BLACK BOX®
ServSwitch™
Wizard DVI

KV1002A
KV1004A
KV1022A
KV1024A
KV1042A
KV1044A

BLACK BOX®
NETWORK SERVICES

Welcome to the ServSwitch™ Family!

Thank you for purchasing a BLACK BOX® ServSwitch™ Brand KVM switch! We appreciate your business, and we think you'll appreciate the many ways that your new ServSwitch keyboard/video/mouse switch 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!

<p align="center">*</p>

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

<p align="center">KV1002A   KV1022A   KV1042A
KV1004A   KV1024A   KV1044A</p>

This manual also includes information about the Remote-Control Module accessory, whose product codes are:

<p align="center">KV6REM   KV6REM-25   KV6REM-50   KV6REM-75</p>

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RADIO-FREQUENCY INTERFERENCE STATEMENTS

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

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

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

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

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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 may 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, the user is encouraged to 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 with this equipment to maintain compliance with radio-frequency energy-emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.

$$ C\,\epsilon $$

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 connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

Contents

Contents (continued)

1. Specifications

Compliance:	CE (EN55022 Class A); FCC Part 15 Subpart B Class A, IC Class/classe A
Standards:	Supports DDC2B signaling
Interfaces:	Video: Single-link DVI (Digital Visual Interface); Keyboard and mouse: IBM PS/2 compatible; with appropriate adapters, also supports CPUs with EIA/TIA RS-232 mouse ports; OPTIONS port: EIA/TIA RS-232 proprietarily pinned on DB15
Resolution and Refresh Rate:	Up to 1600 x 1200 noninterlaced at up to 60 Hz (higher refresh rates possible at lower resolutions); with video cards and monitors that support composite images transmitted on multiple heads, the KV1022A and KV1024A can support up to 2400 x 1600 and the KV1042A and KV1044A can support up to 3200 x 2400
Protocol:	RS-232: Asynchronous
Data Format:	RS-232: 8 data bits, no parity, 1 stop bit
Data Rate:	RS-232: 1200 bps
Flow Control:	RS-232: None
Maximum Distance:	2 m (6 ft.) if interface-powered or 5 m (16 ft.) if AC-powered to any attached keyboard, monitor, and mouse; 5 m (16 ft.) to any attached CPU or cascaded KVM switch

User Controls: Keyboard commands;
Mouse-click functions;
(1) Front-mounted pushbutton for channel change and configuration mode;
(1) Bottom-mounted 8-position DIP switch for bootup autoswitching, reset, and firmware upgrade;
Optional Remote-Control Module for channel change;
Optional serial commands for channel change and multi-chassis synchronization

Indicator: (1) Front-mounted 7-segment status display

Connectors: All rear-mounted:
(1) Multipurpose DB15 female (see **Section A.3** of the **Appendix**);
(1) Barrel jack for power-supply connection;
User port:
(2) 6-pin mini-DIN female for keyboard and mouse attachment;
Molex DVI-D female for monitor attachment:
KV1002A, KV1004A: (1);
KV1022A, KV1024A: (2);
KV1042A, KV1044A: (4);
CPU ports ([2] on KV10x2A models, [4] on KV10x4A models), each consisting of:
(2) 6-pin mini-DIN female for keyboard- and mouse-port attachment;
Molex DVI-D female for video-port attachment:
KV1002A, KV1004A: (1);
KV1022A, KV1024A: (2);
KV1042A, KV1044A: (4)

MTBF: 500,000 hours (based on the historical reliability of similarly designed and manufactured products)

**Maximum
Altitude:**   10,000 ft. (3048 m)

**Temperature
Tolerance:**   32 to 104˚F (0 to 40˚C)

**Humidity
Tolerance:**   5 to 60% noncondensing

Enclosure: Steel, aluminum, and plastic

Power: KV1002A, KV1004A: Either:
     5 VDC at up to 1 A from the keyboard interfaces of the attached computers; or
     From a utility-power (mains) outlet, through a detachable power cord and IEC 320 male inlet, to the external transformer of optional power supply PS649:
     Input: 100 to 240 VAC at 50 to 60 Hz;
     Output: 5 VDC at up to 1 A;
     Consumption: 5 watts maximum in either case;
     All other models: From a utility-power (mains) outlet, through a detachable power cord and IEC 320 male inlet, to the external transformer of the included power supply:
     Input: 100 to 240 VAC at 50 to 60 Hz;
     Output: 5 VDC at up to 4 A;
     Consumption: 20 watts maximum

Size: 1.75"H (1U) x 10.3"W x 5.9"D (4.4 x 26.2 x 15 cm)

Weight: 2.2 lb. (1 kg)

2. Introduction

The ServSwitch™ Wizard DVI is a high-performance keyboard-, monitor-, and mouse-sharing device that supports a wide range of IBM® PC compatible hardware and software platforms, including some high-end IBM PS/2® compatible computers (IBM RS/6000®, Compaq® Alpha®, and SGI™). It is specifically designed to support DVI (Digital Visual Interface) video. It comes in several models:

- The 2-Port (product code KV1002A) and 4-Port (KV1004A) Single-Head models support DVI video cards with a single video output.

- The 2-Port (KV1022A) and 4-Port (KV1024A) Dual-Head models support DVI video cards with up to two video outputs. They also support user stations with either dual monitors or a single monitor that can composite dual video feeds into a single image.

- The 2-Port (KV1042A) and 4-Port (KV1044A) Quad-Head models support DVI video cards with up to four video outputs. They also support user stations with either as many as four monitors or a single monitor that can composite as many as four video feeds into a single image.

2.1 Features and Benefits

Here are some of the useful features of the ServSwitch Wizard DVI and some of the ways those features benefit you:

- You can use a single keyboard, mouse, and one to four monitors or monitor feeds to control multiple computer CPUs that output DVI video.

- Supports DVI monitors at resolutions up to 1600 x 1200 pixels and refresh rates up to 60 Hz. Its maximum pixel frequency is 165 MHz per port—the maximum single-link bandwidth in the DVI specification—so higher refresh rates can be supported for lower resolutions.

- When used with video cards and monitors that can transmit and receive multiple parts of the same image on multiple video heads, the Dual-Head models can support resolutions up to 2400 x 1600, and the Quad-Head models can support resolutions up to 3200 x 2400.

- Supports IBM RS/6000`, Compaq Alpha, and SGI computers that output DVI video.

- Compatible with all popular operating systems for the IBM PC.

- Continuous keyboard and mouse emulation on all ports ensures problem-free computer bootup. And because all ports are active simultaneously, all attached CPUs can be booted at the same time.

- Automatically detects attached hardware.

- The Dual- and Quad-Head models come with a power supply, but the Single-Head models can usually draw all the power they need from the attached CPUs. For demanding applications with cascading and/or high-end video, an optional power supply (product code PS649) is available for the Single-Head models.

- Local channel switching using its front-panel pushbutton, a keyboard hotkey sequence, or a three-button mouse.

- Remote channel switching through its RS-232 serial port, using its convenient optional Remote-Control Module (RCM) or some other device.

- Intelligent switching: You can scan/switch between all ports or just the active ones.

- Flash-upgradable for easy on-site firmware upgrades.

- Video channels support DDC2B Display Data Channel signaling and DVI Hot Plug Detect.

- Can be cascaded to control a large number of CPUs.

- Can be synchronized to control CPUs with more than four video outputs.

- Password security prevents unauthorized use.

- Stores its configuration in persistent EEPROM memory.

- Restores keyboard and mouse states automatically when channel is changed.

- CPUs can have PS/2 keyboard ports and either PS/2 or RS-232 mouse ports.

- Supports keyboard modes 1, 2, and 3, as well as both "prompt" and "stream" mouse modes, for maximum compatibility.

- Support for Microsoft® IntelliMouse® and many other "wheel mice."

- Mouse-restoration functions that make it possible to hot-plug certain systems.

- If problems occur, you can soft-reset the keyboard, the mouse, or the Wizard DVI itself without disconnecting any devices.

- Includes screen-blank, autoscan, and variable-hotkey options.

- Front-panel 7-segment LED shows you how the Wizard DVI is operating.

- Metal enclosure for good shielding and video quality.

2.2 The Complete Package

The only other thing that comes with the Single-Head (KV1002A and KV1004A) models of the ServSwitch Wizard DVI is a users' manual. All other models also come with a power supply. (We don't include a power supply with the Single-Head models because most applications for those models don't require one. If you need a power supply for a Single-Head Wizard DVI, it can be purchased separately as product code PS649.)

The only other things that come with the Wizard's optional Remote-Control Module ("RCM" for short, the KV6REM series of product codes—see **Section 5.2**) are VELCRO® mounting strips.

2.3 The ServSwitch Wizard DVI Illustrated
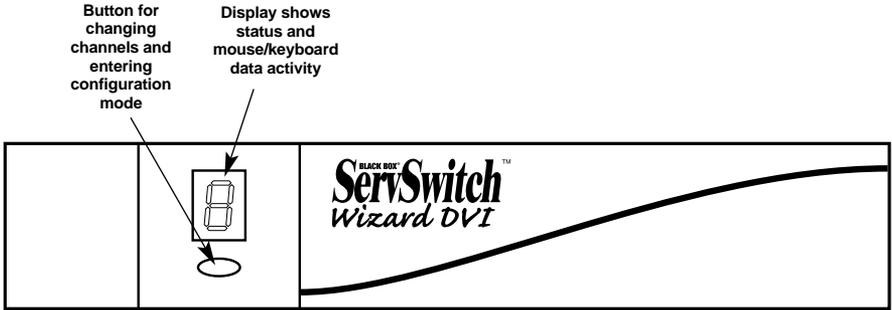
**Figure 2-1. The ServSwitch Wizard DVI's front panel.
(The front panel of a Single-Head model is shown here; the other versions
are very similar but taller.)**
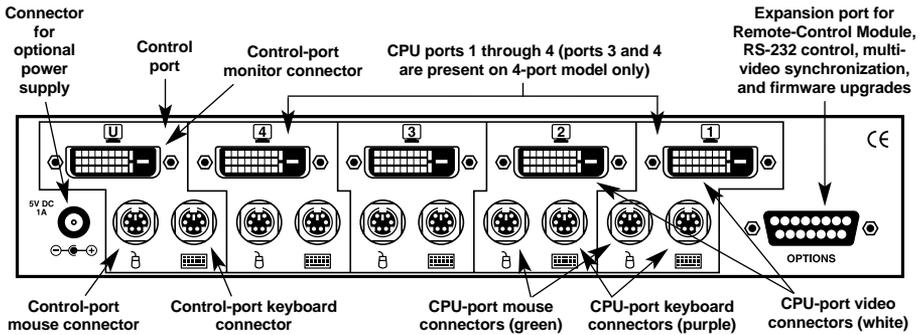
**Figure 2-2. The Single-Head ServSwitch Wizard DVI's rear panel
(KV1004A shown).**
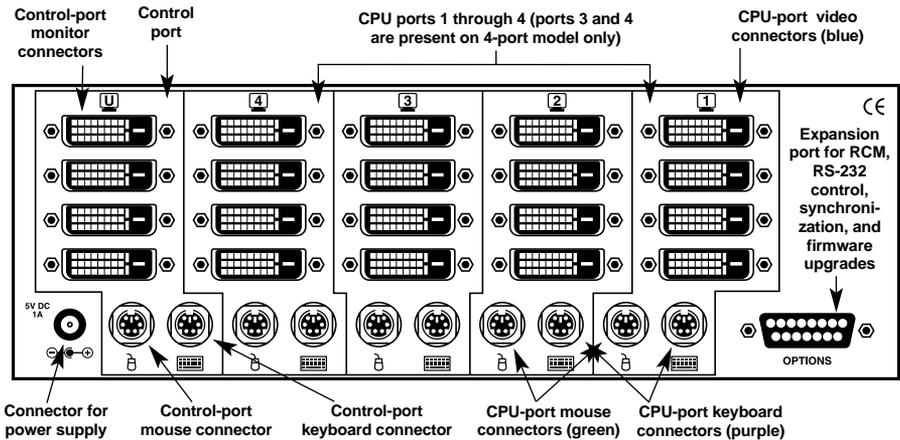
Figure 2-3. The Quad-Head ServSwitch Wizard DVI's rear panel (KV1044A shown).

The bottom panel of the ServSwitch Wizard DVI isn't shown here, but there's an 8-position DIP switch mounted on it. You'll use this switch if you want to turn off bootup autoswitching (see **Section 4.2.1**) or if you ever do a "warm reset" of the Wizard DVI (see **Section 5.12**) or upgrade the Wizard DVI's firmware (see **Section 5.13**).

You can also use an optional Remote-Control Module with the ServSwitch Wizard DVI (see **Section 5.2**). This is what the Module looks like:
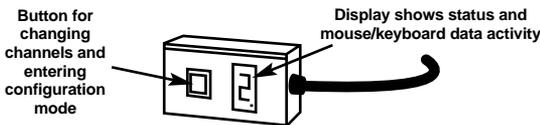
Figure 2-4. The Remote-Control Module (KV6REM), an optional accessory.

2.4 Safety Concerns

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

- The Wizard DVI is for use in dry, oil-free indoor environments only.

- Do *not* attempt to fix the Wizard DVI yourself.

- Follow all warnings and instructions marked on the Wizard DVI, its power supply (if you're using one), and any other accessories.

