

# BLACK BOX<sup>®</sup> ServSwitch<sup>™</sup>

Wizard  
Extender



ACU5010A  
ACU5011A

## Welcome to the ServSwitch™ Family!

Thank you for purchasing a BLACK BOX® ServSwitch™ Brand KVM extender! We appreciate your business, and we think you'll appreciate the many ways that this product will save you money, time, and effort.

Our ServSwitch family is all about breaking away from the traditional, expensive model of computer management and display. You know, the one-size-fits-all-even-if-it-doesn't model that says, "One computer gets one dedicated monitor or 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 many monitors or user stations for the same computer? Why not access or display any of your computers, anywhere in the world, with any of your user stations or monitors?

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 mice, keyboards, and monitors on your desk? Or do you need to share many computers, including a mix of IBM® PC, RS/6000®, Apple® Macintosh®, Sun Microsystems®, and SGI™ types among multiple worldwide users with different access levels?
- Do you have to send video from one computer to two different local monitors? Or do you need to send video from multiple computers to dozens of remote monitors?
- 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, use convenient many-to-one cables, and have a rackmounted user station that folds and slides into 1U of space?

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 video and KVM switching and extension needs!

★

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

**ACU5010A ACU5011A**

This manual also includes information about the ServSwitch™ Wizard Extender Chassis, Extender Blank Chassis Panels, Extender Chassis Power Supply, and Skew Compensator, some of which have their own manuals or installation guides:

**ACU5000A ACU5003 ACU5004 PS5000 ACU5100A**

**FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA  
RADIO-FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.*

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.*

**EUROPEAN UNION DECLARATION OF CONFORMITY**

This equipment has been tested and found to comply with the limits for a class A computing device in accordance with the specifications in the European standard EN55022. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio-frequency energy, and if not installed and used in accordance with the instructions, might cause harmful interference to radio or television reception. However, there is no guarantee that harmful interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, you can correct the interference with one or more of the following measures:

- (a) Reorient or relocate the receiving antenna.
- (b) Increase the separation between the equipment and the receiver.
- (c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- (d) Consult the supplier or an experienced radio/TV technician for help.

Shielded cables must be used to connect other compliant devices to this equipment in order to maintain compliance with radio-frequency-energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.



**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. Specifications

- Cable Required** — Between transmitters and receivers: Four-pair (eight-wire) Category 5 or higher unshielded twisted-pair (UTP); shielded twisted-pair (STP) can also be used at shorter distances
- Compliance** — CE (EN55022 Class A); FCC Part 15 Subpart B Class A, IC Class/classe A
- Standards** — VGA, SVGA, XGA, or XGA-2 video
- Interfaces** — Video: VGA;  
Keyboard and mouse: IBM PS/2 compatible
- Resolution and Refresh Rate** —  
At distances to 65 m (210 ft.): Up to 1600 x 1280 noninterlaced at up to 85 Hz;  
At distances to 100 m (325 ft.): Up to 1600 x 1280 noninterlaced at up to 65 Hz;  
At distances to 200 m (655 ft.): Up to 1024 x 768 noninterlaced at up to 65 Hz
- Maximum Distance** —  
Between transmitters and receivers: Up to 200 m (655 ft.) of unshielded twisted-pair cable or 100 m (325 ft.) of shielded twisted-pair cable;  
From ACU5010A transmitter: 5 m (15 ft.) to any attached CPU;  
From ACU5010A receiver or ACU5011A: 10 m (30 ft.) to any attached keyboard, monitor, or mouse;
- User Controls** — Keyboard commands;  
ACU5010A transmitter, ACU5010A receiver, ACU5011A:  
(1) Rear-mounted 4-position DIP switch for various options and functions
- Indicators** — ACU5010A transmitter, ACU5010A receiver, ACU5011A:  
Right-side-mounted LED for power and data activity

<b>Connectors —</b>	<p>ACU5010A transmitter:</p> <ul style="list-style-type: none"> <li>(1) Left-side-mounted DB25 female for CPU connection;</li> <li>(1) Left-side mounted 8-pin mini-DIN female expansion port for future features;</li> <li>(1) Right-side-mounted RJ-45 for CAT5 link to transmitter;</li> </ul> <p>ACU5010A receiver, ACU5011A:</p> <ul style="list-style-type: none"> <li>(2) Left-side-mounted 6-pin mini-DIN female, (1) for keyboard and (1) for mouse;</li> <li>(1) Left-side-mounted HD15 female for monitor;</li> <li>(1) Right-side-mounted RJ-45 for CAT5 link to receiver;</li> <li>(1) Right-side-mounted 2.5-mm center-positive barrel jack for power input;</li> </ul>
<b>Maximum Altitude —</b>	10,000 ft. (3048 m)
<b>Temperature Tolerance —</b>	32 to 104°F (0 to 40°C)
<b>Humidity Tolerance —</b>	5 to 60% noncondensing
<b>Enclosure —</b>	Steel and stainless steel
<b>Power —</b>	<p>ACU5010A transmitter: 5 VDC at 500 mA (normally draws only 180 mA) from attached CPU's keyboard interface;</p> <p>ACU5010A receiver or ACU5011A using included external power adapter:</p> <p>Input: 100 to 240 VAC at 50 to 60 Hz from utility-power (mains) outlet, through detachable power cord and IEC 320 inlet, to external transformer;</p> <p>Output: 5 VDC at up to 2.5 A from transformer to receiver's 2.5-mm barrel jack (receiver normally draws less than its rated 500 mA);</p> <p>ACU5010A receiver or ACU5011A using PS5000: 5 VDC at 500 mA from PS5000 to receiver's 2.5-mm barrel jack;</p>

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- Power (cont'd)** — Consumption:  
ACU5010A transmitter: 0.9 watts typical, 2.5 watts maximum;  
ACU5010A receiver or ACU5011A: 2.5 watts maximum;
- Size** — ACU5010A transmitter, ACU5010A receiver, ACU5011A:  
1"H x 4.9"W x 3.1"D (2.5 x 12.5 x 7.9 cm); rear edge of endplate protrudes an additional 0.4" (1 cm); optional stick-on feet protrude an additional 0.1" (0.3 cm)
- Weight** — ACU5010A transmitter, ACU5010A receiver, ACU5011A:  
12.3 oz. (350 g)

## 2. Introduction

The ServSwitch™ Wizard Extender is designed to transfer keyboard, video, and mouse signals up to 200 meters (655 ft.) over Category 5 or higher twisted-pair cable. At its most basic, the Extender consists of a local transmitter and a remote receiver interconnected with a twisted-pair cable. The receiver connects to your keyboard, monitor, and mouse, and the transmitter connects to the computer CPU that is to be controlled.

There are a number of individual products in the Wizard Extender line. Two are covered by this manual:

- The ServSwitch Wizard Extender Kit (ACU5010A) includes both a transmitter and a receiver.
- The ServSwitch Wizard Extender Receiver (ACU5011A) is a single receiver that can be used with the ServSwitch™ Duo and ServSwitch™ Quadro (which contain built-in transmitters) as a smaller alternative to the ServSwitch™ Duo Extender.

Some of these accessories have their own manuals or installation guides:

- The ServSwitch Wizard Extender Chassis (product code ACU5000A) is a rackmount chassis that can hold a number of transmitters or receivers.
- If you won't be filling all of the slots in your Wizard Extender Chassis, you can install optional Single (ACU5003, one-slot) or Quad (ACU5004, four-slot) Blank Chassis Panels to cover the empty slots.
- To provide power to as many as four receivers with a single transformer, you can install an optional ServSwitch Wizard Extender Chassis Power Supply (PS5000).
- To correct for signal skew that can be introduced in long runs of CAT5 or higher cable, you can install an optional ServSwitch Wizard Skew Compensator (ACU5100A) between your transmitters and receivers.

### 2.1 Features and Benefits

Some useful features of the Extender:

- Enables a keyboard, monitor, and mouse to be located up to 200 meters (655 ft.) of UTP or 100 meters (330 ft.) of STP from a computer or KVM switch.
- Uses a single Category 5 (or better) twisted-pair cable to carry all the keyboard, video, and mouse signals.
- Compatible with ServSwitch Wizard, ServSwitch Duo, and ServSwitch Quadro KVM switches, so it can meet a wide range of KVM-switching and -extension requirements.
- Supports high-bandwidth monitors at resolutions up to 1600 x 1280.
- Includes CPU-connection cable for easy installation.
- Transmitters and receivers may be neatly rackmounted in a standard 19" equipment rack using the Extender Chassis. Other Extender-compatible products such as the Chassis Power Supply and Skew Compensator may also be mounted in this chassis. Each 2U-high chassis will house up to 16 local or remote modules.
- Supports Microsoft® IntelliMouse®, IntelliMouse Explorer, and other common wheel mice.
- Fine user-adjustable video compensation enables the video quality to be maximized for any given length of cable. Supports automatic and manual video compensation.
- In manual compensation mode, the video compensation only needs to be adjusted once during setup. The chosen compensation setting is retained in EEPROM memory even when the Extender is powered off.
- In automatic compensation mode, the video compensation will be automatically adjusted every time that the Extender is powered on or reset.
- Keyboard data is kept in its native format, which ensures that the additional keys on enhanced keyboards are supported.
- Password security prevents unauthorized use.
- Supports keyboard modes 1, 2, and 3 and "prompt" and "stream" mouse modes for maximum compatibility.

- Flash-upgradeable through its keyboard ports.
- Power/activity LED indicators confirm correct operation.
- Robust metal cases ensure good shielding and video quality.
- Supports IBM® PC compatibles, Compaq® Alpha®, SGI™, and RS/6000® computers.
- “Transparent” mode enables the Extender to be used to link together most cascaded KVM-switch systems.

Some useful features of the main accessories:

- The Wizard Extender Chassis makes it easy to mount Extender modules in 19" racks.
- The Wizard Extender Chassis Power Supply can power as many as four Extender receivers using a single AC power adapter.
- The Wizard Extender Skew Compensator can compensate for the color skew that is introduced by using longer lengths of certain types of Category 5e and 6 cable. (The Wizard Extender can report the cable skew present in your installation and the required skew-compensation settings.)

### 2.2 Complete Packages

The ServSwitch Wizard Extender Kit (ACU5010A) comes with:

- (1) Local transmitter module;
- (1) Remote receiver module;
- (1) Power adapter for the receiver, including a region-specific input cord;
- (1) 2-m (6.5-ft.) three-to-one cable to connect the transmitter to a computer or KVM switch;
- (2) Pan-head screws for attaching the modules to the Extender Chassis;
- (8) Adhesive rubber feet; and
- This manual.

The ServSwitch Wizard Extender Receiver (ACU5011A) comes with:

- (1) Remote receiver module;
- (1) Power adapter for the receiver, including a region-specific input cord;
- (1) Pan-head screw for attaching the module to the Extender Chassis;
- (4) Adhesive rubber feet; and
- This manual.

If you didn't receive everything, or if anything arrived damaged, contact Black Box right away.

