.). In general, however, *avoid* using cables rated CAT5e, “Level 6,” “Level 7,” etc.

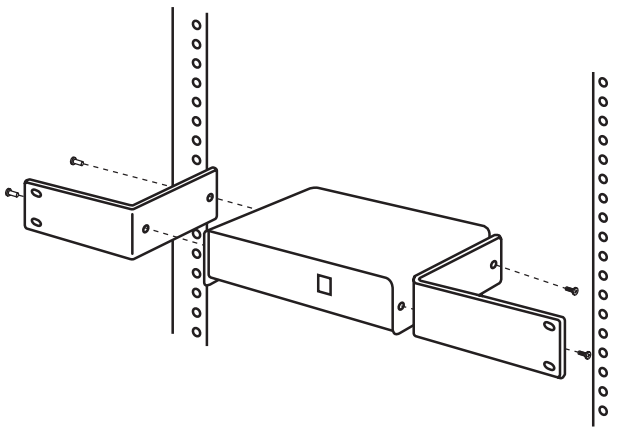
Appendix B: Rackmounting

If you'd like to mount any of your ServSwitch™ Brand CAT5 KVM Extender system's Local or Remote Units in a 19" rack, use a two-bracket Rackmount Kit like the one shown here (product code RMK19U).



To use a Kit to mount an Extender Unit, take these steps, referring to the illustration below:

1. Unscrew and keep the two screws on each side of the Unit's case.
2. Match up the two holes in the "Unit end" of each Kit bracket with the two now-vacant screwholes on each side of the Unit, then fasten the brackets to the Unit with the screws you removed in step 1.
3. Once you've attached both brackets, match the holes in the "rack end" of each bracket to an appropriate set of matching holes on your equipment rack. Screw the Unit assembly to the rack using your own screws, bolts, or cage nuts (not included).



Appendix C:

Keyboard-Command Summary

Here is a brief list of the keyboard commands you can use to control your ServSwitch™ Brand CAT5 KVM Extender. For detailed descriptions of the commands and the effects they have on the system (including their effects on the keyboard LEDs), refer to **Section 7.3**.

Single-Access Extender (ACU1001A)

| <i>Function:</i> | <i>Keyboard command/activity:</i> |
|--------------------------|--|
| Take control of CPU | Press any key on keyboard or move mouse |
| Reset keyboard and mouse | Press and release [Scroll Lock] once |
| Send null byte to mouse | Press and hold left and right mouse buttons, then press and release [Scroll Lock] once |

Dual-Access Extender (ACU1009A)

| <i>Function:</i> | <i>Keyboard command/activity:</i> |
|--------------------------|---|
| Take control of CPU | Press any key on keyboard or (if Extender is set for this—see Section 5.2.2) move mouse |
| Reset keyboard and mouse | Press and release [Scroll Lock] <i>once</i> at Remote Unit, <i>twice</i> at Local Unit |
| Send null byte to mouse | Press and hold left and right mouse buttons, then press and release [Scroll Lock] once |
| Enter Private Mode | <i>At Local Unit only:</i> Press and release [Scroll Lock] <i>once</i> |

Switching Extender (ACU1049A)

| <i>Function:</i> | <i>Keyboard command/activity:</i> |
|---------------------------|---|
| Take control of local CPU | Press any key on keyboard or move mouse |
| Reset keyboard and mouse | Press and release {hotkey*}, then press and release keypad's up-arrow (number [8]) key |
| Send null byte to mouse | Press and release {hotkey*}, then press and release keypad's left-arrow (number [4]) key |
| Enter Private Mode | Press and release {hotkey*}, then press and release [Scroll Lock] |
| Switch to other CPU | <i>At Remote Unit only:</i> Press and release {hotkey*}, then press and release keypad's plus ([+]) key |

*The default {hotkey} is right-[Ctrl], but you can set it to left-[Ctrl]; see **Section 5.2.3**.

DISCLAIMERS

While every precaution has been taken in the preparation of this manual, the manufacturer assumes no responsibility for errors or omissions. Neither does the manufacturer assume any liability for damages resulting from the use of the information contained herein. They reserve the right to change the specifications, functions, or circuitry of the product without notice.

The manufacturer cannot accept liability for damage due to misuse of the product or due to other circumstances outside the manufacturer's control. And the manufacturer will not be responsible for any loss, damage, or injury arising directly or indirectly from the use of this product.

NOTES

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Customer Support Information:

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