- If you'll be using a power supply with the Wizard DVI (optional with the Single-Head models, required for other models):

  – **Warning:** The Wizard DVI's power-supply transformer contains *no* user-serviceable parts, but it *does* contain "live" parts capable of delivering hazardous electric shocks—do *not* attempt to dismantle it!

  – Make sure that the total current rating of the devices plugged into the AC outlet that's supplying the Wizard DVI is not greater than the outlet's rated current capacity.

  – If you use an extension cord with the power supply, make sure that the total current rating of the devices plugged into the extension cord is not greater than the cord's rated current capacity.

  – Do *not* continue to use the Wizard DVI's power supply if the supply's transformer case becomes damaged, cracked, or broken, or if you suspect that the power supply isn't operating properly.

  – If the Wizard DVI's power supply stops working, replace it with a manufacturer-approved power supply of the same type only.

3. Installation

3.1 What You Will Need

You'll need these things before you can install your ServSwitch Wizard DVI:

- Cables to connect the ServSwitch Wizard DVI to the keyboard, video, and mouse ports of each of your computers. (You don't need to connect mouse cabling to a CPU if you're not using a mouse with that CPU.) If you'll be installing cascaded or synchronized Wizard DVIs, you'll also need cables to interconnect the Wizard DVIs. You'll need adapters to connect the Wizard DVI to any CPUs' RS-232 serial mouse ports. For cable and adapter specifications, see the **Appendix**.

- A monitor with one or more DVI connectors that will work when connected directly to each of your computers.

- A standard PS/2 style keyboard.

- A PS/2 style two- or three-button Microsoft or Logitech™ compatible mouse or a Microsoft IntelliMouse or IntelliMouse Explorer compatible mouse. If you want to use the mouse to switch channels on the ServSwitch Wizard DVI, you'll need a three-button mouse or an IntelliMouse. (The Wizard DVI supports other IntelliMouse compatible "Internet mice"—fitted with a wheel or other scrolling control, and sometimes additional buttons—including several models by Logitech and Genius™.)

  All the mouse connections from ServSwitch Wizard DVI to the attached computers support either PS/2 mouse ports or RS-232 serial mouse ports. The Wizard DVI automatically converts PS/2 mouse data and commands to serial-mouse data and commands, but you'll still need the appropriate adapter—product code FA314—to connect the Wizard DVI to a PC with a serial mouse port. See **Section A.2** in the **Appendix**.

  The Wizard DVI will operate without a mouse connected if you don't want to use one.

- A suitable mouse driver for your PCs (if you're using a mouse). 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 drivers with IntelliMouse compatible data formats, but these might not work—trial-and-error testing might be necessary.)
  - Logitech mouse drivers, including those for two-button, three-button, and wheel mice.

3.2 Placement

The ServSwitch Wizard DVI should be placed on a desktop or shelf near your monitor and peripherals. You can use the optional Remote-Control Module if you want to put a Wizard DVI farther from your monitor and peripherals.

3.3 Connecting Your Equipment

IMPORTANT NOTE

Not all DVI video cards properly detect the user-station monitor if their CPU is hot-plugged into the Wizard DVI, or if their CPU is not able to communicate directly with the monitor when the CPU is powered up. This can cause DVI cards not to output any video at all. For this reason, the Wizard DVI's factory-default behavior is to automatically switch to the CPU port of any attached CPU that it detects is being booted.

However, if you boot up all of your CPUs at the same time, some of them might still not be able to detect the monitor properly. To make sure that your video cards detect the monitor and configure themselves correctly, all CPUs should be off when you attach them, and you should power them up one by one, waiting a few seconds between each boot.

If your DVI cards are smart enough that this "bootup autoswitching" is unnecessary, you can turn it off. See Section 4.2.1**.**

NOTES

When you connect devices to Wizard DVIs' "control ports" and "CPU ports," refer to Figures 2-2 and 2-3 in Section 2.3 **to see where these ports are.**

Any unused CPU-port or control-port connectors on a ServSwitch Wizard DVI can be left vacant.

Most ServSwitch Wizard DVI applications will involve a keyboard, mouse, one to four monitors, and two to four computer CPUs attached to a *single* Wizard DVI. If that describes what you want to do, follow the procedure in **Section 3.3.1**.

If you want to switch between more than four CPUs, you'll need multiple *cascaded* Wizard DVIs to connect them. Follow the procedure in **Section 3.3.2**.

If your CPUs have between five and eight DVI outputs, or if they have simultaneous DVI and analog video outputs, you will need multiple *synchronized* Wizard DVIs or other ServSwitch Wizard models to switch between the CPUs. Follow the procedure in **Section 3.3.3**.

NOTE

It is theoretically possible to install a synchronized cascade, or to connect CPUs with more than eight DVI outputs, but the cabling would be complicated. If you need to switch between large numbers of computers with large numbers of multiple video outputs, please call Black Box Technical Support to discuss your application.

The special ServSwitch DVI KVM Cables that you might want to use with the ServSwitch Wizard DVI are described in **Section 3.3.4**.

NOTES

Some high-end DVI monitors and DVI video cards have proprietary connectors. If you want to connect such a monitor or video card to your Wizard DVI system, please call Black Box Technical Support.

At the time of this writing, it is not possible to convert DVI video for display on an analog monitor or vice versa. If you want to switch both DVI and analog video, you'll have to synchronize a Wizard DVI with a Wizard switch that supports analog video (see Section 3.3.3**).**

3.3.1 SYSTEMS WITH A SINGLE WIZARD DVI

Make sure that the ServSwitch Wizard DVI is powered down and unplugged. If possible, turn off and unplug all the devices that you want to attach to it. (If you have to "hot-plug" any powered computers into the Wizard DVI, see **Section 5.8**.)

Connect your user equipment (keyboard, PS/2 mouse, and monitor[s]) to the appropriate "control port" connectors on the Wizard DVI's rear panel. If you had to place the Wizard DVI farther from the user equipment than the equipment's native cables will reach—up to a maximum total Wizard-to-monitor distance of 5 m (16 ft.)—you can plug the monitor cable(s) into male/female DVI extension cable(s) such as EVNDVI03, and plug the keyboard and mouse cables into PS/2 extension cables such as EVNPS03-MF.

Next, connect each computer CPU to the Wizard DVI by running cabling from the CPU's keyboard, mouse, and video ports to the matching connectors in one of the Wizard DVI's "CPU ports." You can use PS/2 extension cables such as EVNPS03-MM to attach the CPU's keyboard and mouse ports, plus male/male DVI extension cables such as EVNDVI02 to attach the CPU's video ports. But we recommend using our many-in-one ServSwitch DVI KVM Cable to attach the CPU's keyboard port, its mouse port, and up to four of its video ports all at the same time (see **Section 3.3.4**). Keep in mind that the maximum Wizard-to-CPU cabling distance is 5 m (16 ft.).

Complete systems using single Wizard DVIs are shown in Figures 3-1 and 3-2 on the next page. For clarity, only one CPU is shown in each illustration.
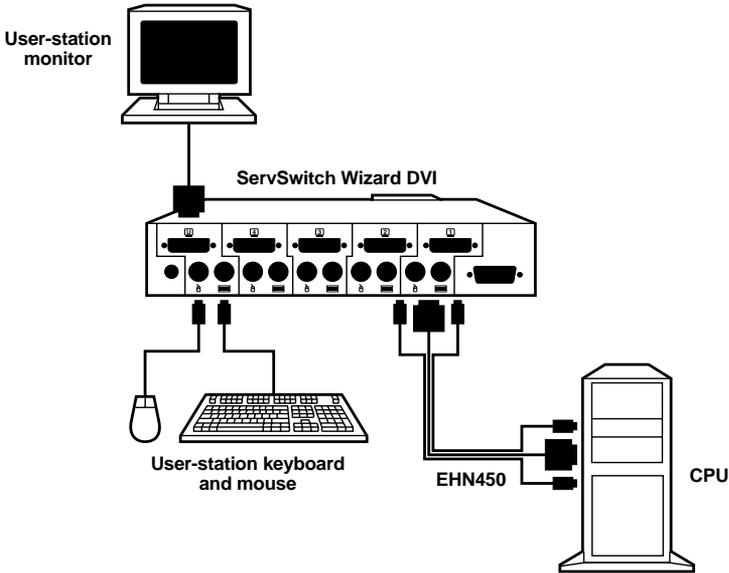
Figure 3-1. System using one Single-Head ServSwitch Wizard DVI (KV1004A shown).
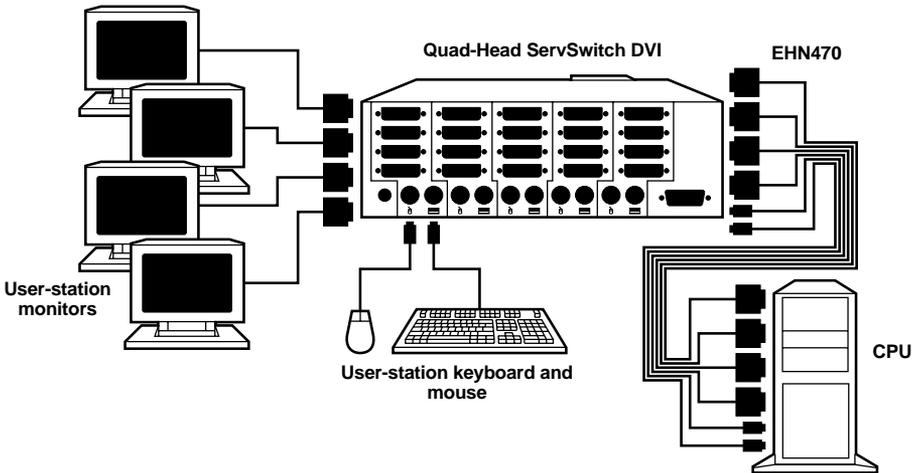
Figure 3-2. System using one Quad-Head ServSwitch Wizard DVI (KV1044A shown).

3.3.2 CASCADED WIZARD DVI SYSTEMS FOR MORE THAN FOUR CPUS

Multiple ServSwitch Wizard DVIs can be cascaded (connected together in a one-to-many scheme) in order to increase the maximum number of available CPU ports in your KVM-switching system. (Note that *each* Wizard DVI in a cascade *must* be powered through a power supply and *not* from the keyboard interface.) This can be particularly useful where clusters of computers are located some distance from each other, because each Wizard DVI acts as a kind of signal booster or repeater and can be long distances away from the other Wizard DVIs in the system.

Make sure that your "master" ServSwitch Wizard DVI—the chassis that your monitor(s), keyboard, and mouse will be attached to—is powered down and unplugged. If possible, turn off and unplug all the devices that you want to attach to this Wizard DVI. (If you have to "hot-plug" any powered computers into your Wizard DVI system, see **Section 5.8**.)

Connect your user equipment (keyboard, PS/2 mouse, and monitor[s]) to the appropriate "control port" connectors on the master Wizard DVI's rear panel. If you had to place the Wizard DVI farther from the user equipment than the equipment's native cables will reach—up to a maximum total Wizard-to-monitor distance of 5 m (16 ft.)—you can plug the monitor cable(s) into male/female DVI extension cable(s) such as EVNDVI03, and plug the keyboard and mouse cables into PS/2 extension cables such as EVNPS03-MF.

Now connect a layer of as many as four "subsidiary" Wizard DVIs to your master Wizard DVI by running cabling from the subsidiary Wizard DVIs' control ports to the master Wizard DVI's "CPU ports." This cabling can be either all separate male-to-male PS/2 and DVI extension cables (EVNPS03-MM and EVNDVI02 respectively), or you can use our many-in-one ServSwitch DVI KVM Cable (see **Section 3.3.4**) to make the keyboard, mouse, and DVI connections simultaneously.

You can extend your cascade to a third layer by repeating the process and attaching additional subsidiary Wizard DVIs to the subsidiary Wizard DVIs already attached to your master Wizard DVI chassis. Though it's theoretically possible to cascade Wizard DVIs to four, five, or more layers, we recommend that you limit your setup to three, because the addresses you need to enter to switch CPU channels become ridiculously long.

Finally, connect each computer CPU to the Wizard DVI system by running cabling from the CPU's keyboard, mouse, and video ports to the matching connectors in one of the CPU ports on one of the subsidiary Wizard DVIs. As with the master-to-subsidiary Wizard DVI connections, this cabling can be either all separate PS/2 and DVI extension cables, or you can use our many-in-one ServSwitch DVI KVM Cable to make the keyboard, mouse, and DVI connections simultaneously.

Figure 3-3 features a complete cascaded Single-Head Wizard DVI system. For clarity, only one attached CPU is pictured for each chassis. In a Dual-Head or Quad-Head system, there would be extra DVI extension cables between the two chassis.
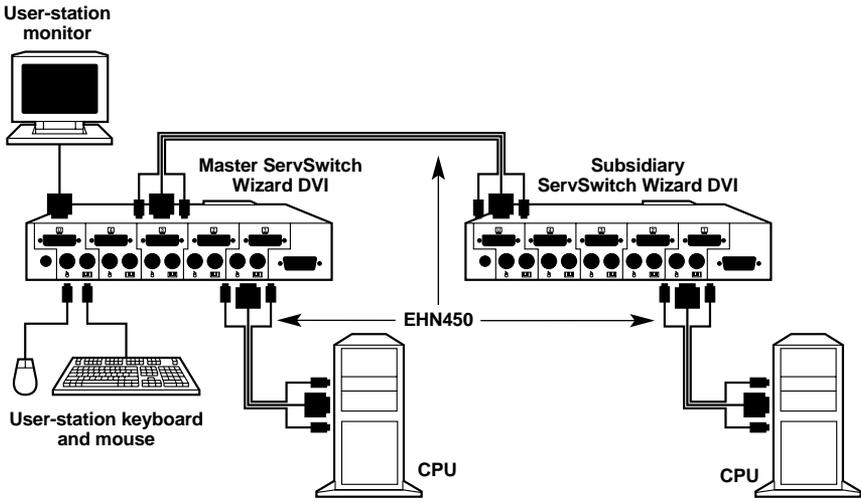
Figure 3-3. A simple cascaded system with two Single-Head ServSwitch Wizard DVIs (KV1004A units shown).