2.3 The Extender Illustrated

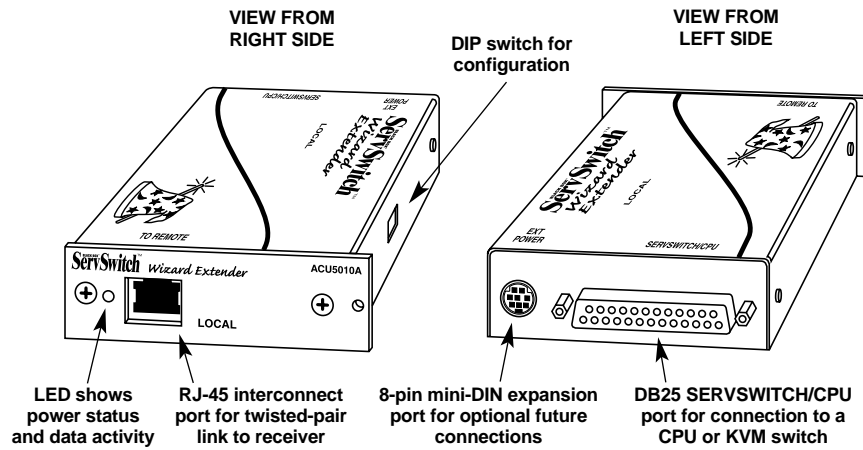


Figure 2-1. The Extender's transmitter (local part of ACU5010A).

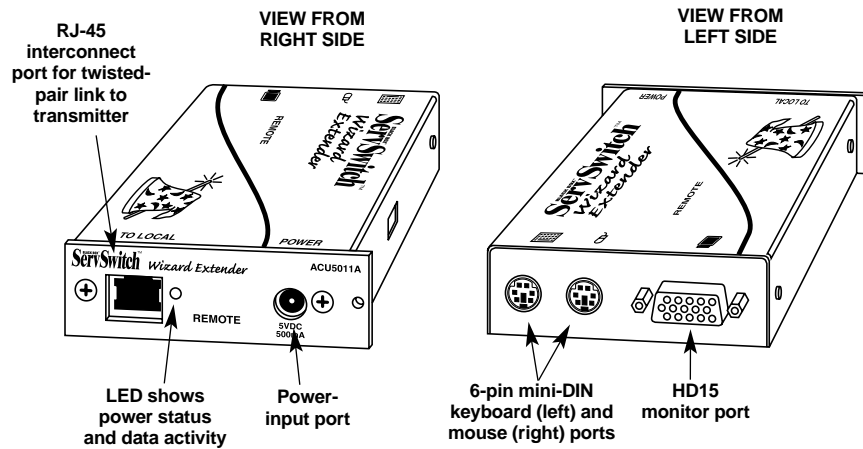
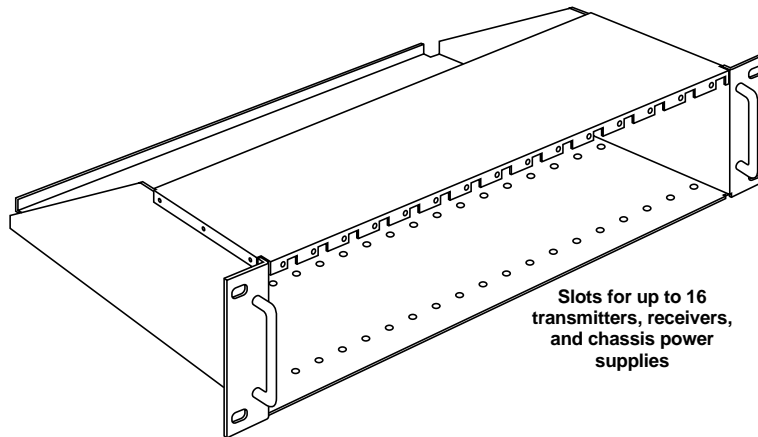


Figure 2-2. The Extender's receiver (ACU5011A or remote part of ACU5010A).



## SERVSITCH™ WIZARD EXTENDER



**Figure 2-3. The ServSwitch Wizard Extender Chassis (ACU5000A).**

## 2.4 Safety Concerns

As you prepare to install the ServSwitch Wizard Extender, please keep these things in mind:

- The Extender is for use in dry, oil-free indoor environments only.
- Make sure that the rated current draw in amperes of all of the devices plugged into the same extension cord, outlet, or circuit as your Extender equipment does not exceed the rated current in amperes of the cord, outlet, or circuit.
- Do not attempt to service the Extender yourself. Instead, call Black Box Technical Support as described in **Section 7.6**.

These issues involve the power adapter included with the Extender receiver or Extender Chassis Power Supply:

- **Warning:** The power adapter contains no user-serviceable parts, but it does contain parts capable of delivering hazardous electric shocks. Do not attempt to dismantle it!
- Plug the power adapter into a socket outlet close to the module it is powering.
- Do not use the power adapter if its case becomes damaged, cracked, or broken, or if you suspect that it is not operating properly.
- If the power adapter stops working, replace it with a manufacturer-approved adapter of the same type only.

## 3. Installation

### 3.1 What You Will Need

These things must be in place before you can install your ServSwitch™ Wizard Extender:

- Four-pair (eight-wire) twisted-pair cabling rated to at least Category 5. This should be long enough to reach from your Extender transmitter to the receiver, up to a maximum of 200 meters (655 feet). Other specifications for this cabling are given in the **Appendix**.  
You can make use of any Category 5 structured-cabling systems that might already be in place at your sites, but you should keep the number of cables and connectors involved to a minimum in order to maximize signal quality.
- A monitor with a standard VGA/SVGA (HD15) connector that will work when connected directly to each of your PCs. The Extender supports low- and high-resolution monitors.
- A standard PC/AT® or PS/2 style keyboard. If you are using a PC/AT keyboard with a 5-pin DIN connector, you can connect it to the Extender using a standard PC/AT to PS/2 keyboard adapter such as product code FA211.
- A PS/2 style two- or three-button Microsoft or Logitech® compatible mouse or a Microsoft IntelliMouse compatible mouse. (The Extender supports other “Internet mice” compatible with the IntelliMouse—fitted with a wheel or other scrolling control, and sometimes additional buttons—which are available from several manufacturers.)  
Keep in mind that the Extender will operate without a mouse connected if you don’t want to use one.
- A suitable mouse driver for your PCs. Supported types are:
  - PS/2 or RS-232 two-button mouse driver by any manufacturer.
  - Microsoft mouse drivers, including those for the IntelliMouse. (You might be able to use other mouse drivers with IntelliMouse compatible data formats, but these might or might not work—trial-and-error testing might be necessary.)
  - Logitech mouse drivers, including those for two-button, three-button, and wheel mice.The Extender will automatically configure its mouse output to match the type requested by any supported driver.

- *If your computer CPU is farther than 2 m (6.5 ft.) from your Extender transmitter:*  
One or more cables to replace or extend the included cable for connecting the CPU to the transmitter, up to a maximum distance of 5 m (15 ft.). You can use VGA and PS/2 extension cables such as EVNPS05 and EVNPS03.  
*To attach a CPU with a PC/AT keyboard port,* you'll need a PS/2 to PC/AT keyboard-port adapter such as product code FA212.  
*To attach a CPU with a serial mouse port,* you'll need a PS/2 to serial mouse-port adapter such as product code FA314. (The Extender automatically converts commands and data from the mouse's PS/2 format to the CPU's RS-232 format and vice versa; the adapter just changes the connector and pinning.)  
For more information about cabling, see the **Appendix**. For assistance figuring out which cables and adapters you'll need, call Black Box Technical Support.
- If you'll be mounting an Extender transmitter or receiver on a wall or some other non-horizontal flat surface, you'll need adhesive mounting strips—preferably the two-part type made with VELCRO® or other hook-and-loop fasteners, so that after it's mounted you can detach and reattach the Extender as necessary.

### 3.2 Placement

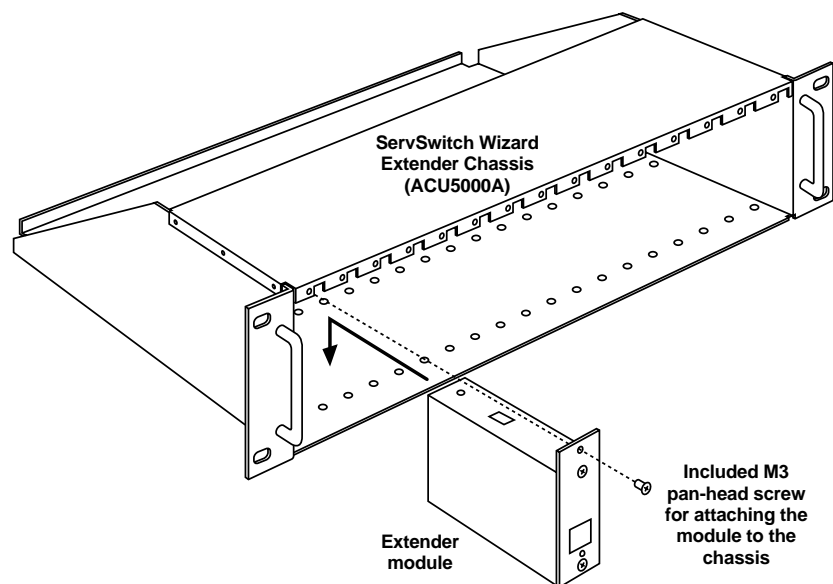
#### NOTE

If you'd like to put an Extender module in a space in which its rackmount-enabling endplate doesn't fit well, or if you need to remove its endplate for whatever other reason, you can do so by unscrewing the two end-mounted screws that hold it on.

The ServSwitch Wizard Extender's transmitter and receiver modules are designed to be mounted in a ServSwitch Wizard Extender Chassis (ACU5000A), which in turn is designed to be mounted in a standard 19" equipment rack. To mount a module in an Extender Chassis, take these steps, referring to Figure 3-1:

1. Slide the module into the chassis with the protruding tip of its endplate pointing upwards.
2. Screw the included pan-head screw through the hole at the top of the module's endplate and the matching hole in the front flange of the chassis in order to secure the module to the chassis.

To mount the chassis itself, hold its side flanges against the vertical rails of your rack, then use four of your own screws, bolts, cage nuts, etc., to secure the flanges to the rails.



**Figure 3-1. Mounting a module in an Extender Chassis.**

You can cover one (ACU5003) or four (ACU5004) empty slots in the chassis using our Blank Chassis Panels. The ACU5003 Single Blank Panel comes with one (ACU5003) or two screws that you'll use to secure it to the chassis in the same way you'd secure a module. The ACU5004 Quad Blank Panel should be secured with one screw in the upper left corner and one screw in the upper right corner.

If you would rather set an Extender module on a desktop or some other flat horizontal surface, you'll need to stick the included adhesive rubber feet to the bottom of the module (the wide flat area where there are no connectors, no DIP switches, and no LEDs). Four feet are included for each module—attach one in each corner of the bottom of the module.

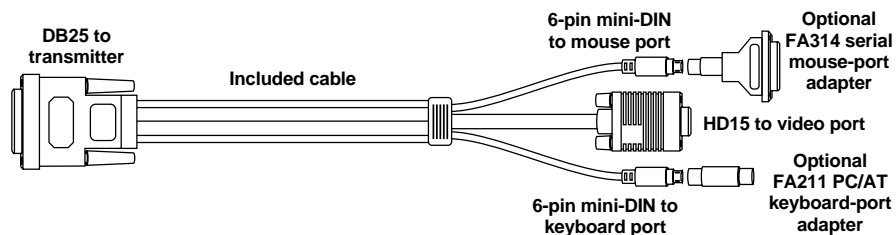
To mount an Extender module on a non-horizontal surface such as a wall or the side of a desk, use a pair of double-sided adhesive strips (not included), preferably the kind that have VELCRO or some other hook-and-loop fastener between the adhesive sides. Peel the backing away from one side of each of the two strips and press the strips firmly onto the bottom of the module. Then peel the backing away from the other side of the strips and press the bottom of the module firmly against the surface you want to mount the module on.