3.3.3 SYNCHRONIZED WIZARD DVI SYSTEMS FOR CPUS WITH UP TO EIGHT DVI OUTPUTS OR WITH BOTH DVI AND ANALOG VIDEO OUTPUTS

The Quad-Head ServSwitch Wizard DVI is able to support CPUs with as many as four DVI video outputs. If you need to switch CPUs with between five and eight DVI outputs, or if you need to switch CPUs with both DVI and analog video outputs, you can attach these CPUs to a Wizard DVI that's "synchronized" with another Wizard DVI or with one of the ServSwitch Wizard models that supports analog video.

Here's how it works: When you switch to a different CPU channel, the Wizard DVI transmits the same switching command out of its RS-232 port. Any other compatible ServSwitch Wizard model that receives this command will make the same channel change. So you can connect a CPU's additional video outputs to additional Wizard switches, then interconnect the switches' RS-232 ports to create a synchronized switching system that switches all video feeds coming from each CPU at the same time.

(Note that *each* Wizard DVI in a synchronized system *must* be powered through a power supply and *not* from the keyboard interface.)

Make sure that your "master" ServSwitch Wizard DVI—the chassis that your keyboard and mouse will be attached to—is powered down and unplugged. If possible, turn off and unplug all the devices that you want to attach to this Wizard DVI. (If you have to "hot-plug" any powered computers into your Wizard DVI system, see **Section 5.8**.)

Connect your keyboard and PS/2 mouse to the matching "control port" connectors on the master Wizard DVI's rear panel. Attach your primary monitor(s) to the control-port DVI connector(s): If the Wizard DVI is a Single-Head Model, connect a single DVI or DVI/analog monitor to the DVI connector; if it's a Dual-Head Model, connect one or two such monitors to the DVI connectors; or if it's a Quad-Head Model, connect up to four such monitors to the DVI connector. (If the monitors don't have dedicated cables attached to them, you'll have to run DVI extension cables such as EVNDVI02 from the monitor to the Wizard DVI.) If you had to place the Wizard DVI farther from the user equipment than the equipment's native cables will reach—up to a maximum total Wizard-to-monitor distance of 5 m (16 ft.)—you can plug the monitor cable(s) into male/female DVI extension cable(s) such as EVNDVI03, and plug the keyboard and mouse cables into PS/2 extension cables such as EVNPS03-MF.

Attach your secondary monitor(s) to the control-port monitor connector(s) on the subsidiary Wizard's rear panel—DVI or DVI/analog monitor(s) to the DVI connector(s) if the Wizard is a Wizard DVI, multisync VGA-style analog monitor(s) to the VGA connector(s) if the Wizard is some other model: If the subsidiary

Wizard is a Single-Head Wizard DVI or an analog Wizard with one monitor output, connect a single such monitor to the monitor connector; if the subsidiary Wizard is a Dual-Head Wizard DVI or an analog Wizard with two monitor outputs, connect one or two such monitors to the monitor connectors; if the subsidiary Wizard is a Quad-Head Wizard DVI or an analog Wizard with four monitor outputs, connect up to four such monitors to the monitor connectors. As with your primary user equipment, you can use DVI extension cable such as EVNDVI03 to cross gaps up to 5 m (16 ft.).

Connect the additional Wizard switch to your master Wizard DVI with a special male-to-male DB15 synchronization cable (available on a quote basis; see **Section A.2** of the **Appendix** for a pinout). (If your CPUs output more video feeds than a pair of Wizard switches can handle, you'll need to use pass-through, multi-drop, or preferably one-to-many DB15 cabling to synchronize three or more Wizard switches; call Black Box Tech Support to discuss your application.)

Connect each computer CPU to the synchronized Wizard DVI system. First run cabling from the CPU's keyboard, mouse, and video ports to the matching connectors in one of the master Wizard DVI's "CPU ports." This cabling can be either all separate PS/2 and DVI extension cables (EVNPS03-MM and EVNDVI02 respectively), or you can use our many-in-one ServSwitch DVI KVM Cable (see **Section 3.3.4**) to make the keyboard and mouse connections and up to four DVI connections. Then connect any additional DVI outputs from that CPU to the DVI connectors of the same-numbered CPU port on the subsidiary ServSwitch Wizard DVI. (You can also use a ServSwitch DVI KVM Cable for this—just don't attach anything to the keyboard and mouse connectors on the subsidiary Wizard DVI.) Or, if the CPU has simultaneous analog video outputs, connect them to the CPU-video connectors of the same-numbered CPU port on the subsidiary non-DVI Wizard switch.

Feel free to mix computers with multiple video outputs and computers with single outputs in your synchronized system. When you switch to a CPU with a single output, that output will be displayed on the first monitor and the additional monitors will be blank.

Figure 3-4 on the next page features a complete synchronized Wizard DVI system. For clarity, only two CPUs are shown.
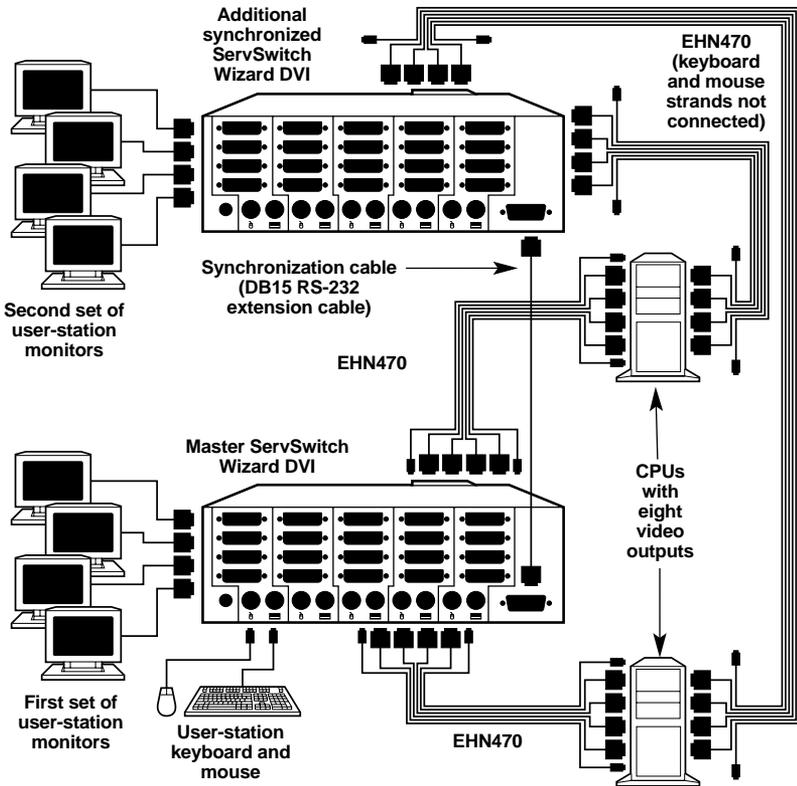
Figure 3-4. A synchronized system with two Quad-Head Wizard DVIs.

3.3.4 SERVSWITCH DVI KVM CABLES

The ServSwitch DVI KVM Cables are designed to connect a DVI switch to a CPU or another switch. They're built to the special three- or four-in-one design shown in Figure 3-5. The central coaxial video strand(s) of each cable are molded to the keyboard and mouse strands on either side. To help you tell the otherwise identical keyboard and mouse strands apart, they're labeled with a purple keyboard icon and a green mouse icon respectively.

The cable comes in three varieties (one with a single DVI video strand, one with two of these strands, and one with three), each of which is available in either 3-, 6-, or 10-ft. (1-, 1.8-, or 3-m) lengths: The single-video cable is product code EHN450-0003, EHN450-0006, or EHN450-0010 respectively; the dual-video cable and quad-video cables are EHN460 and EHN470 (use the same suffixes for lengths).
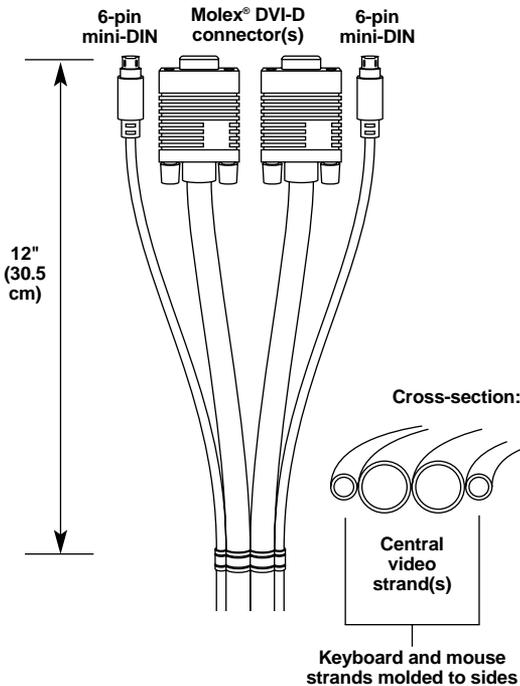
Figure 3-5. Construction of the ServSwitch DVI KVM Cables (EHN460 shown).

3.4 Powering the Wizard DVI

Once you've installed your ServSwitch Wizard DVI system and attached your equipment to it, you need to apply power to each Wizard DVI. Dual-Head and Quad-Head Wizard DVI models are demanding enough that they always need to be powered with their included external power supply. Single-Head Wizard DVIs can normally get all the power they need from the attached CPUs, so they don't come with an external power supply. (If you find that you need one for your application, they're available separately as product code PS649.)

If you're using an external power supply: Plug the power supply's output cord into the power jack on the back of the ServSwitch Wizard DVI, then attach the input cord to the power-supply transformer's IEC 320 inlet, then plug the input cord into utility (mains) power. (In this situation, always apply power to the ServSwitch Wizard DVI *first*, *then* power on the monitor and each of the computers; if you power up the computers before the Wizard DVI, the computers might not recognize the presence of the mouse or keyboard.) The Wizard DVI should start operating immediately; it has no ON/OFF switch.

If you're powering a Single-Head Wizard DVI with the attached CPUs: Power up the CPUs. The Wizard DVI (which has no ON/OFF switch) might be able to start operating automatically; it can draw power from the attached CPUs' keyboard interfaces, and a single cable connection to a CPU's keyboard port is usually sufficient to power the Wizard DVI if the cable isn't more than 3 meters (10 feet) long. (If more than one computer is connected to the Wizard DVI, you'll probably be able to use longer cables; the Wizard DVI will draw power intelligently from all attached computers.) As you power up your CPUs, watch the Wizard DVI's 7-segment display as discussed in **Section 5.1**: If it shows the number "1" or the letter "P," the Wizard DVI will be able to operate using the power it's receiving from the CPUs. But if it's blank, the Wizard DVI is not getting enough power from the CPUs, and you'll have to either use the power supply or swap in shorter CPU cables.

4. Configuration

To configure your ServSwitch Wizard DVI system, you'll first need to configure the attached PCs, as directed in **Section 4.1**, then the Wizard DVI itself, as directed in the rest of this chapter.

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 Your PCs

Configure your PCs in the same way that you would if your keyboard, mouse, and monitor(s) were all connected directly to your PCs. Keep in mind that the ServSwitch Wizard DVI emulates Microsoft compatible serial, IntelliMouse, and PS/2 mice; so you'll need to 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**.

4.2 Configuring the ServSwitch Wizard DVI

The ServSwitch Wizard DVI comes from the factory preset to default configuration settings that are suitable for most applications. If you want to turn its bootup autoswitching off, you can move position 1 of its DIP switch to OFF as described in **Section 4.2.1**. If you need to set any of the Wizard DVI's other user-selectable options differently, you can access its "configuration mode" to do so, as described in **Sections 4.2.2** through **4.2.11**. After you make configuration-mode changes, the new settings are stored in the ServSwitch Wizard DVI's EEPROM memory and are retained when the Wizard DVI is powered OFF.

4.2.1 TURNING BOOTUP AUTOSWITCHING ON OR OFF

Not all DVI video cards will properly detect the user-station monitor if their CPU is hot-plugged into the Wizard DVI, or if their CPU is not able to communicate directly with the monitor when the CPU is powered up. This can cause the DVI card not to display any video at all. For this reason, we have built an autoswitch into the Wizard DVI. In the Wizard DVI's factory-default setting (with position 1 of the 8-position DIP switch on the bottom of the unit set to ON), whenever an attached CPU is booted or rebooted, the Wizard DVI will automatically switch to that CPU port.

If your video cards are advanced enough that they will all provide video even if they don't see a monitor when the CPU is powered up, you might want to turn the Wizard DVI's bootup autoswitching feature off. To do this, move position 1 of the 8-position DIP switch on the bottom of the Wizard DVI to the OFF setting.

Changes to the setting of this switch position take effect immediately; you don't need to power the Wizard DVI off and back on again to activate the new setting.

4.2.2 ENTERING CONFIGURATION MODE

You can access the ServSwitch Wizard DVI's configuration mode in either of two ways: Use one method when you power up the Wizard DVI; use the other while the Wizard DVI is operating.

- To enter configuration mode at power-up, make sure that the ServSwitch Wizard DVI and all attached computers are turned OFF and unplugged. Hold down the front-panel pushbutton while you plug in the ServSwitch Wizard DVI (if you're using the power supply) or power up one or more of the attached CPUs (if the Wizard DVI is a Single-Head model and you're *not* using the power supply); do *not* release the button until the ServSwitch Wizard DVI displays "C" to show that it is in configuration mode.

- To enter configuration mode while the ServSwitch Wizard DVI is running, hold down its front-panel pushbutton for 5 seconds until the front-panel display shows "C".

In configuration mode, you can change settings by typing a single-letter command (for a given feature), followed by a single-digit numeric argument (for how you want that feature to behave), followed by the [Enter] key. Press the [Esc] (escape) key to abort a setting change before you fully enter it. The ServSwitch Wizard DVI will remain in configuration mode until you type the letter "E" followed by the [Enter] key.

For example: To set the hotkey sequence to option #2 ([Ctrl] + [Shift] + command key), type [H][2][Enter] while the ServSwitch Wizard DVI is displaying "C", then type [E][Enter] to exit configuration mode.

The remaining sections of this chapter describe the Wizard DVI's user-selectable configuration-mode settings.

4.2.3 SETTING THE SCREEN-SAVER TIMEOUT

The ServSwitch Wizard DVI has a programmable screen-saver function that will blank the display on the shared monitor(s) after a certain time elapses with no activity on the shared keyboard or mouse.

The Wizard DVI's front-panel display will flash while the Wizard DVI is in screen-saver mode. To restore the blanked monitor display, just type at the keyboard or move the mouse. Use the "B" command (type [B] [*digit*] [Enter]) to set how long the ServSwitch Wizard DVI waits for keyboard or mouse activity before activating the screen saver:

B1   Screen saver disabled (default)

B2   Screen saver is activated after 1 minute of inactivity

B3   2 minutes

B4   4 minutes

B5   8 minutes

B6   12 minutes

B7   16 minutes

B8   20 minutes

4.2.4 AUTOSCANNING: SETTING THE SCAN MODE AND PAUSE TIME

The ServSwitch Wizard DVI begins autoscanning its CPU channels (that is, briefly displaying each channel's video in turn) when you type in the hotkey sequence followed by the letter "A" (see **Section 5.5**). By default, the Wizard DVI only scans those channels that have a powered-up computer or cascaded switch connected to them. But if you need the Wizard DVI to scan all its channels, you can send it the [L][2] or [L][4] command. (In these settings, when the Wizard DVI scans a channel that has no computer or cascaded switch attached, or a channel whose attached computer or switch is off or just not outputting video, the shared monitor[s] will display a blank screen.) Also, if you want the Wizard DVI to start autoscanning as soon as it powers up, instead of waiting for the "A" command, you can send it the [L][3] or [L][4] command.

   Please keep in mind that in cascaded systems, it isn't possible to perform a single autoscan of the whole cascade; you must separately scan each Wizard DVI that has CPUs attached to it. During a scan, when a Wizard DVI switches to a port with a cascaded switch attached to it, the system will display the video from whatever channel is currently selected at the *cascaded* switch. Refer to **Section 5.10**.

   L1   ServSwitch Wizard DVI only scans active ports during autoscanning (default)

   L2   ServSwitch Wizard DVI scans every one of its ports during autoscanning

   L3   ServSwitch Wizard DVI powers on in autoscan mode and scans active ports only

   L4   ServSwitch Wizard DVI powers on in autoscan mode and scans all ports

CAUTION!

Many modern monitors are fitted with automatic power-saver relays and will automatically blank their displays after a short time if the computer they're communicating with becomes idle. If you are using such a monitor, you should not use the Wizard DVI's L2 or L4 setting unless you can set the monitor's power-saver timeout to an interval longer than the Wizard DVI's autoscan pause time (see the next page), because if the monitor keeps going in and out of power-saver mode during autoscanning, the constant switching ON and OFF of your monitor's relay will eventually damage your monitor.

While autoscanning, the Wizard DVI will pause at each channel to display that channel's video signal for the duration of the currently selected autoscan-pause time:

T1 During autoscan, the Wizard DVI pauses at each channel for 2 seconds (default)

T2   5 seconds

T3   7 seconds

T4   10 seconds

T5   15 seconds

T6   20 seconds

T7   30 seconds

T8   60 seconds

To get out of autoscan mode, simply select a fixed channel using the Wizard DVI's front-panel pushbutton, the keyboard hotkeys, or the mouse.

4.2.5 ENFORCING MOUSE SPEED

In its factory-default state, the ServSwitch Wizard DVI allows each CPU to handle mouse communication any way the CPU wants to. However, some CPUs with certain rare combinations of operating systems, mice, and mouse drivers can be abnormally sensitive to small timing changes in mouse communication. These CPUs can react badly to the presence of ServSwitch Wizard style KVM switches, making persistent timing errors that cause the mouse to seem slow or sluggish. This has especially been noted to occur while using Logitech mice with some HP® Vectra® machines running later versions of Windows NT® and Logitech mouse drivers.

It's extremely unlikely that this problem will occur in Wizard DVI systems. But if it does, one way to fix it is to change the mouse driver. But if this isn't an option, at least in the short term, you can send the Wizard DVI the [L][6] command. This causes the Wizard DVI to take a more active role in mouse communication, ensuring that the CPU won't have timing problems and keeping the mouse up to speed.

L5   ServSwitch Wizard DVI allows CPU to react to the mouse at any speed (default)

L6   ServSwitch Wizard DVI forces normal mouse speed

4.2.6 SETTING MOUSE-MODE REPORTING AND ENABLING/DISABLING MOUSE SWITCHING

In the ServSwitch Wizard DVI's factory-default state, you can use a three-button PS/2 mouse or an IntelliMouse to cycle through the Wizard DVI's CPU channels. To switch to the next channel, simply hold down the center or "wheel" button on the mouse, then press its left button. If you don't want to use this feature—particularly if it's going to conflict with mouse-controlled application functions—you can disable it by sending the [U][2], [U][3], or [U][5] command. If the third button on a three-button mouse is being used to switch the Wizard DVI, it won't be available for use with PC software, although the wheel on an IntelliMouse can be used for both switching and software with no problems. For this reason, we've included the [U][1] and [U][2] command options, which cause the Wizard DVI to report to the attached PCs that they are attached to a two-button mouse. If you want to use all the functions of a three-button mouse or IntelliMouse for your PC software, you should send the Wizard DVI the [U][3] or [U][5] command.

The ServSwitch Wizard DVI supports "Internet mice" that are compatible with the Microsoft IntelliMouse. These are fitted with a wheel or other type of scrolling control and sometimes have additional buttons. Many such mice are available from several different manufacturers.

You can connect either a standard PS/2 mouse or an IntelliMouse compatible mouse to the Wizard DVI's control port. You can configure your CPUs using Microsoft PS/2 or IntelliMouse drivers in any combination as required.

IntelliMouse features are supported on both PS/2 and RS-232 CPU connections. When you use PS/2 CPU connections, the Wizard DVI will configure itself automatically to the type of mouse requested by the driver. If you are using RS-232 CPU connections, you will need to send the [U][4] or [U][5] command to enable the IntelliMouse features.

U1 Channels are mouse-switchable; the Wizard DVI reports " two-button mouse" to the attached PCs (default)

U2 Channels are not mouse-switchable; the Wizard DVI reports " two-button mouse" to the attached PCs

U3 Channels are not mouse-switchable; the Wizard DVI reports "three-button mouse" to the attached PCs

U4 Channels are mouse-switchable; the Wizard DVI reports "IntelliMouse" to the attached PCs

U5 Channels are not mouse-switchable; the Wizard DVI reports "IntelliMouse" to the attached PCs

4.2.7 CHOOSING ACTIVE PORTS OR ALL PORTS FOR KEYBOARD-TAB AND MOUSE SWITCHING

In the ServSwitch Wizard DVI's factory-default state, when you "cycle through" the CPU ports on the Wizard DVI by pressing {Hotkeys} + [Tab], or when you switch to the next or previous channel with your mouse, the Wizard DVI stops at *every* channel. It does this even if the device attached to a particular channel is off or not outputting video, or even if there *isn't* any device attached to that channel. (The Wizard DVI will display a blank screen for such channels.) But if you'd rather have the Wizard DVI "skip over" any ports that don't have a powered-up computer or cascaded switch connected to them, you can send it the [U][8] command.

U7   Switch to all ports when switching with {Hotkeys} + [Tab] or with the mouse (default)

U8   Switch only to active ports when switching with {Hotkeys} + [Tab] or with the mouse

The U7/U8 setting has no effect on autoscanning (see **Section 4.2.4**) or on switching with {Hotkeys} + [*digit*], with the front-panel pushbutton, or through the RS-232 serial interface.

4.2.8 SETTING THE HOTKEY SEQUENCE

You can access many of the ServSwitch Wizard DVI's main functions (such as CPU-channel selection, autoscanning, and locking) by sending commands from the shared keyboard. Each command must start with a "hotkey sequence" (series of keystrokes) that alerts the Wizard DVI to interpret the keyboard data that follows it as a command. The default hotkey sequence is [Ctrl] and [Alt] pressed simultaneously. If any of the applications on computers attached to the Wizard DVI require this sequence to trigger important application-specific functions, you will have to change the Wizard DVI's hotkey sequence with the "H" command (type [H][*digit*][Enter]).

Alternative hotkey sequence #5 is particularly suitable for extended keyboards where additional keys can be programmed to act as combinations of other keys. If you program one of these "spare" keys to produce both hotkey keystrokes, or if you program a set of these keys to produce the hotkey *and* channel-number keystrokes, you'll be able to select channels, lock the Wizard DVI, etc., with as few as one or two keypresses.

H1 Either of the left and right [Ctrl] keys and either of the left and right [Alt] keys together (default)

H2 Either of the left and right [Ctrl] keys and either of the left and right [Shift] keys together

H3 Either of the left and right [Alt] keys and either of the left and right [Shift] keys together

H4 Right [Alt] key only

H5 Both the left and right [Alt] keys together

H6 The left [Ctrl] key and the left [Alt] key together

H7 The right [Ctrl] and the right [Alt] key together

H8 No hotkey enabled; the hotkey-dependent functions can't be accessed from the keyboard

4.2.9 VIEWING THE FIRMWARE REVISION, RESTORING MOUSE FUNCTION, OR RESETTING TO FACTORY DEFAULTS

For technical-support purposes, it might be necessary to find out the firmware-release version of the control software in your ServSwitch Wizard DVI. Before calling Black Box Tech Support about a problem, you can use the [F][1], [F][2], and [F][3] commands to retrieve this; each of these commands causes the Wizard DVI to briefly show one of the digits of the firmware's version number on its front-panel display. For example, if the Wizard DVI responds to [F][1][Enter] with the digit "1", to [F][2][Enter] with the digit "0", and to [F][3][Enter] with the digit "2", your Wizard DVI is using firmware version 1.02.

You can also restore the function of previously disconnected PS/2 type CPU mouse ports with the [F][5] and [F][6] commands (see **Section 5.8**) and you can reset all of the Wizard DVI's configuration options to their factory-default states with [F][8].

F1   Display first digit of firmware-version number

F2   Display second digit of firmware-version number

F3   Display third digit of firmware-version number

F4   (Reserved for future use)

F5   Restore PS/2 mouse function to the currently selected CPU's mouse port

F6   Restore IntelliMouse function to the currently selected CPU's mouse port

F7   (Reserved for future use)

F8   Reset all configuration options to their factory-default settings (the Wizard DVI will briefly show the letter "r" on its front-panel display to indicate that this has been completed)

4.2.10 SETTING THE PASSWORD

There are many situations where access to corporate file servers or sensitive information needs to be controlled. In such circumstances, the ServSwitch Wizard DVI can be locked in a room or secure cabinet and controlled remotely. In this mode, you can type the hotkey sequence followed by the letter "L" at the keyboard in order to "lock" the Wizard DVI. When you do so, the Wizard DVI blanks the screen, disconnects the keyboard and mouse from all the computers, and displays the letter "P" on its front-panel display. Control can only be regained by typing the correct password on the keyboard.

To set this password, get into configuration mode, then type the letter "P" and press the [Enter] key. The ServSwitch Wizard DVI will light the middle and bottom segments of its front-panel display, so that it resembles a wide equals sign, and you can then type your password. 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.) When you've finished typing in your password, press [Enter] to save it to the Wizard DVI's EEPROM. (This type of memory does not depend on active power or even a battery backup, so it can persist indefinitely.) 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. (The exception to this is if somebody locks the Wizard DVI, and you discover only then that you messed up entering the password or can't remember what the password is. At that point, you'll have to power down the Wizard DVI and hold down its front-panel pushbutton while powering it back on to get back into configure mode—as described in **Section 4.2.2**—in order to change the password.)