### 3.3 The Installation Procedure

First make sure the power adapter is unplugged and disconnected from the ServSwitch Wizard Extender's receiver. Also make sure that (if possible) all of the devices you want to attach to your Extender system are turned off and unplugged. (If you have to "hot-plug" a powered computer into the Extender, see **Section 5.6**.) You don't have to connect anything to ports on the Extender that you're not using.

Connect your devices to the Extender's transmitter and receiver as described in the following procedure and shown in Figures 3-3 and 3-4 at the end of this section, making sure that the cables are not longer than the maximum lengths specified in the **Appendix**. (If you are installing only an ACU5011A receiver—the transmitter is embedded in a ServSwitch Duo, Quadro, etc.—skip steps 2 and 3.)

1. Run CAT5 or higher twisted-pair cable (not included) between your transmitter and receiver, not farther than 200 m (655 ft.). If necessary, install a ServSwitch Wizard Skew Compensator between these modules (see **Section 7.2**).
2. Plug the composite end of the included three-to-one cable, shown in Figure 3-2, to the transmitter's DB25 connector.
3. Attach the triple end of the included three-to-one cable to the computer CPU or KVM switch you want to control:
  - *If it's a CPU or a switch with separate keyboard, mouse, and monitor user-port connectors, plug the cable's keyboard, mouse, and monitor strands into the corresponding connectors on the CPU or switch. If the CPU or switch has serial mouse connectors or PC/AT style keyboard connectors, you'll need adapters (see the **Appendix**).*
  - *If it's a switch with single user-port connectors, plug a user cable designed for that switch into one of its user ports. Then mate the matching ends of this user cable and the Extender's three-to-one cable.*



**Figure 3-2. The Extender's included three-to-one cable and optional adapters you can use with it.**

4. Plug your monitor, keyboard, and mouse directly into the appropriately labeled connectors on the Extender receiver. Or, if you need to place them too far away to plug in directly, plug them into extension cables (see the **Appendix**) and run the extension cables to the connectors on the receiver.
5. Plug the output cord of the receiver's power adapter—or a power cord from one of the output jacks of an optional Extender chassis power supply—into the receiver's power jack.
6. *If you're using an optional Extender chassis power supply (PS5000)*, run its other power cords to any other receivers you've otherwise finished installing. Plug the output cord of the power supply's power adapter into the power supply's input jack.
7. Plug the input cord of the receiver's or power supply's power adapter into a working AC-power outlet. The receiver (and the chassis power supply if you're using one) should begin operating immediately; they have no on/off switch.
- 8A. *If you're using the full Extender kit (ACU5010A)*, plug in and power up the CPU or KVM switch attached to the transmitter. The transmitter should begin operating immediately; it has no on/off switch.

### NOTE

The Extender's standalone transmitter normally draws its power from the keyboard leads of the connected computer or KVM switch. However, if you need to use cabling (included cable + extension cable) whose total length is greater than 5 meters (16.5 ft.) to connect the transmitter to the CPU or switch, the CPU or switch might not be able to provide enough power to operate the transmitter. Call Black Box Technical Support if this turns out to be the case.

- 8B. *If you've attached a standalone receiver (ACU5011A) to a ServSwitch model with an embedded transmitter*, plug in and power up the switch, then plug in and power up the attached CPUs.

The Extender is now ready for use and its local-to-remote link should begin functioning as soon as the transmitter and receiver are both operational.

### CAUTION!

Even though the cabling and connectors might be the same, do *not* connect an Extender to your LAN. Doing so will damage the Extender and might damage the network as well.



## SERVSWITCH™ WIZARD EXTENDER

Keyboard, mouse, and monitor  
plug in directly or with extension  
cables (see the Appendix)

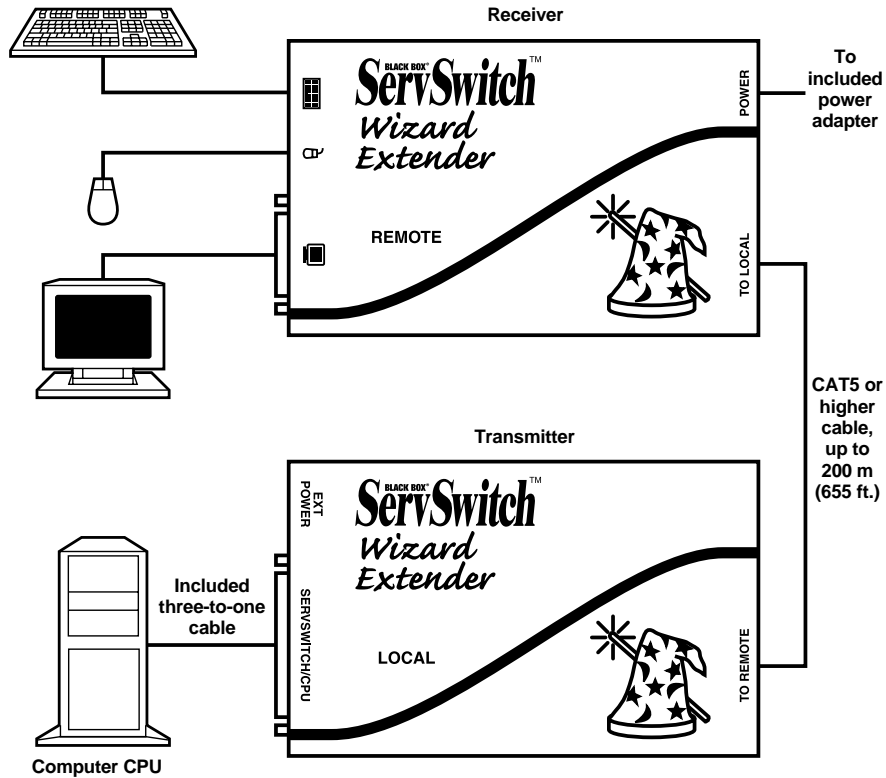


Figure 3-3. A simplified ACU5010A Wizard Extender installation.

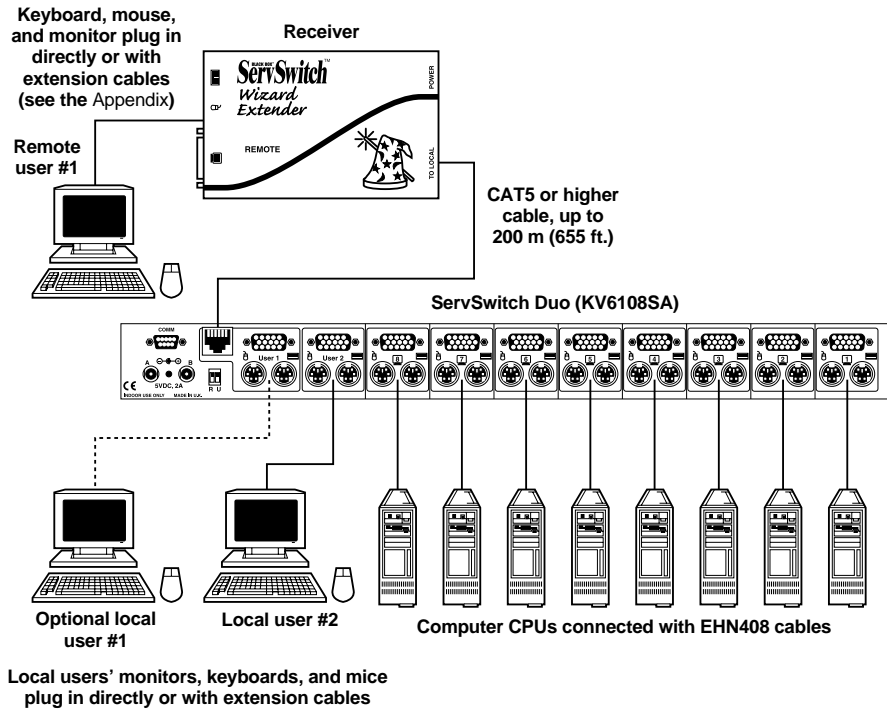


Figure 3-4. A simplified ACU5011A Wizard Extender receiver installation.

## 4. Configuration

To configure your ServSwitch™ Wizard Extender system, first you'll need to configure any directly attached PC, as directed in **Section 4.1**. Then you'll need to configure the Extender itself, as directed in the rest of this chapter.

### IMPORTANT NOTE

Throughout the rest of this manual, the [Enter] designation refers to the main “enter” or “carriage-return” key (often labeled “↵”) on the main section of the keyboard. Do not use the “Enter” key on the numeric keypad or the extra “Enter” key found on the main section of some specialized keyboards.

#### 4.1 Configuring an Attached PC (ACU5010A Only)

If you've directly attached a PC to the standalone transmitter of a full ACU5010A Extender kit, configure it in the same way that you would if your keyboard, mouse, and monitor were all connected directly to it, but keep these things in mind:

- The Extender emulates Microsoft compatible serial, IntelliMouse, and PS/2 mice, so make sure that your PC software is configured for a Microsoft mouse of the correct type. Refer to the list of supported drivers in **Section 3.1**.
- The Extender supports VGA, SVGA, XGA, and XGA-2 type monitors, but does not support the automatic detection features available with some Plug-and-Play monitors and video cards. If you have this type of video card or monitor, you should select the video mode manually instead of relying on the automatic detection feature.

## 4.2 Configuring the Extender

The ServSwitch Wizard Extender ships from the factory in a default state that's suitable for most applications, but it has a large number of configuration options. You'll set different options using one of two different methods:

- Set the 8-position DIP switches on the Extender's receiver and transmitter (see **Section 4.2.1**) to select automatic or manual video compensation, the keyboard hotkey combination, and other hardware-related functions.
- Manual video compensation and other advanced options are controlled with keyboard commands after the Extender is placed in "configuration mode" (see **Section 4.2.2**). When you exit configuration mode, any new settings are saved in the receiver's nonvolatile memory.