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 Wizard DVI before you've set a password, or after you've removed the password, the Wizard DVI will still blank the video, but it won't prevent someone from selecting another channel.)

4.2.11 EXITING CONFIGURATION MODE

When you've finished configuring the ServSwitch Wizard DVI, simply type the letter "E" and press [Enter]. The Wizard DVI will exit the configuration mode and return to normal operation. The attached computers can now be switched on.

5. Operation

This chapter explains how to operate the ServSwitch Wizard DVI. Please read this chapter carefully before starting to use the Wizard DVI; also make sure you have read the note at the start of **Chapter 4**.

5.1 Power Status

At power-up, the ServSwitch Wizard DVI will try to select CPU channel #1 unless (a) a password has been set or (b) the Wizard DVI isn't getting enough power to operate properly. Watch the Wizard DVI's front-panel 7-segment display, as described in Figure 5-1: If the Wizard DVI is not receiving enough power, the display will be blank; if the Wizard DVI can select CPU 1, the display will show "1"; or if a password has been set, the Wizard DVI will display "P" and remain locked until a valid password is entered. (For the meaning of this display after power-up, see **Section 5.3**.)

DISPLAY SHOWS: **MEANING:**
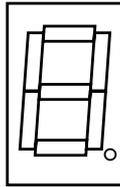
Blank   Switch is not receiving nearly
                                                                 enough power to operate
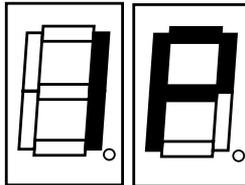
The number "1"   Switch has powered up normally
                                                          and has selected channel 1
————   ————
The letter "P"   Switch has powered up normally
                                                        but is locked and is waiting for
                                                          the password to be entered

Figure 5-1. The front-panel status display at power-up.

5.2 The Front-Panel Pushbutton and the Remote-Control Module

You can use the ServSwitch Wizard DVI's front-panel pushbutton to select which CPU channel (CPU port) is currently controlled by the active control port. Press the key once during normal operation to select the next CPU channel in sequence (for example, to select channel 4 if channel 3 is currently selected); press the key repeatedly to manually cycle through the channels.

You can also use this button to access the ServSwitch Wizard DVI's configuration mode (see **Section 4.2.2**). To access configuration mode while the Wizard DVI is operating, press the button and hold it down for 5 seconds until "C" appears on the Wizard DVI's front-panel display.

An optional Remote-Control Module ("RCM") is also available for the ServSwitch Wizard DVI. It's a small hand-held component—with a SELECT key that mimics the Wizard DVI's pushbutton and an identical copy of the Wizard DVI's front-panel display—whose cord you can plug into the Wizard DVI's RS-232 port. This is particularly useful in applications where the ServSwitch Wizard DVI is located some distance from the shared keyboard, mouse, and monitor. The RCM can be conveniently attached to your keyboard with the included VELCRO strips so you can have channel information and channel-selection control at your fingertips.

At the time of this writing, four different models of the Remote-Control Module are available, each with a different cord length: 10 ft. (3 m, product code KV6REM), 25 ft. (7.6 m, KV6REM-25), 50 ft. (15.2 m, KV6REM-50), and 75 ft. (22.9 m, KV6REM-75).

5.3 The Status Display

The ServSwitch Wizard DVI's front-panel 7-segment status display usually shows the number of the currently selected computer channel, while the dot LED alongside it flashes in response to data from the shared keyboard or mouse (see the top illustration in Figure 5-2). If you select autoscan mode, however, the display will alternately (a) display the current channel number and (b) light each of its outer six LED segments, one after the other, in a clockwise sequence, as shown in the second illustration. If the Wizard DVI is in configuration mode, it will display "C". If the Wizard DVI has been locked, it will display "P" until a valid password has been typed to unlock the Wizard DVI. Finally, if the screen-saver mode has been activated, the channel number will flash.

DISPLAY SHOWS:		MEANING:
Channel number 1 through 8, steadily lit		That channel is selected
As above, with flashing dot in lower right-hand corner		Switch is receiving keyboard or mouse data to be transmitted to the selected computer
Zero		Display's disabled, but not controls
Alternately, channel number and clockwise progression of lit segments		Switch is in autoscan mode, scanning from channel to channel at user-selected rate
The letter "P"		Switch is locked and is waiting for the password to be entered
The letter "C"		Switch is in configuration mode
Channel number, flashing		Switch is in screen-saver mode and is waiting for keyboard or mouse activity to restore video
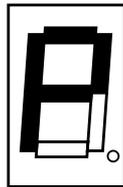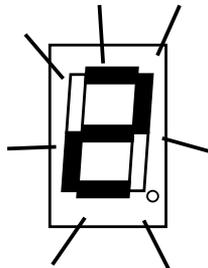
Figure 5-2. The front-panel status display during regular operation.

5.4 Things to Keep in Mind About the Keyboards and Mice

CPU bootup sequence: When your computer CPUs are powered on, they communicate with any attached keyboards and mice and load the setup parameters required by their particular operating systems. It's necessary for the ServSwitch Wizard DVI 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 computer 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 ServSwitch Wizard DVI will have no immediate effect, but the CPU will lose mouse function as soon as you plug the mouse back in. (RS-232 mouse-port connections can usually be freely unplugged and replugged, provided that a mouse was connected when the operating system initially booted.) The ServSwitch Wizard DVI has a PS/2 mouse-recovery system that allows you to disconnect and reconnect the shared mouse without powering down the system, but we recommend using this only when absolutely necessary. See **Section 5.8** for details.

Keyboard- and mouse-mode handling during channel switching: The ServSwitch Wizard DVI keeps a log of the keyboard and mouse modes and resolution settings requested by each of the connected computer CPUs, including the keyboard Num Lock, Caps Lock, and Scroll Lock states. These settings are automatically restored to the shared keyboard and mouse when the ServSwitch Wizard DVI channel is switched, ensuring maximum software compatibility.

5.5 Keyboard Control: Hotkey Commands

You can control many functions on the ServSwitch Wizard DVI—such as CPU-channel selection, autoscanning, or locking—from the keyboard, using commands triggered with the Wizard DVI's currently selected hotkey combination. All the hotkey-control commands are invoked by holding down the one or two hotkeys and then pressing a command key. By default, the two hotkeys are [Ctrl] and [Alt], although other keystroke combinations can be selected (see **Section 4.2.8**).

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], the "switch to next CPU channel" command; you can "tab through" the channels by holding down the hotkeys and repeatedly pressing [Tab].

The hotkey commands are summarized below and on the next page. 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 Wizard DVI doesn't recognize keypad numbers.

- Use {Hotkeys} + [*x*], where *x* is a number from one to two (on the 2-port model) or one to four (on the 4-port model), to switch to the corresponding CPU channel. If you try to select a channel with a higher number than the Wizard DVI has ports, the Wizard DVI will ignore the command and pass it through to the currently selected computer.

- Use {Hotkeys} + [Tab] to switch to the next channel in numeric sequence (if the Wizard DVI is set to "U7") or to the next *active* channel (if the Wizard DVI is set to "U8"); refer to **Section 4.2.7**.

- Use {Hotkeys} + [A] to have the Wizard DVI start autoscanning (briefly displaying the video from each CPU channel in turn). You can control whether or not it scans empty channels, and for how long it pauses at each channel, with the "L1" through "L4" and "T*x*" configuration commands respectively (see **Section 4.2.4**). To stop autoscanning, simply select a fixed channel using the Wizard DVI's front-panel pushbutton, the keyboard hotkeys, or the mouse (if mouse switching is enabled and the mouse is a three-button or IntelliMouse type).
  Please note that, in cascaded systems, it is not possible to scan through all of the channels on every Wizard DVI in the same scan. Each Wizard DVI must be scanned separately.

- Use {Hotkeys} + [0] to select nonexistent "channel zero" in order to shut off the video output from the Wizard DVI to the shared monitor(s). The Wizard DVI's front-panel display will show "0". You can re-enable video by selecting another channel through the keyboard, front-panel pushbutton, or mouse.

- Use {Hotkeys} + [L] to lock the Wizard DVI (disable its shared keyboard and mouse and select nonexistent "channel zero" in order to shut off the video output from the Wizard DVI to the shared monitor[s]). If a password has not been set (see **Section 4.2.10**), the Wizard DVI behaves exactly as if you had entered {Hotkeys} + [0] (see above). If a password has been set, the Wizard DVI displays "P" to indicate that a valid password must be entered to unlock the switch; simply type in the password followed by the [Enter] key to do so. Note that if anyone has tried to type something at the shared keyboard while the Wizard DVI 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} + {Channel Address} to select a CPU channel in a cascaded system (see **Section 5.10**). The {Channel Address} is a series of single-digit channel numbers that specify the "path" to follow to get from the master ServSwitch Wizard DVI to the desired CPU channel on the subsidiary Wizard DVI. For example, if you want to access
  →CPU port **4** on a "second-layer" subsidiary Wizard DVI connected to
  →CPU port **2** on a "first-layer" subsidiary Wizard DVI connected to
  →CPU port **3** on a master Wizard DVI, you would enter:
  {Hotkeys} + [3][2][4].

To make sure that the Wizard DVI doesn't switch prematurely to the wrong channel, hold down the hotkeys until you enter the last digit, *then* release them.

Examples of common hotkey commands (assuming the hotkeys are [Ctrl] and [Alt]):

- *To select channel 2:*
  Press and hold [Ctrl] and [Alt], press and release [2], release [Ctrl] and [Alt].

- *To "tab through" channels:*
  Press and hold [Ctrl] and [Alt], press and release [Tab] (repeat as many times as necessary), release [Ctrl] and [Alt].

- *To select channel 1 on an 2-port subsidiary Wizard DVI connected to port 4 on a 4-port master Wizard DVI:*
  Press and hold [Ctrl] and [Alt], press and release [4], press and release [1], release [Ctrl] and [Alt].

5.6 Mouse Control

Yet another convenient way to select CPU channels on the ServSwitch Wizard DVI is through a three-button mouse, if this feature is enabled (see **Section 4.2.6**). As shown in Figure 5-3 (button to hold down is black, button to click is gray):

- To switch to the *next* channel, hold down the central mouse button or "wheel" button, then click on the *left-hand* mouse button.

- To switch to the *previous* channel, hold down the central mouse button or wheel button, then click on the *right-hand* mouse button.

Depending on whether the Wizard DVI's set to "U7" or "U8" (see **Section 4.2.7**), the mouse will switch to either each channel in sequence or to *active* channels only.

Select next channel:

Three-button mouse   **Wheel mouse**

Select previous channel:

Three-button mouse   **Wheel mouse**
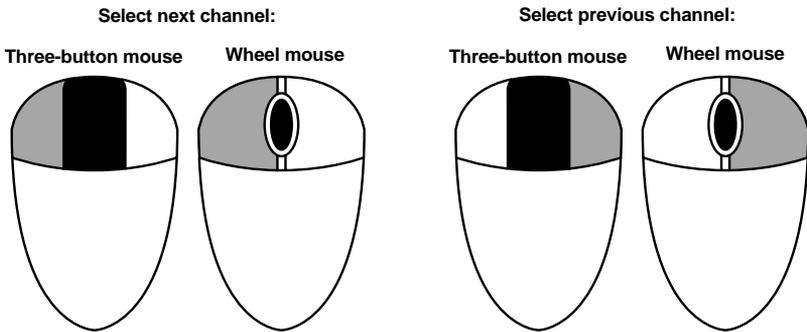
Figure 5-3. Using the mouse buttons for switching.

5.7 Re-Enabling a Disconnected PS/2 Mouse

If you accidentally disconnect the shared PS/2 mouse from the ServSwitch Wizard DVI while the Wizard DVI is operating, the mouse will not work correctly when you plug it back in. To avoid having to reboot the entire system in this situation, the Wizard DVI has an automatic mouse-recovery system.

   With the PS/2 mouse disconnected, change the channel using the Wizard DVI's front-panel pushbutton or the keyboard hotkeys. The ServSwitch Wizard DVI detects that the mouse has been disconnected and triggers the automatic recovery system. Plug in the PS/2 mouse and the ServSwitch Wizard DVI will re-initialize it.

   Alternatively, you can reset the keyboard and mouse by holding the Wizard DVI's front-panel pushbutton down for five seconds to enter configuration mode, then releasing the button, then pressing the button again while the display shows "C". When you do, the Wizard DVI will perform a complete power-off reset of the connected keyboard and mouse. This function only resets the shared keyboard and mouse that are plugged into the control port; it does not affect the status of any of the other ports on the Wizard DVI or of the CPU connections.

5.8 Hot-Plugging Devices Into the ServSwitch Wizard DVI and Re-Enabling Disconnected CPU PS/2 Mouse Ports

We suggest that, if possible, you turn off the computers that will be connected to the ServSwitch Wizard DVI before you install a Wizard DVI system. However, most systems can be "hot-plugged" (connected to the Wizard DVI while they are powered and operating); the PS/2 mouse-port malfunctions this usually causes can often be overcome by using the ServSwitch Wizard DVI's mouse-restoration functions. (The keyboard connection will normally restore itself automatically.)

   This is an issue because, on many computer CPUs, mouse movement will be lost if the PS/2 mouse is unplugged and plugged back in while the CPU is running. Mouse movement can then only be restored by rebooting the CPU. This is because the mouse drivers only set up and enable the mouse when the CPU is initially booted.

   If you have powered down your ServSwitch Wizard DVI, or if you are attempting to hot-plug a system into it, you might be able to restore lost mouse movement using the ServSwitch Wizard DVI's mouse-restoration functions.

   Important: Mouse-restoration functions should be used with caution, because unpredictable results might occur if the wrong mouse type is selected. If in doubt, restore the mouse by rebooting the CPU normally.

Standard PS/2 mouse data uses a different data format than IntelliMouse data, so two reset functions are provided on the ServSwitch Wizard DVI. The type of data format expected by the CPU depends upon the driver and the type of mouse that was connected when the driver was booted. The following table may be used as a guide; note that the mouse-reset functions predict the likely mouse *resolution* settings but may not restore the *speed* or *sensitivity* of the mouse exactly as they were when the CPU 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	F5
PS/2	IntelliMouse	PS/2	F5
IntelliMouse	PS/2 only	PS/2	F5
IntelliMouse	IntelliMouse	IntelliMouse	F6

To restore lost mouse movement on a CPU connected to the ServSwitch Wizard DVI:

1. Select the CPU that has lost its mouse movement.

2. Press and hold the pushbutton on the front of the ServSwitch Wizard DVI for five seconds until "C" appears in the front-panel display. The Wizard DVI is now in configuration mode.

3. To restore a PS/2 mouse connection, type the letter "F", then the number "5", then [Enter]. Or, to restore an IntelliMouse connection, type the letter "F", then the number "6", then [Enter].

4. Exit from configure mode by typing the letter "E" followed by [Enter].

5. Test the mouse movement by moving the mouse a short distance.

5.9 RS-232 Control

There is yet one more way to select channels on the ServSwitch Wizard DVI: through its RS-232 serial port. (This is a proprietarily pinned DB15 connector; see **Section A.3** of the **Appendix** for more information.) This connector serves more often as the attachment point for the Wizard DVI's optional Remote-Control Module, but by using an adapter you can connect a different RS-232 device to it. To select a channel through this port, the data rate and format of the sending device must be set to 1200 bps, 8 data bits, no parity, and 1 stop bit. No handshaking (flow control) is used by the ServSwitch Wizard DVI.

Simply send the ASCII character for the channel which needs to be selected: ASCII "1" (31 hex, 49 decimal) will select channel 1, ASCII "2" (32 hex, 50 decimal) will select channel 2, and so on. The Wizard DVI will echo this character back to the sending device when the channel has been changed. At the time of this writing, this method is best used to switch channels on single Wizard DVIs; switching synchronized Wizard DVIs would require carefully pinned special cabling, and switching cascaded Wizard DVIs this way isn't possible.

5.10 Operating Cascaded ServSwitch Wizard DVIs

As described in **Section 3.3.2**, multiple ServSwitch Wizard DVIs can be cascaded together. To select channels in cascaded systems, you will need to send hotkey commands from the master Wizard DVI's attached keyboard (see the "{Hotkeys} + {Channel Address}" paragraph in **Section 5.5**).

For an example of hotkey switching, consider a situation in which two ServSwitch Wizard DVIs are connected together as shown in Figure 5-4 on the next page. To select the computer attached to port 1 on the subsidiary ServSwitch Wizard DVI, you would press and hold down the hotkeys, then press and release "3," press and release "1," and finally release the hotkeys. This causes the master Wizard DVI to switch to its port 3, to which the subsidiary Wizard DVI is attached, and send the subsidiary Wizard DVI the command to switch to port 1, to which your desired computer is attached.

Please note that it is not possible to autoscan every channel in a cascaded system with a single scan. Cascaded Wizard DVIs must be scanned individually using their front-panel pushbuttons or {Their Hotkeys} + [A]. When you switch or scan to a port on a Wizard DVI to which a subsidiary Wizard DVI is attached, the Wizard DVI system will display the video from the currently selected port on the *subsidiary* Wizard DVI.
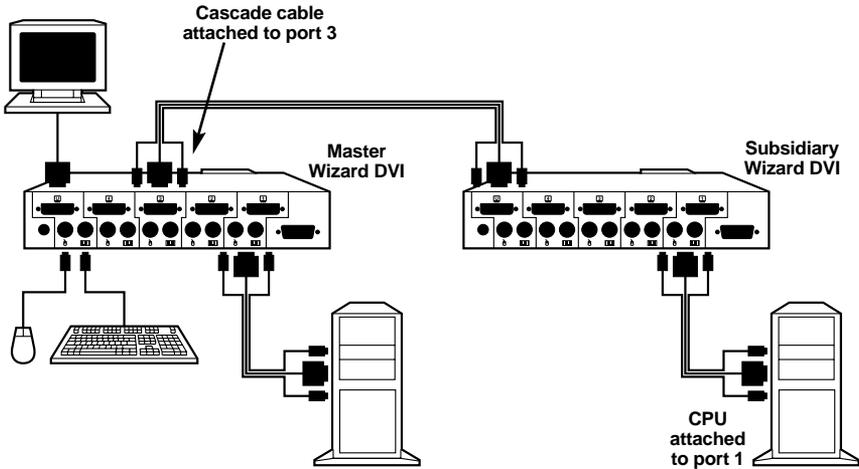
Figure 5-4. Cascade layout.

5.11 Operating Synchronized ServSwitch Wizard DVIs

As described in **Section 3.3.3**, multiple ServSwitch Wizard DVIs or other ServSwitch Wizard models can be interconnected with serial cable and synchronized to support CPUs with large numbers of video outputs. To select channels in synchronized systems, just send a hotkey command from the master Wizard DVI's attached keyboard, press the master Wizard DVI's front-panel pushbutton, or—if this is enabled—send a switching command from the master Wizard DVI's attached mouse. This command will be echoed out of the master Wizard DVI's OPTIONS port and received by the other synchronized Wizard switch(es), which will switch to the same port. If you have your system cabled correctly, all the video outputs from the CPU you've selected will now be displayed.

5.12 Performing a Warm Reset

Sometimes, when problems occur in a ServSwitch Wizard DVI system, powering the Wizard DVI off and back on again can fix the problem. If a Wizard DVI is getting power from its external power supply, you can do this by unplugging and replugging the power supply. But if a Single-Head Wizard DVI is getting power from the attached computers, the only way to shut it down is to disconnect it from those computers or turn the computers off, which might not be desirable or possible.

Instead of powering the Wizard DVI off and back on to completely reinitialize it, you can accomplish the same results by having the Wizard DVI do a "warm reset" (hardware reset) while it's still operating. You'll see an 8-position DIP switch on the bottom of the Wizard DVI. Move position 8 of this switch (the rightmost one if you hold the Wizard DVI with its front panel facing the ceiling) to the ON (up) position to make the Wizard DVI halt; move position 8 back to OFF (down) to reset the Wizard DVI and return it to normal operation.

Even though the Wizard DVI doesn't have any CPU startup communication to work with after a warm reset, it should still be able to autodetect the correct keyboard mode and mouse type under most circumstances. Occasionally, however, you'll also need to do a mouse reset and/or recovery (see **Sections 5.7** and **5.8**) to get the mouse working properly.

Note: Aside from position 8 and position 7 (used for firmware upgrades, as described in the next section), all of the positions of the Wizard DVI's DIP switch are reserved for future use. Do *not* change their settings.

5.13 Upgrading the Wizard DVI's Firmware

Because the ServSwitch Wizard DVI stores most of its firmware (its "operating system," if you will) in flash memory, the firmware is upgradable. To fix bugs in existing firmware, or to add features to your Wizard DVI, Black Box Technical Support might sometimes recommend that you upgrade the Wizard DVI's firmware if a newer revision is available. (Follow the procedure described in **Section 4.2.9** to find out which firmware version your Wizard DVI is currently running.)

To upgrade the Wizard DVI's firmware, you'll need a "host PC," which must be an IBM PC compatible computer with an RS-232 serial port. This computer must be running an operating system that can execute DOS programs, such as MS-DOS® or Windows® 3.x, 95, or 98. (We don't recommend using computers running Windows 2000 or Windows XP®—see the Note on the next page). You'll also need

a DB9 female to DB15 male firmware-upgrade cable (product code KV6SER) to transfer the firmware files to the Wizard DVI. (Refer to Figure A-3 in the **Appendix** for the pinning of this cable.)

NOTE

The programs used to upgrade the firmware of the Wizard DVI are DOS-based for the maximum range of OS compatibility. They run quite efficiently under DOS, Windows 3.x, Windows for Workgroups, Windows 95/98/Me, and even Windows NT, taking roughly 10 minutes to complete the upgrade. But when these programs are run under Windows 2000 or Windows XP, which don't handle DOS programs well, they can take substantially longer. Upgrades will be reliable but might require three or more hours to complete. For this reason we recommend that you run the upgrade programs on a computer using an older version of Windows.

Take these steps to perform the upgrade:

1. Download the firmware-installation/verification program (probably named "SSW*xyz*.EXE") and the firmware binary itself (probably "SSW*xyz*.HEX") from our Web site at **www.blackbox.com** onto the host PC. If you can't find these files on our Web site, Tech Support can help. (In these filenames, *xyz* = the *x.yz* firmware-revision level; for example, "SSW118.EXE" would be the installation program for firmware revision 1.18.)

2. Run the firmware-upgrade cable from the host PC to the OPTIONS port on the ServSwitch Wizard DVI.

3. There is an 8-position DIP switch on the bottom of the Wizard DVI. Move position 7 of this switch (the next-to-the-rightmost one if you hold the Wizard DVI with its front panel facing the ceiling) to the ON (up) position to set the Wizard DVI to "upgrade mode."

4. Do a full reset of the Wizard DVI: Either power it down and back up again, or move position 8 of its DIP switch to the ON (up) position and back to OFF (down) to do a warm reset (see **Section 5.12**).

At this point, make *very sure* that the Wizard DVI is receiving adequate power. The upgrade program monitors the Wizard DVI's voltage and won't allow an upgrade to proceed if the voltage is insufficient. If you're using a power supply with the Wizard DVI, it's definitely going to get the power it needs. If the Wizard DVI is a Single-Head model powered by the attached computers, it's normally possible to perform an upgrade when the Wizard DVI is powered by a single computer, but it's a good idea to power up all the computers attached to the switch anyway. This minimizes the possibility that power will fail during an upgrade because of a sudden brownout, cable disconnection, etc.

The ServSwitch Wizard DVI's front-panel 7-segment display should now show a lowercase "u" to indicate that the Wizard DVI is ready to be upgraded:
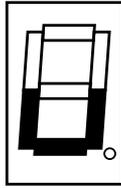
5. Run the SSW*xyz*.EXE firmware-upgrade program that you downloaded in step 1. Follow the directions that appear on the host PC's screen to transfer the new firmware to the Wizard DVI. The Wizard DVI's 7-segment display will change to show an uppercase "U" and its dot will flash to show that the Wizard DVI's receiving data from the PC:
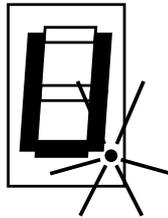
6. When the upgrade's complete, the 7-segment display will change back to the lowercase "u" and the dot will stop flashing. Move position 7 of the Wizard DVI's DIP switch back to OFF (down) to return the Wizard DVI to normal operation.

CAUTION—if the upgrade goes wrong:

The upgrade program rewrites the Wizard DVI's existing firmware code with the code in the SSW*xyz*.HEX file. If the upgrade process is interrupted, the Wizard DVI will contain invalid code and will not operate properly. A partial, interrupted, or failed upgrade can be fixed, but only if you *immediately* repeat the upgrade process *without* turning OFF position 7 of the Wizard DVI's DIP switch. (The code that the Wizard DVI uses to download new firmware is not itself affected by the upgrade process.) If you move position 7 back to OFF after a failed upgrade attempt, the Wizard DVI will begin running the incomplete code. This could have unpredictable results and might damage your Wizard DVI or the attached equipment!

7. Verify that the upgrade has been successful by having the Wizard DVI indicate its new firmware revision as described in **Section 4.2.9**.

6. Troubleshooting

6.1 Things to Try

This section suggests possible answers for a number of problems that people some-
times encounter when trying to operate the ServSwitch Wizard DVI. If the suggested
actions don't solve your problem, or if you don't see a listing for the type of trouble
you're having, contact Black Box Technical Support as described in **Section 6.2**.

Problem:
Poor video quality with excessive noise in the signal.

Possible Solution:
This can happen if (a) you're using low-quality cable, (b) you've run the cable too
far, or (c) you're trying to run video at a refresh rate too high for the cable to
carry. Use high-quality shielded or screened coaxial video cables to connect your
devices to the ServSwitch Wizard DVI, and keep them as short as possible. If you
already are, try lowering the refresh rate.

Problem:
The CPU channel changes automatically whenever you boot or reboot a CPU.

Possible Solution:
This is the Wizard DVI's default behavior, in order to make sure that your CPUs'
DVI cards detect the monitor properly. If you find that your DVI cards don't need
this feature, you can turn it off; see **Section 4.2.1**.

Problem:
Your mouse does not move the cursor/pointer.