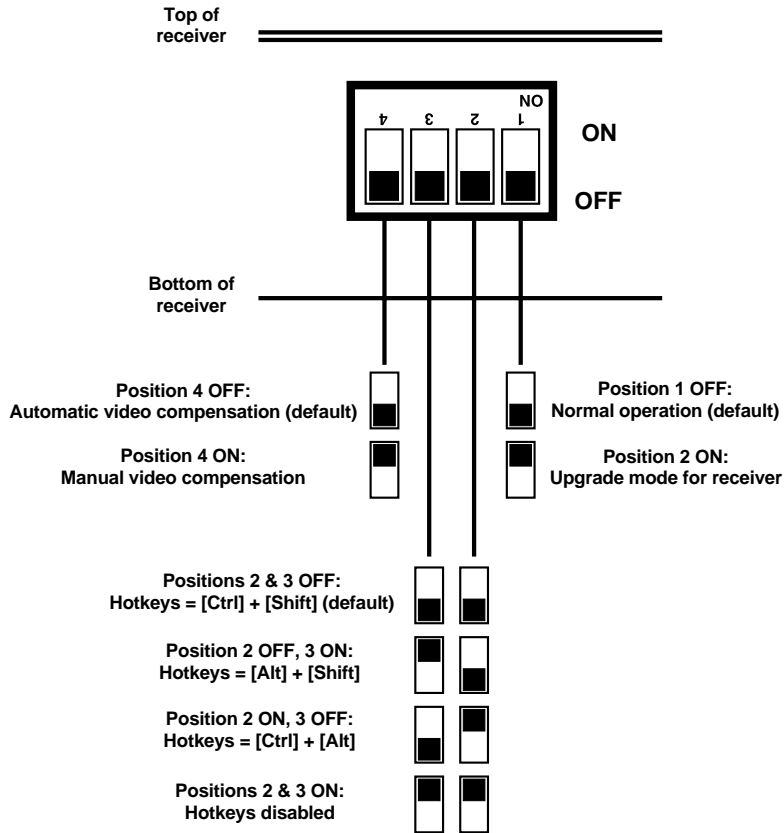
### 4.2.1 SETTING THE DIP SWITCHES

You can use the DIP switches on the sides of the Extender receiver and transmitter to set several configuration options. The switches are continuously read by the Extender and may be changed while it's powered on. The default settings (all switches OFF) are suitable for most installations. The DIP switches are shown in Figures 4-1 and 4-2 on the following pages. They have these functions:

#### Receiver's DIP switch:

- *Position 1:* Leave this position OFF for normal operation (the default setting). Move it to ON to put the receiver in upgrade mode (see **Chapter 6**) so that new firmware can be downloaded into its flash memory.
- *Positions 2 and 3:* Use these positions to select which keystroke combination the Extender will recognize as its hotkey (see **Section 5.5**): Both OFF = [Ctrl] + [Shift] (the default setting); 2 OFF and 3 ON = [Alt] + [Shift]; 2 ON and 3 OFF = [Ctrl] + [Alt]; both ON = no hotkey (hotkey functions disabled).
- *Position 4:* Leave this position OFF for automatic video compensation (the default setting). In this mode, the Extender will check the length of the twisted-pair cable linking the transmitter and receiver when they are powered on, then adjust its video-compensation amplifiers.  
Move this switch position to ON for manual compensation. In this mode, the video-compensation setting may be adjusted by the user as described in **Section 4.2.2.A**.

## SERVSWITCH™ WIZARD EXTENDER

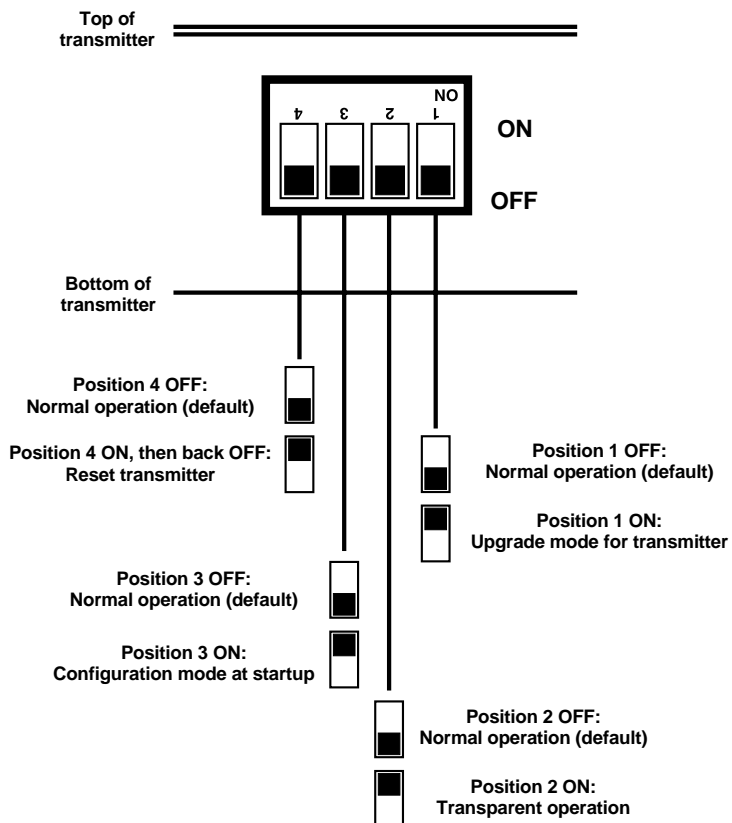


**Figure 4-1. The receiver's DIP-switch settings.**

**Transmitter's DIP switch (leave all positions OFF—the default settings—for normal operation):**

- *Position 1:* Move this position to ON to put the transmitter in upgrade mode (see **Chapter 6**) so that new firmware can be downloaded into its flash memory.
- *Position 2:* If you want to use the Extender between two cascaded KVM switches that aren't circuit-compatible with it (as are ServSwitch Wizards, Duos, or Quadros), move this switch position to ON for "transparent" operation, so that the Extender can pass through types of cascade signaling that it isn't designed for.

- *Position 3:* If you've password-protected the Extender's receiver and lost the password, move this switch position to ON to put the Extender in configuration mode when it powers up. This will allow you to reset the password, as described in **Section 4.4**.
- *Position 4:* To reset the Extender without removing power from the receiver or transmitter or disconnecting any of the attached devices, move this switch position to ON, then back to OFF.

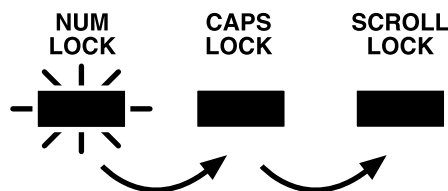


**Figure 4-2. The transmitter's DIP-switch settings.**

## SERVSWITCH™ WIZARD EXTENDER

### 4.2.2 USING CONFIGURATION MODE

If hotkeys are currently enabled (see **Section 4.2.1**), you can put the Extender in configuration mode by pressing the currently selected hotkeys along with the [Enter] key. For example, if the currently selected hotkey combination is the default pairing of [Ctrl] and [Shift], press [Ctrl] + [Shift] + [Enter] to activate configuration mode. Once you do this, you will see the Num Lock, Caps Lock, and Scroll Lock LEDs on your keyboard begin to flash one after another in a cycling pattern, like this:



**Figure 4-3. The configuration-mode LED pattern.**

Once the Extender is in configuration mode, you can change its video compensation (see **Section 4.2.2.A**) or set various other options (see **Section 4.2.2.B**).

#### 4.2.2.A Setting the Video Compensation

The Extender contains video-compensation equalizers that maximize the picture quality for your system even though the video signal is being sent across twisted-pair cable. By default, the Extender performs automatic compensation. In this mode, the Extender automatically adjusts its video-compensation amplifiers to suit the twisted-pair cable whenever the Extender is powered on. But you might want to manually fine-tune the video compensation, because the perfect adjustment for any given length of cable is subjective and depends on personal preference. If you move position 4 of the receiver's DIP switch to ON to select manual compensation (see **Section 4.2.1**), you can then set the compensation in configuration mode. This only needs to be done once; the compensation value is stored by the Extender and is retained even when the Extender is powered off.

### NOTE

**If your picture is suffering from skew—the colors are separated—you might need to install a ServSwitch Wizard Skew Compensator between the transmitter and receiver and set skew compensation as well. See Section 7.2.**

To manually set the Extender's video compensation, take these steps:

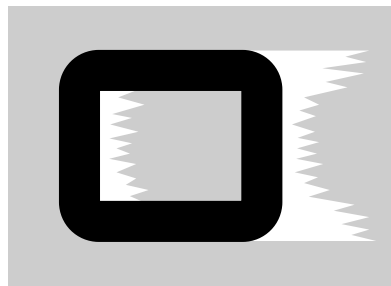
1. Go into configuration mode as described at the top of this page. Observe *how fast* the Num Lock, Caps Lock, and Scroll Lock LEDs on your keyboard are flashing; this indicates the level of compensation currently being applied. If

they're flashing slowly (to a minimum of one cycle per second for zero distance), the Extender is compensating at a low level suitable for shorter runs of twisted-pair cable. If they're flashing quickly (to a maximum at which the cycling can no longer be distinguished and it looks like all the LEDs are "half on" for 200 m [655 ft.]), the Extender is compensating at a high level suitable for longer runs of twisted-pair cable.

2. Press the keyboard's [Home] key to set video compensation to "none." The picture on the monitor will probably become fuzzy.
3. Use any of these keys to "tune" the Extender's video compensation:
  - [Home] sets video compensation to zero.
  - [Pg Up] increases the video compensation coarsely (in large increments).
  - [↑] (up-arrow) increases the video compensation finely (in small increments).
  - [Pg Dn] decreases the video compensation coarsely (in large increments).
  - [↓] (down-arrow) decreases the video compensation finely (in small increments).

As you change the video-compensation setting, you'll see the sharpness of the picture change (the Extender automatically recalculates the required matching brightness). Adjust the video compensation until you get the best picture. The longer your twisted-pair cable, the more compensation you'll need, but if you add too much compensation you might wash out the picture altogether. (If this happens, just reduce your compensation, and the picture will reappear.)

This might be the best technique for quickly finding the best compensation setting: First, press [Pg Up] until you see white trailing edges on the right-hand side of black text or graphics, as shown in Figure 4-4. Then press and release [↓] until the trailing edges disappear. At that point, compensation should be about as close to ideal as you can make it.



**Figure 4-4. "Bleed" due to overcompensation.**



4. When you find the best possible picture—and finish entering any other configuration commands (see **Section 4.2.2.B**)—press [Enter] to save the configuration setting and exit configuration mode. The compensation setting is saved in EEPROM, so it will persist even if the Extender is powered off. For this reason, unless you change your twisted-pair cabling, you shouldn't need to adjust this setting again.

### *4.2.2.B Issuing Other Configuration-Mode Keyboard Commands*

While the Extender is in configuration mode, it is also possible to enter a number of other keyboard commands that you can use to configure advanced options on the Extender. (There are also commands for such functions as displaying the Extender's firmware revision, restoring a disconnected mouse port, and resetting all of the keyboard-controlled configuration options to their factory-default states.)

Most of these commands consist of pressing a letter key followed by a number key followed by [Enter]. For example, to restore the Extender's keyboard-controlled settings to their factory-default states, type in [F], then [8], then [Enter]. When you do this, the flashing Num Lock, Caps Lock, and Scroll Lock LEDs on your primary keyboard—which normally flash in sequence during configuration mode—will be affected this way:

1. After you press the first key of a command sequence, the Num Lock, Caps Lock, and Scroll Lock LEDs will all be steadily lit. Any invalid character will be ignored.
2. After you press the second key of the sequence, the Num Lock and Caps Lock LEDs will remain lit and the Scroll Lock LED will go dark. Any invalid character will be ignored.
3. After you press [Enter] to end the sequence, the command will be executed (or rejected as incomplete if the second character was never entered) and the LEDs will go back to flashing in sequence.

Here are the keyboard commands you can give the Extender in configuration mode. (Letter keys are shown in uppercase, but the commands are not case-sensitive.) The settings are explained in greater detail in the indicated sections of this manual.