Possible Solutions:
If you move the mouse and the activity indicator (the dot on the 7-segment
display) does not flash, then the ServSwitch Wizard DVI is not receiving data from
the mouse. Check the mouse's connection to the Wizard DVI; if it's OK, try
resetting the mouse using the reset function (see **Section 5.7**), warm-resetting the
Wizard DVI (see **Section 5.12**) or powering the Wizard DVI OFF and then ON
again. If you are attempting to connect the Wizard DVI to a CPU with a PS/2
mouse connection that has not been powered down, you will need to use the
mouse-restoration function F5 or F6 (see **Section 5.8**).

Make sure that the selected computer's software is configured to accept a
Microsoft compatible PS/2 mouse of the type that you have connected.

Make sure that (a) the mouse and computer were both connected to the
ServSwitch Wizard DVI before any part of the system was powered up, and (b) the
Wizard DVI 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 Wizard DVI (if you're using a power supply with it), 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 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.

Problem:
Just using your mouse normally causes the CPU channel to change unexpectedly.

Possible Solutions:
Some cheaper mice are not fully compatible with the ServSwitch Wizard DVI and can lose data, which—if mouse switching is enabled (see **Section 4.2.6**)— sometimes causes the Wizard DVI to interpret a data stream as a channel-change request. Try using a Microsoft, Logitech, IBM, Compaq, or Hewlett-Packard® mouse instead.

Make sure that you are using a Microsoft compatible mouse driver on your PC. Some drivers by other manufacturers can cause the mouse to use proprietary mouse-data formats that the Wizard DVI doesn't support. If you have unplugged and reconnected a mouse to the ServSwitch Wizard DVI, make sure that you reset it (see **Section 5.7**) or—especially if the mouse is an IntelliMouse—use the mouse-restoration function (see **Section 5.8**).

Problem:
The mouse moves very slowly but otherwise functions correctly.

Possible Solutions:
Change to a Microsoft mouse driver or set the Wizard DVI to the "L6" configuration option. See **Section 4.2.5**.

Problem:
The cursor/pointer jumps around the screen after you disconnect the mouse cable or power down the ServSwitch Wizard DVI.

Possible Solution:
If you have disconnected and reconnected a CPU mouse cable or you have powered down the ServSwitch Wizard DVI, and you're using a PS/2 mouse or IntelliMouse, the mouse might have gotten out of sync with the CPU. Try the mouse-reset function (see **Section 5.7**) or the mouse-restoration function (see **Section 5.8**), or reboot the CPU.

Problem:

Compaq MX11800 model integrated keyboard and mouse only: The mouse consistently fails to boot when the Wizard DVI is connected to PCs running Windows NT 4.0 through their PS/2 style mouse ports.

Possible Solutions:

There are three possible solutions to this problem:

   1. Use a different type of mouse.

   2. Connect the Wizard DVI to your NT 4.0 PCs through adapters and their serial ports rather than through their PS/2 ports.

   3. Select channel 0, or another channel that is not connected to an NT 4.0 PC, while NT is booting. You should be able to use the system normally once the logon screen appears.

6.2 Calling Black Box

If you determine that your ServSwitch Wizard DVI 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 nature and duration of the problem;

   • when the problem occurs;

   • the components involved in the problem—that is, what types of computers, what type of keyboard, brand of mouse, make and model of monitor, 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.

6.3 Shipping and Packaging

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

   • Package it carefully. We recommend that you use the original container.

   • Before you ship the Wizard DVI back to Black Box for repair or return, contact us to get a Return Authorization (RA) number.

Appendix: Cable Guidelines

IMPORTANT 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 Wizard DVI

All the shared devices plug directly into the relevant control-port connectors at the rear of the ServSwitch Wizard DVI.

If you're *not* using a power supply with your Single-Head ServSwitch DVI, these peripherals' cables should be no longer than 2 m (6 ft.). If you *are* using a power supply with your Wizard DVI, you can use extension cables to increase the distance from the Wizard DVI to your peripherals to as much as 5 m (16 ft.): You can plug the monitor cable(s) into male/female DVI extension cable(s) such as EVNDVI03, and plug the keyboard and mouse cables into PS/2 extension cables such as EVNPS03-MF.

A.2 Cabling from the Wizard DVI to the CPUs

None of the cabling running from the ServSwitch Wizard to the CPU should be longer than 5 m (16 ft.).

Video cabling: Should be DVI-D male to DVI-D male. You can use a DVI video strand of a ServSwitch DVI KVM Cable (EHN450, EHN460, or EHN470—see **Section 3.3.4**) or a dedicated cable such as EVNDVI02.

PS/2 keyboard- and mouse-extension cabling: 6-pin mini-DIN male to 6-pin mini-DIN male with all lines connected straight through (1 to 1, 2 to 2, etc.). You can use the keyboard and mouse strands of a ServSwitch DVI KVM Cable (EHN450, EHN460, or EHN470—see **Section 3.3.4**) or a dedicated cable such as EVNPS03.

Cabling to CPUs' RS-232 serial mouse ports: Either PS/2 extension cabling as described above, plus a special adapter (FA314) with the pinning shown in Figure A-1 on the next page on the PC end, or DB9 male-to-female extension cable (BC0200 etc.) with the FA314 on the Wizard DVI end.

**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**

6-pin mini-DIN				DB9
KDAT	1	N/C — 1		RLSD (DCD)
TD	2	2		RD
SGND	3	3		TD (-12V)
+5V	4	4		DTR
KCLK	5	5		SGND
-12V	6	6		DSR
		7		RTS
		N/C — 8		CTS
		N/C — 9		RI

Male

```
5  6
3  4
1  2
```

1 Male 5

6 9

Female

```
6  5
4  3
2  1
```

5 Female 1

9 6
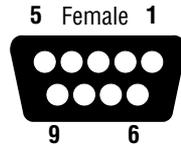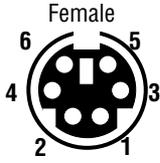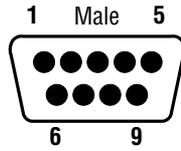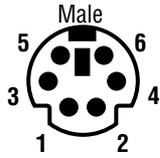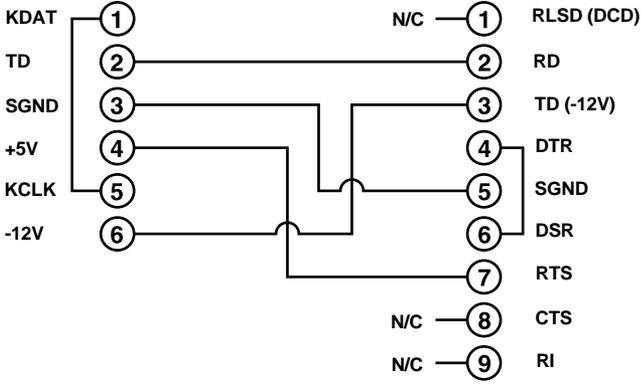
Figure A-1. The RS-232 mouse adapter's pinout.

A.3 Cabling Attached to the OPTIONS Port

The DB15 connector labeled "OPTIONS" on the back of the ServSwitch Wizard DVI is a proprietarily pinned port using RS-232-type signaling. You can connect any of these devices to it:

• The Wizard DVI's optional Remote-Control Module (RCM, see **Section 5.2**);

• An RS-232 device for serially controlled channel switching (see **Section 5.9**);

• Another Wizard DVI, to create a synchronized system for CPUs with multiple video outputs (see **Section 3.3.3**); or

• A PC, in order to upgrade the Wizard DVI's firmware (see **Section 5.13**).

The pinout of this connector is pretty simple: Pin 9 (Signal Ground, SGND), Pin 10 (Transmit Data, TD), and Pin 11 (Receive Data, RD) are the only pins used for serial communication to PCs, other Wizard DVIs, and RS-232 devices. All other pins are intended for RCM communication only and should be left unconnected; attaching them to any other RS-232 equipment could have unpredictable and possibly damaging effects.

The pinout for a synchronization cable is shown in Figure A-2. We can offer this cable as a special quote, but it's not a stock item at the time of this writing. The pinout for a firmware-upgrade cable (product code KV6SER) is shown in Figure A-3 on the next page.

DB15 male attaches to master Wizard　　　**DB15 male attaches to second Wizard**

TD (10) ———————————— (11) RD

RD (11)

SGND (9) ———————————— (9) SGND

1　Male　8　　　　1　Male　8

9　　15　　　　9　　15
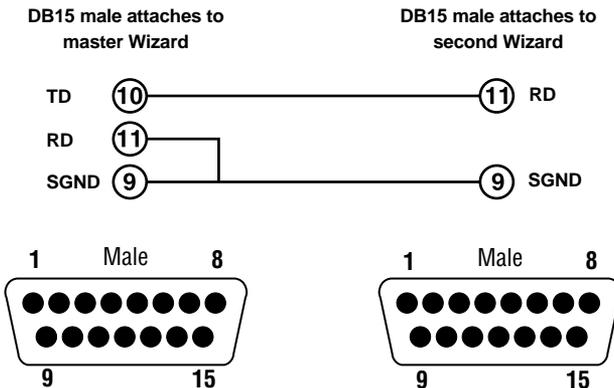
Figure A-2. The synchronization cable.

DB9 female
attaches to PC

DB15 male
attaches to Wizard

RD ② ⑨ SGND

TD ③ ⑩ TD

DTR ④ ⑪ RD

SGND ⑤

DSR ⑥

CTS ⑧

5 Female **1**   **1** Male **8**

9   **6**   **9**   **15**
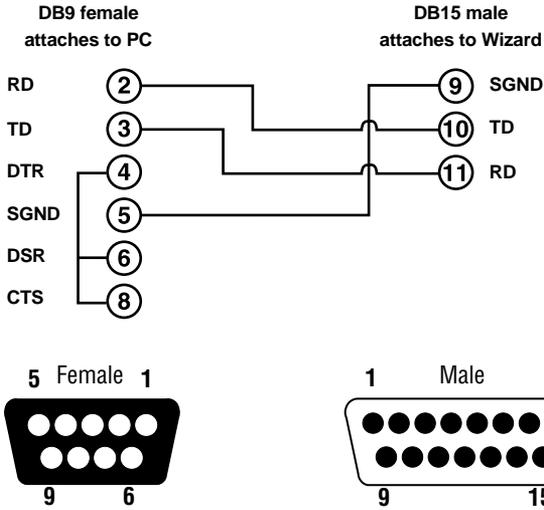
Figure A-3. The firmware-upgrade cable KV6SER.

DISCLAIMERS

While every precaution has been taken in the preparation of this manual, neither the manufacturer nor its authorized agents assume any responsibility for errors or omissions. Nor do they 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.

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BLACK BOX®
NETWORK SERVICES

Welcome to the ServSwitch™ Family!

Thank you for purchasing a BLACK BOX® ServSwitch™ Brand KVM-switching accessory! We appreciate your business, and we think you'll appreciate the many ways that your new ServSwitch keyboard/video/mouse switch 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 Fiber KVM Extender, including how to install, operate, and troubleshoot it. For an introduction to the Extender, see **Chapter 2**. The Extender product codes covered in this manual are:

ACS235A
ACS236A

DECLARATION OF CONFORMITY

This is to certify that, when installed and used according to the instructions in this manual together with the specified cables, the ServSwitch™ Brand Fiber KVM Extender is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, as well as these standards:

EN 55022: 1989 class B
EN 50082-1: 1993
IEC 801-2: 1991 - 4kV CD/8kV AD
IEC 801-3: 1984 - 3V/m
IEC 801-4: 1988 - 4kV power-supply lines
               - 2kV data lines

The Extender was tested in a typical configuration.
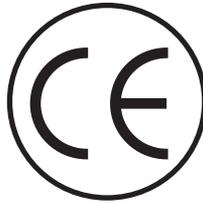
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ST is a registered trademark of AT&T®.

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Sun and Sun Microsystems are registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

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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 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.

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.