- **Set mouse protocol** (see **Section 4.3**):  
[M] [3] [Enter] = Select Microsoft protocol  
[M] [4] [Enter] = Select Logitech protocol
- **Restore mouse** (see **Section 5.6**):

[M] [6] [Enter] = Restore regular mouse

[M] [7] [Enter] = Restore IntelliMouse

- **Set/clear password** (see **Section 4.4**):
  - [P] [Enter] (password) [Enter] = Sets the Extender's password
  - [P] [Enter] [Enter] = Clears the Extender's password
- [F] [1] [Enter] = **Display firmware version** (see **Section 7.5**)
- [F] [2] [Enter] = **Apply automatic compensation** (see **Section 7.1**)
- **Report skew** (see **Section 7.2**):
  - [F] [3] = Reports for users with QWERTY keyboards
  - [F] [4] = Reports for users with French AZERTY keyboards
- [F] [8] [Enter] = **Reset to factory defaults** (see **Section 4.5**)

When you finish entering configuration commands and/or adjusting the Extender's video compensation (see **Section 4.2.2.A**), press [Enter] to quit configuration mode and return to normal operation. The Num Lock, Caps Lock, and Scroll Lock LEDs on your keyboard will stop flashing and will return to the states they were in before.

### 4.3 Selecting the Mouse Protocol

Most mouse drivers are compatible with Microsoft mice, so the Extender uses a "Microsoft compatible" mouse-signaling protocol by default. However, in some cases, Logitech mouse drivers running on attached computers can erroneously disable the mouse buttons in response to this Microsoft protocol. To prevent this, you might want to have the Extender use a "Logitech compatible" protocol instead. To select the Microsoft compatible mouse protocol, type [M], then [3], then [Enter]. To select the Logitech compatible mouse protocol, type [M], then [4], then [Enter].

#### 4.4 Setting a Password for the Extender

There are many situations where access to corporate file servers or sensitive information needs to be controlled. In such circumstances, the ServSwitch Wizard Extender's transmitter and the attached CPU can be locked away in a secure room or cabinet and controlled from the primary control station attached to the receiver.

The Extender also has a password that you can set to prevent unauthorized use. After setting a password, you can "lock" (disable) the receiver at any time by typing the hotkey sequence together with the letter "L" at the primary keyboard: [Ctrl] + [Shift] + [L] if the hotkey sequence is set to its default value, for example. While the receiver is locked, it doesn't output video to the monitor or accept input from the keyboard or mouse. The receiver indicates that it's locked by alternately flashing the Num Lock/Scroll Lock LED pair and the Caps Lock LED on the attached primary keyboard. The receiver can only be unlocked if a user types in the password followed by [Enter] at the primary keyboard. Locking the receiver has no effect on the operation of the transmitter.

The password is not case-sensitive and can be any combination of keystrokes, including function keys but excluding [Ctrl], [Alt], [Shift], and [Enter]. (For example, the password [F4] [F] [R] [E] [D] [Home] would be valid.) The length of the password can be from 1 to 40 characters, although for better security we recommend that the password be at least four characters long.

To set the password, first get into configuration mode by typing in the current hotkey sequence followed by [Enter] at the receiver's keyboard: [Ctrl] + [Shift] + [Enter] if the hotkey sequence is set to its default value, for example. Then type [P], followed by [Enter], followed by the password characters, followed by another [Enter] to save the password to nonvolatile memory. (This type of memory does not depend on active power or even a battery backup, so it can persist indefinitely.) For instance, to set the password to "open sesame", you would type in [P] [Enter] [O] [P] [E] [N] [Space] [S] [E] [S] [A] [M] [E] [Enter].

Don't worry if you type the password incorrectly; you can always re-enter it, even if you've exited and re-entered configuration mode. (Of course, if you discover that you messed up entering the password or can't remember what the password is only after someone locks the receiver, you will have to take these steps to recover: First power down the receiver, then move position 3 on the transmitter's DIP switch to ON, then power the receiver back on. This will cause the receiver to power up directly into configuration mode, and you can then change or clear the password. When you've finished doing this, move position 3 of the transmitter's DIP switch back to its default OFF setting so that the receiver will go back to powering up normally.

If you want to remove the password after setting one, get into configuration mode, type the letter “P”, and press the [Enter] key as before, but then press [Enter] again without typing in any other characters. (If you try to lock the Extender before you’ve set a password, or after you’ve removed the password, the Extender will still blank the video, but it won’t prevent anyone from accessing the CPU.)

### 4.5 Resetting the Extender to Its Factory-Default Configuration

If you want to set all of the ServSwitch Wizard Extender’s keyboard-controlled configuration options back to their factory defaults, first go into configuration mode, then issue the [F] [8] [Enter] command. (“[F] [8]” is the letter “F” followed by the number “8”, not the [F8] function key.) This will also clear any password you’ve set, but it will have no effect on the Extender’s video compensation, nor will it change any settings controlled with the Extender’s DIP switches.

## 5. Operation

This chapter explains the general operation of the ServSwitch™ Wizard Extender. We recommend that you read this chapter carefully before starting to use the Extender; also make very sure you have read the important note at the start of **Chapter 4!**

### 5.1 Power-Up Status

Under normal circumstances, the ServSwitch Wizard Extender is ready for use as soon as the transmitter and receiver power up. The receiver will draw power from its power adapter or from the optional power supply; the transmitter will draw power from the attached CPU's keyboard port. If either module's LED remains dark when the module should be operating, the module isn't receiving enough power to do so.

How the receiver behaves at bootup when both modules are properly powered will depend on how position 3 of the transmitter's DIP switch is set (see **Section 4.2.1**) and on whether you've set a password for the Extender or not (see **Section 4.4**):

- If position 3 is set to ON, the Extender will go directly into configuration mode (see **Section 4.2.2**), so that you can reconfigure it as necessary before pressing [Enter] to resume normal operation. (This is most commonly done to clear an incorrectly entered or forgotten password—see **Section 4.4**.)
- If position 3 is set to OFF but you haven't set a password, the receiver will establish a connection to the transmitter and will light its LED.
- If position 3 is set to OFF and you *have* set a password, the receiver will light its LED but will not display any video. It will show that it's expecting you to enter the password by alternately flashing the Num Lock/Scroll Lock LED pair and the Caps Lock LED on the attached keyboard. When you type in the password at the keyboard and press [Enter], the receiver will “unlock,” stop flashing the keyboard LEDs, and then establish a connection to the transmitter.

## 5.2 The Extender's LEDs

The ServSwitch Wizard Extender's transmitter and receiver modules each have one LED mounted on their right sides next to their RJ-45 interconnect ports. There is a similar LED on the right side of the power-supply module. If you have the modules mounted in the Extender Chassis, this LED can be read from the front of the chassis. On all of the modules, the LED has these two states and meanings:

- STEADILY LIT = The module is receiving enough power to operate.
- DARK = The module is *not* receiving enough power to operate.

On the transmitter and receiver, this LED can also have these two states and meanings:

- FLASHING QUICKLY (approximately five times per second) = The module is sending or receiving keyboard or mouse data.
- FLASHING SLOWLY (once per second) = The module is being upgraded.

Several things can cause the Extender's LEDs to be dark. On the transmitter, this can be caused by (in decreasing order of likelihood) loose/undone cable connections, CPU cables being run farther than 5 m (16.5 ft.), low power on the CPU's keyboard port, the CPU being powered OFF, cables being broken, the transmitter's LED being defective, or the transmitter's main board being defective.

On the receiver, this can be caused by (in decreasing order of likelihood) loose/undone power-supply connections, AC outlet being turned OFF/not working, power supply being broken, the module's LED being defective, or the module's main board being defective. If you can't determine the cause of this problem, call Black Box for technical support.

### 5.3 How the Extender Uses the Keyboard LEDs

The ServSwitch Wizard Extender also uses the LEDs on the attached keyboards to indicate various conditions. It will light the Num Lock, Caps Lock, and Scroll Lock LEDs in several different ways:

- **Configuration-mode indication—rolling sequence.** As shown in Figure 5-1, the receiver flashes the Num Lock, Caps Lock, and Scroll Lock LEDs on the attached keyboard in sequence to show that it's in configuration mode (see **Section 4.2.2**). Num Lock will light first while Caps Lock and Scroll Lock are dark. Then Caps Lock only will be lit, then Scroll Lock only, and then Num Lock again. The cycle repeats itself continuously until you exit configuration mode, after which the LEDs will be placed back in the states they were in before you went into configuration mode.

The speed of the cycle indicates how much video compensation the Extender is applying (which is one of the things you can set in configuration mode, if you choose to do so): A slow flash rate indicates low compensation suitable for shorter cable distances, while a fast flash rate indicates high compensation suitable for longer distances. For examples of actual rates and distances, see step 1 in **Section 4.2.2.A**.

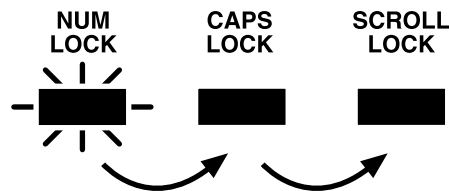


Figure 5-1. The configuration-mode LED pattern.

- **Password-lockout indication—lightbar flashing.** As shown in Figure 5-2, while the Extender is locked and waiting for the user to enter a password (see **Sections 4.4** and **5.1**), it alternately lights the Num Lock/Scroll Lock LED pair and the Caps Lock LED on the primary keyboard. This pattern of flashing alternate LEDs is similar to that of the lights in the lightbar of a police car. Once you type in the correct password and press [Enter], these LEDs will stop flashing and return to their previous states.

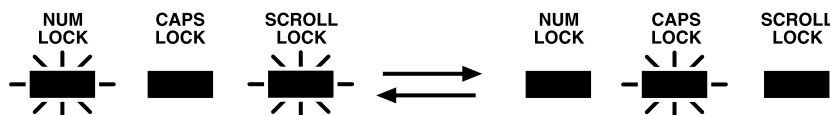


Figure 5-2. The password-lockout LED pattern.

## 5.4 Things to Keep in Mind About the Keyboards and Mice

**PC bootup sequence:** When your PC CPUs are powered on, they communicate with any attached keyboards and mice and load the setup parameters required by their particular operating systems. It is necessary for the Extender to be attached and powered on during this sequence so that it can give the CPUs the required responses and keep track of all the modes and settings requested by each of the connected CPUs.

**Mouse characteristics:** Do not unplug a PS/2 mouse connection from a CPU while the CPU is on. Because of the way PS/2 mice communicate, the CPU will lose mouse function and you will have to reboot the CPU to regain normal operation. Unplugging a shared PS/2 mouse from the Extender will have no immediate effect, but the PC will lose mouse function as soon as you plug the mouse back in. (RS-232 mice can usually be freely unplugged and replugged, provided that an RS-232 mouse was connected when the operating system initially booted.) The Extender has a PS/2 mouse-recovery system which allows you to disconnect and reconnect the mouse without powering down the system, but we recommend using this only when absolutely necessary. See **Section 5.6** for details.

**Keyboard- and mouse-mode handling during CPU switching:** The Extender keeps a log of the keyboard and mouse modes and resolution settings requested by each of the connected CPUs, including the keyboard Num Lock, Caps Lock, and Scroll Lock states. These settings are automatically restored to the primary keyboard and mouse when you switch to the other CPU, as well as when the Extender is returned from configuration, password-lockout, or control-lockout mode to normal operation, ensuring maximum software compatibility.



## 5.5 Keyboard Control: Hotkey Commands

You can control several functions on the ServSwitch Wizard Extender—including CPU connection/disconnection, screen blanking, locking, and entering configuration mode—from the keyboard, using commands triggered with the Extender's currently selected hotkey combination. All of the hotkey-control commands are invoked by holding down the two hotkeys and then pressing a command key. By default, the two hotkeys are [Ctrl] and [Shift], but you can change them to [Alt] and [Shift] or [Ctrl] and [Alt] by setting positions 2 and 3 of the DIP switch on the Extender's receiver (see **Section 4.2.1**).

Normally, when you send a hotkey command, you have to release the hotkeys and the command key before you can send another one. The one exception to this rule is {Hotkeys} + [Tab], one of the “connect to the CPU” commands; for as long as you hold down the hotkeys, the Extender will execute the connect command each time you press [Tab]. (Originally, this command was designed to “tab through” the CPU ports on compatible switches such as the ServSwitch Duo and Quadro; repeating it doesn't do anything useful on the Extender, but you should keep in mind that the Extender will keep absorbing the [Tab] keystroke until you release the hotkeys.)

The hotkey commands are summarized below. Note that to generate the numeric digits in the commands that contain them, you need to press the number keys on the top row of the main section of the keyboard, *not* the number keys on the keypad; the Extender will not recognize keypad numbers.

- Use {Hotkeys} + [1] or {Hotkeys} + [Tab] to select the attached CPU or KVM switch if it's been deselected.
- Use {Hotkeys} + [0] to deselect the attached CPU or KVM switch and select nonexistent “CPU zero.” This causes the Extender to disable keyboard and mouse input to the attached CPU or switch (although Extender commands will still work) and shut off the video output to the attached monitor. (Be aware that this will cause some monitors to go into standby mode or shut themselves off.) You can re-enable video by reselecting the “real” CPU or switch.
- Use {Hotkeys} + [L] to lock the receiver. If no password has been set for the Extender (see **Section 4.4**), this command is equivalent to the {Hotkeys} + [0] command. If a password has been set, this command also causes the receiver to (a) stop accepting keyboard and mouse input except for password attempts until someone enters the password and (b) alternately light the Num Lock/Scroll Lock LED pair and the Caps Lock LED on the attached keyboard. Note that if anyone has tried to type something at the receiver's keyboard while the

Extender is locked, you will have to press [Enter] to clear those characters so that they won't invalidate the password when you proceed to type it in.

- Use {Hotkeys} + [Enter] to cause the Extender to go into configuration mode. See **Section 4.2.2**.

Examples of how to enter these hotkey commands (assuming the hotkeys are [Ctrl] and [Shift]):

- *To blank the attached monitor's video:*  
Press and hold [Ctrl] and [Shift], press and release [0] (zero), release [Ctrl] and [Shift].
- *To password-lock the receiver:*  
Press and hold [Ctrl] and [Shift], press and release [L], release [Ctrl] and [Shift].

## 5.6 Hot-Plugging PS/2 Mice and Mouse Ports into the Extender and Re-Enabling Disconnected CPU PS/2 Mouse Ports

It is advisable to switch off the computer systems that are going to be connected to the ServSwitch Wizard Extender before you install them. However, even if this is not possible, most systems can be “hot-plugged” (connected to the Extender while they are powered and operating); the PS/2 mouse-port malfunctions this usually causes can often be overcome by using the Extender’s mouse-restoration functions. (The keyboard connection will normally restore itself automatically.)

Let’s take this from the top: On many PCs, mouse movement will be lost if the PS/2 mouse is unplugged and plugged back in while the PC is running. Mouse movement can then be restored only by rebooting the PC. This is because the mouse drivers only set up and enable the mouse when the PC is initially booted.

If you have powered down your Extender, or if you are attempting to hot-plug a system into it, you might be able to restore lost mouse movement using the Extender’s mouse-restoration functions. These should be used with caution, because unpredictable results might occur if you select the wrong mouse type. If in doubt, restore the mouse by rebooting the PC normally.

Standard PS/2 mouse data is formatted differently than IntelliMouse data, so two reset functions are provided on the Extender. The type of data format expected by the PC depends on the driver and the type of mouse that was connected when the driver was booted. You can use the following table as a guide; note that the mouse-reset functions predict the likely mouse *resolution* settings but might not restore the *speed* or *sensitivity* of the mouse to exactly what they were when the PC originally booted:

Type of mouse/ system connected at bootup:	Driver type:	Probable expected data format:	Suggested restoration command:
PS/2	PS/2 only	PS/2	PS/2—type [M] [6]
PS/2	IntelliMouse	PS/2	PS/2—type [M] [6]
IntelliMouse	PS/2 only	PS/2	PS/2—type [M] [6]
IntelliMouse	IntelliMouse	IntelliMouse	IntelliMouse—type [M] [7]

To restore lost mouse movement on a CPU connected to the Extender:

1. At the receiver's keyboard, select the CPU that has lost its mouse movement.
2. Enter configuration mode (see **Section 4.2.2**) by pressing the hotkeys followed by [Enter].
3. To restore a PS/2 mouse connection, issue the [M] [6] [Enter] command. Or, to restore an IntelliMouse connection, issue the [M] [7] [Enter] command.
4. Press [Enter] again to exit configuration mode.
5. Move the mouse a short distance to make sure that the connection has been restored properly.
6. Press [Enter] again to exit configuration mode.

## 6. Upgrading the Extender's Firmware

The ServSwitch™ Wizard Extender uses flash-rewritable program memory, and you can upgrade its firmware code by using a PC program to download new firmware into the transmitter and receiver through their keyboard connections. (The transmitter and receiver may be independently upgraded, but we highly recommend that whenever you upgrade one, you also always upgrade the other.)

To perform a flash upgrade you will need to create an MS-DOS® boot disk for the PC-compatible computer CPU that you'll run the upgrade program on. This boot disk is used to run the upgrade program automatically without the need for keyboard control. On a CPU running DOS, a boot disk can be created using the DOS FORMAT command (for example, "FORMAT A: /S"). In Windows® 95 and 98, DOS boots disks can be created in a similar manner. For other versions of Windows, refer to Windows Help for instructions. (For example, a DOS disk can be created in Windows XP® by selecting My Computer, right-clicking on the "A:" disk icon, selecting "Format" and then selecting "Create an MS-DOS startup disk.")

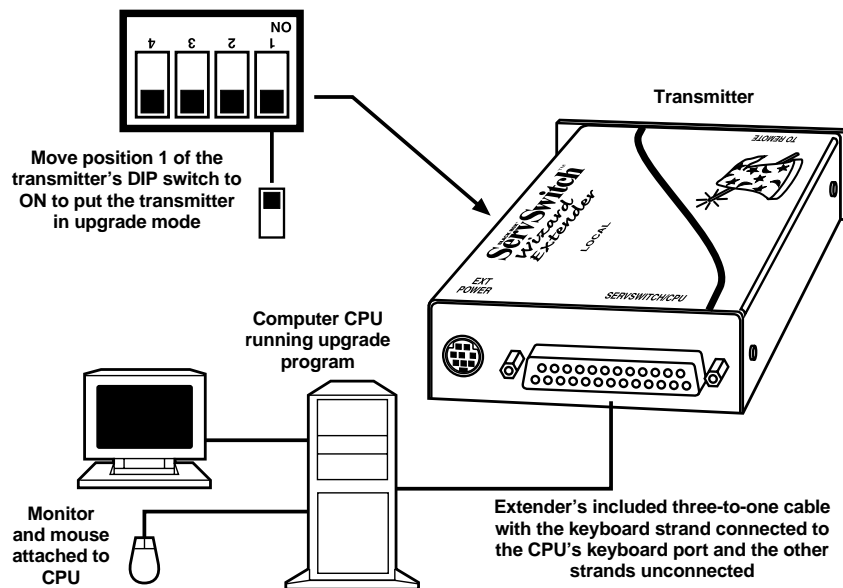
To upgrade the Extender's firmware, take these steps:

1. Create an MS-DOS boot disk using a blank floppy disk.
2. Download the latest firmware upgrade files as directed by Black Box Technical Support. The firmware upgrade is available as a compressed ZIP archive containing the following files ("xxx" in the filenames is the version number of the firmware — for example, "108" is version 1.08):
  - SSWEDxxx.EXE is the download program; it automatically selects the firmware to use by detecting the module that is connected during download.
  - SSWERxxx.HEX is the firmware file for the receiver.
  - SSWETxxx.HEX is the firmware file for the transmitter.
  - AUTOEXEC.BAT is the autoexec file for the DOS boot disk that automatically runs the SSWEDxxx.EXE upgrade file.

Unzip these four files and copy them to the root directory of the MS-DOS boot disk (you will need to overwrite the AUTOEXEC.BAT file that is currently on the DOS disk).

## CHAPTER 6: Upgrading the Extender's Firmware

3. Power down the computer that will be running the upgrade program.
4. Disconnect the twisted-pair cable and any previously connected CPU from the transmitter.
5. Connect the transmitter to the computer that will be running the upgrade program as shown in Figure 6-1. You only need to connect the keyboard strand of the three-to-one cable between the transmitter and the computer. Plug the monitor and mouse directly into their normal ports on the CPU. Plug the monitor and mouse directly into their normal ports on the CPU.

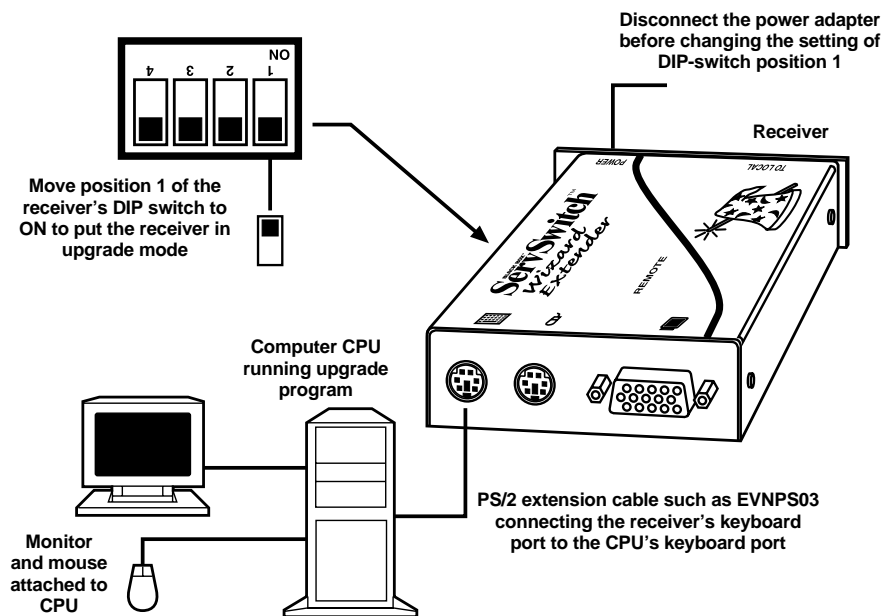


**Figure 6-1. Upgrading the transmitter.**

6. Set position 1 of the transmitter's DIP switch to ON.
7. Insert the DOS disk into your computer's floppy drive and power on the computer. The upgrade should be performed automatically.
8. When the upgrade has completed, power down the computer and disconnect the transmitter from it.
9. Set position 1 of the transmitter's DIP switch back to OFF.
10. Power down the computer again.

## SERVSWITCH™ WIZARD EXTENDER

11. Power down the Extender's receiver and disconnect the twisted-pair cable and any previously connected keyboard from it.
12. Use standard PS/2 extension cable such as product code EVNPS03 to connect the receiver's keyboard port to the keyboard port of the computer that will be running the upgrade program, as shown in Figure 6-2. (This is correct—the upgrade procedure *reverses* the normal signal flow on the CPU's keyboard port.) Plug the monitor and mouse directly into their normal ports on the CPU.



**Figure 6-2. Upgrading the receiver.**

13. Set position 1 of the receiver's DIP switch to ON.
14. Power up the receiver.
15. Make sure the DOS boot disk is still in your computer's floppy drive and power on the computer. The upgrade should be performed automatically.
16. When the upgrade has completed, power down the computer and disconnect the receiver from it.
17. Set position 1 of the receiver's DIP switch back to OFF.

## CHAPTER 6: Upgrading the Extender's Firmware

18. Reconnect the upgraded transmitter and receiver to each other and to any previously connected equipment.



## 7. Troubleshooting

If your ServSwitch™ Wizard Extender is not providing sharp video, you can force it to apply automatic video compensation as described in **Section 7.1**. If one or more of the red, green, and blue colors in the video it's displaying seems separated or offset, have the Extender report how much skew is occurring (and install the ServSwitch Wizard Skew Compensator, if necessary) as described in **Section 7.2**.

If you have some other kind of difficulty with your Extender, see if the problem is listed in **Section 7.3** and, if so, try the suggested remedies. You can also, at any time, reset the Extender itself as described in **Section 7.4**. If nothing helps, get the Extender's firmware-revision level as described in **Section 7.5** if possible, then call Black Box Technical Support as directed in **Section 7.6**. If you need to ship your Extender, see **Section 7.7**.

### 7.1 Forcing Automatic Video Compensation

Sometimes, when the Extender is operating with a manual video-compensation setting (see **Sections 4.2.1** and **4.2.2.A**), situations can arise in which that setting no longer provides the best video—for example, if you swap in a different cable, CPU, or monitor. If you would rather not spend a lot of time trying to find a better manual compensation setting—especially if the replacement equipment is only in place temporarily—you can force the Extender to override the current manual setting and apply its automatic video compensation instead, which might result in a better picture being displayed.

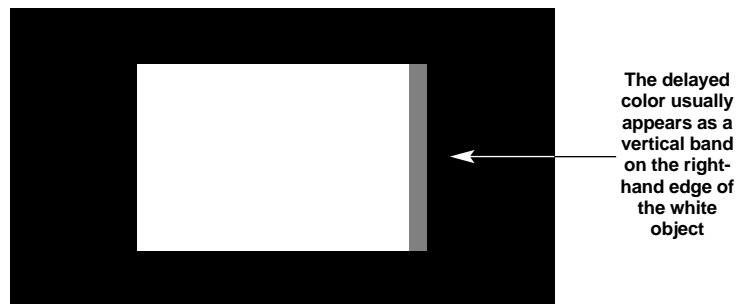
To do this, take these steps:

1. Go into configuration mode by pressing the hotkeys followed by [Enter] at the primary control station's keyboard.
2. Force the Extender to apply automatic video compensation by issuing the [F] [2] [Enter] command. (“[F] [2]” is the letter “F” followed by the number “2”, not the [F2] function key.)
3. Press [Enter] again to exit configuration mode.

The Extender will save this value in its nonvolatile memory, overwriting the value that the manual-compensation DIP-switch setting corresponds to. If you want to have the Extender go back to using a manual-compensation value read from its DIP switch, you'll have to move the DIP-switch positions, even if you just move them to a different setting for a second before returning them to their previous setting.

## 7.2 Reporting and Compensating for Video Skew

If you notice that one or more of the primary colors (red, green, or blue) in the video image displayed on your monitor has separated from the others and is horizontally offset from them on your screen—for example, if colored shadows trail bright white objects, as shown in Figure 7-1—then your Extender system might be affected by video “skew.”



**Figure 7-1. Skew at its most visible (color trailing a white object against a dark background).**

The Extender works by transmitting the three primary video colors on three of the four wire pairs in a twisted-pair cable, as shown in the **Appendix**. These pairs are twisted differently from one another in order to prevent the signals on one pair from interfering with the signals on the other pairs. Over long distances, the pairs' different twist ratios will actually cause the pairs to differ significantly in total length, with tightly wound pairs being longer than more loosely wound pairs. This is good for data transmission, but in an Extender system it will cause the three color signals to arrive at different times and to be displayed at different positions on the screen.

If this appears to be a problem in your system, there are several things you could do about it:

- Can you use a lower screen resolution? Lower resolutions produce less skew.
- Can you shorten the twisted-pair cabling distance between the Extender's transmitter and receiver? Shorter cables cause less skew.
- Can you swap in a type or brand of cable with less extreme differences between the twist ratios of the wire pairs? Generally, the ratios in CAT5 cables are not as different as those in CAT5e cables, which in turn don't differ as much as those in CAT6 cables, but the ratios will vary considerably depending on the manufacturer and make.

## SERVSWITCH™ WIZARD EXTENDER

- If none of the other solutions are practical or if none of them work, you can install a ServSwitch™ Wizard Skew Compensator (product code ACU5100A) between your transmitter and receiver, as shown in Figure 7-2.

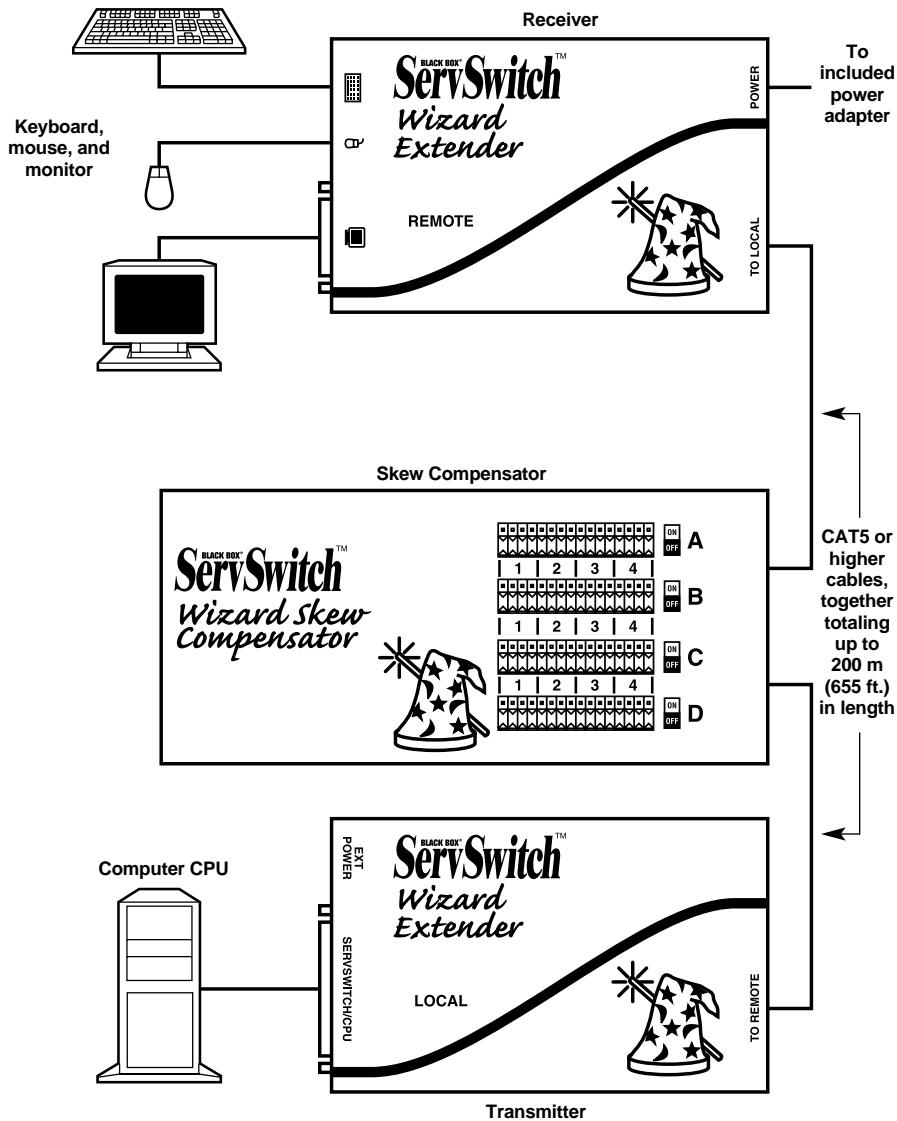


Figure 7-2. An Extender system with a Skew Compensator installed.

Before you install or configure a Skew Compensator—or try the other remedies—you might want to have the Extender report how much skew is occurring in your system. To do this, take these steps:

1. Make sure the transmitter and receiver are connected with the twisted-pair cable you want to use. If you already have a Skew Compensator installed between them, make sure that all of its switches are set to OFF and the total cable length between the receiver and transmitter is not more than 200 m (655 ft.) of UTP or 100 m (330 ft.) of STP:
2. If you're using a manual video-compensation setting (see **Sections 4.2.1** and **4.2.2.A**, make sure that the Extender's video compensation is at its best. (If the picture is not correctly compensated, the skew report might be less accurate.)
3. Bring up a DOS command prompt, a text prompt in a word-processing program, or a similar point in some other application that can display several lines of typed characters on the screen at once. (The Extender generates the skew report by sending keypress signals to the computer, as if the report had been typed in at the keyboard.)
4. Go into configuration mode by pressing the hotkeys followed by [Enter] at the keyboard. (The default hotkeys are [Ctrl] + [Shift].)
5. If you have an English, German, etc. QWERTY keyboard, press the letter [F] followed by the number [3]. If you have a French AZERTY keyboard, press the letter [F] followed by the number [4]. The skew report will appear, as described below.
6. Press [Enter] to exit configuration mode.

When you press [F][3] or [F][4], the monitor screen should go blank for a few seconds as the Extender applies measurement signals to the cable to measure the differences between the twisted pairs. When the picture is restored, a report similar to this one should appear:

**SKEW REPORT**

**RED +0.5M**  
**GREEN +1.0M**  
**BLUE +0.0M**

**SWITCHES ON**  
**A3 B4**

The first section of the report indicates the length differences between the twisted pairs that are carrying the red, green, and blue color signals. One of the colors will have a reported length difference of “+0.0M”; this is the color carried by the *shortest* twisted pair. The other reported differences are how much *longer* the other pairs are than the shortest one.

### TECHNICAL NOTE

Each meter of the length differences between the pairs that the Extender reports is equivalent to 5 nanoseconds of delay. For comparison, you can get a rough estimate of your system’s on-screen “pixel time” by multiplying the horizontal pixels by the vertical pixels by the refresh rate and then dividing 1 by the result. If the delay time is greater than the pixel time, color split will be noticeable.

For example, if the maximum reported difference is 1.5 meters, the delay between color signals will be  $1.5 \times 5 \text{ ns} = 7.5 \text{ ns}$ . If the screen resolution being used is 1024 x 768 x 75 Hz, the pixel time is roughly  $1 / (1024 \times 768 \times 75) = 16.9 \text{ ns}$ . Consequently, the color split will be less than half a pixel time and so is unlikely to be noticeable.

The second section of the report indicates which of the Skew Compensator’s top-panel switches should be set to ON to compensate for the twisted-pair length differences indicated by the report. All other switches should be OFF. You will see that each of these switches is constructed using 4 individual sliders. To set a switch to ON, all four sliders must be moved to the ON position. To set a switch to OFF, all four sliders must be moved to the OFF position. The example skew report on the previous page indicates that switches A3 and B4 should be ON and all the other switches should be OFF.

To compensate for the skew, set the Skew Compensator’s switches as indicated in the report and use a second cable to insert it into the twisted-pair cable run between the transmitter and receiver, as shown in Figure 7-2. If this is a lower-quality patch cable, it should be as short as possible. It doesn’t matter which cable you plug into which of the Compensator’s two RJ-45 jacks; the Compensator is fully bidirectional.

### NOTE

Because the cabling between the CPU and the transmitter can itself introduce some signal skew, sometimes setting the Skew Compensator manually, by trial and error, produces better results than relying on the skew report. For any given wire pair (color), switches 1 and 2 each introduce a 10-nanosecond delay, switch 3 introduces a 5-nanosecond delay, and switch 4 introduces a 2.5-nanosecond delay. For more information, refer to the Skew Compensator’s manual.

### 7.3 Other Problems and Possible Solutions

**Problem:**

Poor video quality with smearing, fuzziness, or rippling.

**Possible Solution:**

Make sure that the video compensation has been set for your system, as described in **Sections 4.2.1** and **4.2.2.A**. Check for video skew; see **Section 7.2**. Make sure your Category 5 cable is pinned and paired properly; see the **Appendix**. Also, if you are using cables other than those that came with the Extender to make your video connections, make sure these are shielded or screened coaxial video cables.

**Problem:**

Your mouse does not move the cursor/pointer.

**Possible Solutions:**

1. Watch the receiver's LED while you move the mouse. If you move the mouse and the LED doesn't flash, then the Extender is not receiving data from the mouse—proceed with the next few steps.
2. Check the mouse's connection to the receiver and the CAT5 cabling between the receiver and transmitter; if the cable connections are OK, try removing and restoring power to the Extender.
3. If you are attempting to connect the mouse to a PS/2 mouse port on a CPU that has not been powered down, you will need to use the mouse-restoration function (see **Section 5.6**).
4. Make sure that you have an appropriate mouse driver loaded and that your computer's software is configured to accept a supported mouse of the type that you have connected. See the relevant paragraphs in **Section 3.1**.
5. Make sure that (a) the mouse and computer were both connected to the Extender before any part of the system was powered up, and (b) the Extender was powered ON before the attached computer. If you're not sure whether this was the case, then (if it's possible to do so) power everything down, make sure all cable connections are correct and secure, power up the Extender's receiver, then power up all attached computers.

**Problem:**

Your keyboard does not function or functions only intermittently. The Num Lock LED does not always light when the Num Lock key is pressed.

**Possible Solution:**

Some older keyboards were designed for use with specific computers and are not truly PC/AT or PS/2 compatible. These are not common, but if you're having problems like this and you're using an old keyboard, try a newer keyboard.

## SERVSWITCH™ WIZARD EXTENDER

### **Problem:**

*Compaq MX11800 model integrated keyboard and mouse only:* The mouse consistently fails to boot when the Extender is connected to a PC running Windows NT® 4.0 through its PS/2 style mouse port.

### **Possible Solutions:**

There are three possible solutions to this problem:

1. Use a different type of mouse.
2. Connect the Extender to your NT 4.0 PCs through an adapter and one of the PC's serial ports rather than through its PS/2 port.
3. Select "CPU zero" while NT is booting. You should be able to use the system normally once the logon screen appears.

## 7.4 Resetting the Extender (Hardware Reset)

The ServSwitch Wizard Extender has a hardware-reset function that does not require you to remove power to the Extender. To trigger a hardware reset, set position 1 of the DIP switch on the Extender's transmitter (see **Section 4.2.1**) to ON. This DIP-switch position is directly connected to the Extender's microprocessor; when you set it ON, the microprocessor essentially shuts down. To finish resetting the Extender, move position 1 back to OFF; power is restored to the microprocessor, which then performs a complete hardware reset.

## 7.5 Displaying the Extender's Firmware Revision

For technical-support purposes, it might be necessary to find out the firmware-release version of your ServSwitch Wizard Extender. To do this, select the CPU and get to a DOS prompt, a text prompt, etc.—it doesn't matter what software is running, as long as it displays characters typed in at the keyboard on the screen. Then refer to **Section 4.2.2** as you take these steps:

1. Go into configuration mode by pressing the hotkeys followed by [Enter] at the primary control station's keyboard.
2. Get the Extender to report its firmware revision by issuing the [F] [1] [Enter] command. ("[F] [1]" is the letter "F" followed by the number "1", not the [F1] function key.)
3. Press [Enter] again to exit configuration mode.

The version number will be reported on screen as the letter "V" followed by three numbers, the first of which is the major revision level and the other two of which are the minor revision level. For example, if the Extender reports "V118", the firmware version is 1.18.

## 7.6 Calling Black Box

If you determine that your ServSwitch Wizard Extender is malfunctioning, *do not attempt to alter or repair the unit*. 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 nature and duration of the problem;
- when the problem occurs;
- the components involved in the problem—that is, which module(s), what type of cable, computer, and keyboard, what make and model of monitor and mouse, 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.

## 7.7 Shipping and Packaging

If you need to transport or ship your ServSwitch Wizard Extender:

- Package it carefully. We recommend that you use the original container.
- Before you ship it back to Black Box for repair or return, contact us to get a Return Authorization (RA) number.



## Appendix: Cable Guidelines

### NOTE

The maximum supported cable lengths vary widely between devices and cables. It might be possible to use cables that are longer than those specified in this Appendix with certain computers and peripherals, but this can't be guaranteed. If you have problems, try using shorter cables.

#### A.1 Cabling from the Keyboard, Monitor, and Mouse to the Receiver

All of the shared devices plug directly into the relevant connectors on the left side of the ServSwitch Wizard Extender's receiver. If you use a PC/AT style keyboard you'll need a PC/AT (5-pin DIN female) to PS/2 (6-pin mini-DIN male) adapter. (These are available from Black Box as product code FA211.)

You can use Premium KVM User Cables (product code EHN409) to increase the distance from the Wizard to your peripherals to as much as 32 ft. (10 m). Many keyboards and mice will operate at distances up to 65 ft. (20 m), but don't count on this.

#### A.2 Cabling from the Transmitter to the CPU

The computer CPU is attached to the Extender's transmitter through the included three-to-one cable as described in **Section 3.3**. There should never be more than 5 m (15 ft.) of cable between the transmitter and the CPU.

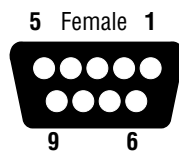
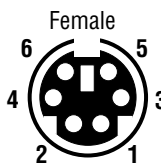
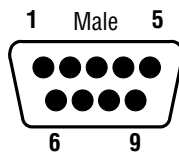
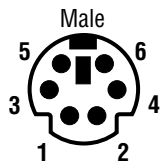
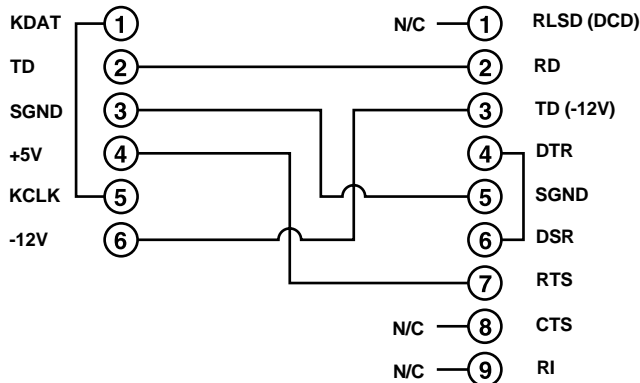
If you want to make use of the Extender's ability to pass Display Data Channel (DDC) information between your CPU and the monitor, you'll need a video cable or cable strand that carries the DDC signaling lines (HD15 pins 12 and 15), which not all video cables do.

If the CPU has a 5-pin DIN PC/AT style keyboard connector, you will need a PS/2 to PC/AT keyboard adapter, 6-pin mini-DIN female to 5-pin DIN male (product code FA212). If the CPU has only a DB9 male serial mouse port, you'll need a special adapter with the pinning shown in Figure A-1 (product code FA314).

## APPENDIX: Cable Guidelines

6-pin mini-DIN attaches to Wizard or cable from Wizard

DB9 attaches to PC's serial port or cable to PC's serial port



**Figure A-1. The RS-232 mouse adapter's pinout.**

### A.3 Twisted-Pair Cabling Between the Transmitter and Receiver

To interconnect the transmitter and receiver of your ServSwitch™ Wizard Extender, you can use either shielded twisted pair (STP) or unshielded twisted pair (UTP) rated to Category 5 or higher. It should be pinned straight-through and paired according to the TIA-568A or (preferred) -568B specification, as shown in Figure A-2.

#### **CAUTION!**

**Do *not* use cables paired according to the USOC specification—Pin 1 with 2, 3 with 4, 5 with 6, and 7 with 8. These will work badly and will yield a particularly horrible picture.**

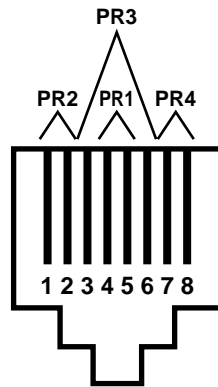
We recommend a solid-core CAT5 cable such as product codes EYN737MS (preterminated) or EYN840A (unterminated bulk); specify the length you'd like when you order. Terminate any unterminated cable with high-quality shielded RJ-45 plugs such as those in our FM732 (unshielded) and FM733 (shielded) 25-packs.

#### **CAUTION!**

**Keep in mind that if you use shielded twisted-pair cable, the maximum distance at which the Extender will operate will be at least cut in half, to no farther than 100 m (325 ft.).**

All twisted-pair cables are constructed in such a way that each of the twisted pairs has a slightly different twist ratio. This is done to reduce the electrical crosstalk between signals carried on adjacent pairs. Because of this, the wire distance that an electrical signal has to travel is different for the different pairs. This does not normally cause a noticeable problem—in fact, the twist differences have no effect at all on digital signals such as network data. But if you're sending higher video resolutions (which are analog signals) across long cables, you might start to see color separation caused by the red, blue, and green signals arriving at the receiver at slightly different times.

If this happens, you might be able to improve your video by reterminating your cable so that the video signals are on the pairs whose twist ratios are the closest to each other. Most network-quality cables have one pair that's much more tightly twisted than the other three; this pair should be avoided. Unfortunately, different manufacturers—and even different cable types by the same manufacturer—use different pairs for the “tight pair,” so call your cable supplier. If they can't tell you which pair to avoid, cut a short section off the end of the cable, open it up, and look at the pairs; the tight pair is usually quite obvious.



**Cable Pinning:** Straight-through (Pin 1 to Pin 1, 2 to 2, etc.)

**Cable Pairing:**

- Pair 1: Pins 4 and 5 (differential green video and vertical sync)
- Pair 2: Pins 1 and 2 (differential blue video)
- Pair 3: Pins 3 and 6 (differential red video and horizontal sync)
- Pair 4: Pins 7 and 8 (keyboard and mouse data)

**Figure A-2. Twisted-pair cable specifications.**

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## NOTES

## NOTES



**Customer Support Information:**

FREE tech support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**.

Mailing address: **Black Box Corporation**, 1000 Park Dr., Lawrence, PA 15055-1018

World-Wide Web: [www.blackbox.com](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

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