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 connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

Contents

Chapter   **Page**

1. Specifications

**Cable
Required —** 62.5/125-µm or 50/125-µm multimode fiberoptic breakout cable with at least five strands (not included)

Compliance — CE (EN 55022, 50082-1); FCC Class A, IC Class/classe A

Interfaces — Both ACS235A and ACS236A:
  Extension: Multimode fiberoptic;
 ACS235A:
  Video: VGA, SVGA, XGA, XGA-2, or RGB (RGB must be patched to an HD15 connector); Plug-and-Play not supported for monitors;
  Keyboard and mouse: IBM PS/2 compatible;
  Printer: IBM PC parallel (Centronics compatible);
 ACS236A:
  Video: Either legacy Sun type or VGA, SVGA, XGA, XGA-2, or RGB (RGB must be patched to an HD15 connector); Plug-and-Play not supported for monitors;
  Keyboard and mouse: Sun type;
  Serial device: EIA/TIA RS-232 (ITU V.24/V.28) pinned according to TIA-574 (PC serial-port compatible)

Resolution — Up to 1280 x 1024

Refresh Rate — Up to 75 Hz

**Keyboard Current
Consumption —** Up to 100 mA

Data Rate — ACS235A's parallel interface: Transparent to data rates up to 20,000 cps;
 ACS236A's serial interface: Transparent to data rates up to 38,400 bps

**Optical
Wavelength —** 850 nm

Optical Power — Into 62.5-µm cable: Typically 88 microwatts;
 Into 50-µm cable: Typically 40 microwatts

**Maximum
Optical Loss —** 5 dB

**Maximum
Distance —** 1000 m (3281 ft.) between Extender's Local and Remote
Modules

User Controls — Both ACS235A and ACS236A, rear-mounted on the
Remote Module:
(2) Rear-mounted dials for contrast and brightness;
(3) Rear-mounted trimpots for adjusting color-signal
gain;
ACS235A:
(12) Internal jumper sets for configuration options:
(6) inside Local Module, (6) inside Remote Module;
ACS236A:
(7) Internal jumper sets for configuration options:
(4) inside Local Module, (3) inside Remote Module

Indicators — (1) Front-mounted 7-segment LED display;
(2) Rear-mounted LEDs for power

Connectors — Both ACS235A and ACS236A, on both the Local and
Remote Modules:
(5) Rear-mounted ST female for Module-to-Module link;
(1) Front-mounted 6-pin DIN female for power;
ACS235A:
Front-mounted on Local Module:
(2) 6-pin mini-DIN female:
(1) for CPU's keyboard port,
(1) for CPU's mouse port;
(1) HD15 male for CPU's video port;
(1) DB25 male for CPU's parallel port;
Front-mounted on Remote Module:
(2) 6-pin mini-DIN female:
(1) for keyboard,
(1) for mouse;
(1) HD15 female for monitor;
(1) DB25 female for parallel printer;

**Connectors
(continued) —**   ACS236A:

      Front-mounted on Local Module:

         (1) 8-pin mini-DIN female for CPU's keyboard and
            mouse ports;

         (1) HD15 male for CPU's video port (if it's VGA type);

         (1) 13W3 male for CPU's video port (if it's legacy Sun
            type);

         (1) DB9 female for CPU's serial port;

      Front-mounted on Remote Module:

         (1) 8-pin mini-DIN female for keyboard and mouse;

         (1) 13W3 female for monitor (if it's legacy Sun type);

         (1) HD15 female for monitor (if it's VGA or multisync
            type);

         (1) DB9 male for serial device

**Temperature
Tolerance —**   Operating: 50 to 113˚F (10 to 45˚C);

      Storage: 23 to 131˚F (–5 to +55˚C)

**Humidity
Tolerance —**   Up to 80% noncondensing

Power —   From utility-power (mains) outlet, through external
      transformer:

      Input: 100 to 240 VAC, 47 to 63 Hz, autosensing, at up to
        0.7 amps;

      Output: +12 VDC at 2.1 amps;

      Consumption:

        Local Module: Approx. 8 watts;

        Remote Module without keyboard: Approx. 8 watts;

        Remote Module with keyboard: Approx. 9 watts

Size —   Each Module: 2.2"H x 6.3"W x 7.5"D (5.6 x 16 x 19.1 cm)

Weight —   Net for each Module: 2 lb. (0.9 kg);

      Shipping (both Modules plus accessories): At least 7.7 lb.
        (3.5 kg)

2. Introduction

2.1 Overview

The purpose of the ServSwitch™ Brand Fiber KVM Extender is to greatly extend the distance between a Sun® or IBM® PC compatible computer CPU and the keyboard, mouse, monitor, and serial or parallel peripheral that the computer operator will be using, especially in electrically noisy environments. Normal keyboard-, video-, and mouse-extension cables (and extenders that use normal cabling) can only go so far, and electromagnetic noise can limit their distance and reliability. But with a fiberoptic system like the ServSwitch Brand Fiber KVM Extender, these concerns are a thing of the past. You can leave the computer CPU in a secured cabinet or data center while you operate it from a convenient location up to 1000 m (3281 ft.) away.

There are two models of the Extender. The PC version (product code ACS235A) extends KVM distance for IBM PC compatible computers. The Sun version (product code ACS236A) extends KVM distance for Sun Microsystems® computers. Each model consists of two main components: a Local Module that you'll attach the computer's CPU to, and a Remote Module that you'll attach the user equipment to. (With the ACS235A, the "user equipment" will be an IBM PS/2® compatible keyboard and mouse, VGA type monitor, and an optional IBM PC compatible or Centronics® compatible parallel printer. With the ACS236A, it will be a Sun compatible keyboard and mouse, VGA or legacy Sun monitor, and an optional serial device.) You'll connect the two units with a five-strand fiberoptic breakout cable. With this Extender, you'll get high monitor resolution, optical isolation, and color fidelity, even in electrically rough surroundings.

The Extender units automatically adapt to the correct transfer rates for all of your data; you won't need to manually set these rates. There is one setting you might need to make after you start operating the units: The Extenders' amplification might need to be adjusted if you use very long fiberoptic cables. (The controls for this are located on the Remote Module—refer to **Section 6.2**.) And even this adjustment is easy to "eyeball" by watching the picture on the monitor screen.

2.2 The Complete Package

Before you do anything else with it, verify that you received everything you should have with your ServSwitch Brand Fiber KVM Extender. These components come with both models of the Extender:

- The Extender's Local Module.

- The Extender's Remote Module.

- (2) power supplies, one for each Module.

- (2) power cords, one for each power supply (equivalent to our product code EPWR08).

- (1) set of eight adhesive feet.

- This manual.

The ACS235A also comes with these components:

- (1) 10-ft. (3-m) keyboard/video/mouse CPU-extension cable with an HD15 female video connector and 6-pin mini-DIN keyboard and mouse connectors (equivalent to our product code EHN235-0010).

- (1) 10-ft. (3-m) DB25 male to DB25 female IBM PC parallel (Centronics compatible) extension cable (equivalent to our product code BC00705).

- (1) 6-in. (15.2-cm) PC/AT® keyboard-port adapter (6-pin mini-DIN female to 5-pin DIN male, equivalent to our product code FA222).

- (1) RS-232 serial mouse-port adapter (6-pin mini-DIN female to DB9 female, equivalent to our product code AC244A).

The ACS236A also comes with this cable:

- (1) 10-ft. (3-m) keyboard/video/mouse CPU-extension cable with an HD15 female video connector and an 8-pin mini-DIN keyboard/mouse connector (equivalent to our product code EHN236-0010).

If anything is missing, contact Black Box right away. If the package has been damaged, contact both Black Box and the shipping carrier.

3. Configuring the ACS235A

This chapter describes how to configure the PC model of the ServSwitch™ Brand Fiber KVM Extender (ACS235A). If your Extender is the Sun model (ACS236A), see **Chapter 4**.

3.1 Configuring for RGB Video

In normal configuration at delivery time, the Extender units are configured to carry video from a VGA source to a VGA monitor. But if you'd like to attach RGB equipment (either an RGB source or an RGB monitor or both) to your Extender system, this section discusses how you might need to set the units' configuration jumpers. (See Table 3-1 on page 15 for a full layout of this.) Of course, RGB video can come in a variety of signal forms and combinations. If after reading the rest of this section you're not sure how to get your RGB application working (or even whether it can be done), call Black Box for technical support.

NOTE

In any application involving RGB video, if the picture on your monitor looks OK with AGC ON, leave the Local Module's JP3 **jumper and the Remote Module's** JP8 **jumpers in their factory settings. Otherwise, remove** JP3 **at the Local Module and move** JP8 **at the Remote Module to turn AGC OFF. You will then have to adjust the gain of the Extenders' video signal manually. See** Sections 3.2.3 **and** 3.3.2**.**

3.1.1 VGA VS. RGB SIGNALING

VGA uses two video-synchronization signals, HSYNC (horizontal sync) and VSYNC (vertical sync). In its factory-default settings, the Extender's Local Module receives these signals from the CPU and overlays them on the color signals for transmission to the Remote Module: HSYNC on green, VSYNC on blue, and SYNCPOL (the combined HSYNC and VSYNC polarity information) on red. But most RGB applications use a single CSYNC (composite sync) signal overlaid on the green color signal instead, so for such applications you'll need to have the Local Module substitute this signal for HSYNC, as well as create its own SYNCPOL information for use by the Remote Module. Then you might have to set the Remote Module to process these signals properly at the other end.

3.1.2 VGA VIDEO CARD TO RGB MONITOR (VGA TO RGB CONVERSION)

To connect a CPU that outputs VGA video to an RGB monitor, remove the Local Module's **JP2** jumper (so that it generates the CSYNC signal needed by the RGB monitor), but leave the **JP6**, **JP10**, and **JP11** jumpers in their factory-default settings (see **Sections 3.2.1** and **3.2.2**). At the Remote Module, install jumpers at

the **JP1**, **JP2**, and **JP3** locations to deactivate the decoupling diodes (so that the Remote Module leaves the sync signals on the color signals), and remove the jumpers at **JP9** and **JP12** to disable VSYNC and force the sync polarity signals negative (see **Sections 3.3.1**, **3.3.3**, and **3.3.4**).

CAUTION!

You can only connect an RGB monitor to a VGA source if the monitor is able to process the source's synchronization frequency; for example, the monitor of a graphic workstation with horizontal bandwidth of 40 to 90 kHz probably won't work with a VGA graphics adapter that has a resolution of 640 x 480 = 31.5 kHz.

3.1.3 RGB VIDEO SOURCE TO RGB MONITOR

To connect an RGB video source to an RGB monitor, set the Local Module's **JP6**, **JP10**, and **JP11** jumpers all to the "RGB settings" (the ones opposite the factory defaults; see **Section 3.2.1**). At the Remote Module, install jumpers at the **JP1**, **JP2**, and **JP3** locations to deactivate the decoupling diodes (so that the Remote Module leaves the sync signals on the color signals; see **Section 3.3.1**).

3.1.4 RGB VIDEO SOURCE TO VGA MONITOR (RGB TO VGA CONVERSION)

To connect an RGB video source to a VGA monitor, set the Local Module's **JP6**, **JP10**, and **JP11** jumpers all to the "RGB settings" (the ones opposite the factory defaults), but leave jumper **JP2** in its factory setting so that HSYNC, not CSYNC, is transmitted on the HSYNC lead. Remove the Remote Module's **JP12** jumper in order to force polarity negative. See **Sections 3.2.1** and **3.3.4**. In this application, the Remote Module also functions as a sync stripper: It strips the sync signals from the color signals, separates them, and presents them as normal TTL signals to the VGA monitor.

IMPORTANT NOTES

You can only connect a VGA monitor to an RGB video source if the monitor is able to process the source's synchronization frequency; for example, a multisync monitor with horizontal bandwidth of 30 to 90 kHz probably won't work with a WF470 graphics adapter that uses a frequency of 15.625 kHz.

The Extender can *not* generate the special VGA-standard phase relation required by some types of dual-scan monitors (LCD panels, etc.).

Be aware that, because of the way some RGB cards output sync signals, it is possible that, despite how the jumpers are set in your Local Module, your monitor will still receive CSYNC on its HSYNC lead *as well as* VSYNC on its VSYNC lead. Some VGA monitors have no problem with this, but others will suffer from distorted displays. If your monitor is affected by this distortion, you can suppress the VSYNC signal by removing the Remote Module's JP9 jumper; the monitor should work fine using CSYNC only. See Section 3.3.3.

Siemens® users: The Extender can process CP581 signals, but this requires special cabling. Call Black Box for technical support.

Table 3-1. Jumper Settings

For all of these applications, to use AGC you must leave **JP3** in the Local Module installed and keep the **JP8** jumpers in the Remote Module on the left-hand posts. To operate without AGC, remove **JP3** in the Local Module installed, move the **JP8** jumpers in the Remote Module to the right-hand posts, and use the Remote Module's gain-control screwdials as necessary (see **Sections 3.2.3**, **3.3.2**, and **5.2**).

LOCAL MODULE JUMPERS:		Standard VGA Source to Std. VGA Monitor	Standard VGA Source to RGB Monitor	RGB Source to Standard VGA Monitor	RGB Source to RGB Monitor
	JP2	Installed	Removed	Installed	Installed
	JP6	Removed	Removed	Installed	Installed
	JP10	Removed	Removed	Installed	Installed
	JP11	Installed on left-hand posts	Installed on left-hand posts	Installed on right-hand posts	Installed on right-hand posts
PINS 13 & 14 (HS, VS) FROM CPU		Connected	Connected	Open	Open
REMOTE-MODULE JUMPERS:					
	JP1, 2, 3	Removed	Installed	Removed	Installed
	JP9	Installed	Removed	Installed	Removed
	JP12	Installed	Removed	Removed	Removed
PINS 13 & 14 (HS, VS) TO MONITOR		Connected	Open	Connected	Open
USE RM'S CONTROLS?					
	Contrast	If necessary	If necessary	If necessary	If necessary
	Brightness	No	If necessary	No	If necessary

3.2 Setting the Jumpers in the Local Module (Optional)

There are six user-settable jumpers inside the Local Module of the ServSwitch Brand Fiber KVM Extender. They control these options:

- Whether the Local Module transmits VGA (default) or RGB video signals to the Remote Module, and if RGB, which signals and how (jumpers **JP6**, **JP10**, and **JP11**).

- Whether the Local Module transmits HSYNC (default) or CSYNC to the Remote Module (jumper **JP2**).

- Whether the Local Module uses automatic (default) or manual gain control (jumper **JP3**).

- Whether the Local Module expects to transmit into 62.5/125-µm (default) or 50/125-µm fiber (jumper **JP5**).

If you need to set the unit for a non-default option, open the Local Module—being sure to take all reasonable precautions against static electricity—by unscrewing the upper part of its casing. (The jumper locations on the motherboard are shown in Figure 3-1.) Then set your desired jumpers as described in **Sections 3.2.1**, **3.2.2**, **3.2.3**, and/or **3.2.4**, and then close the unit back up.
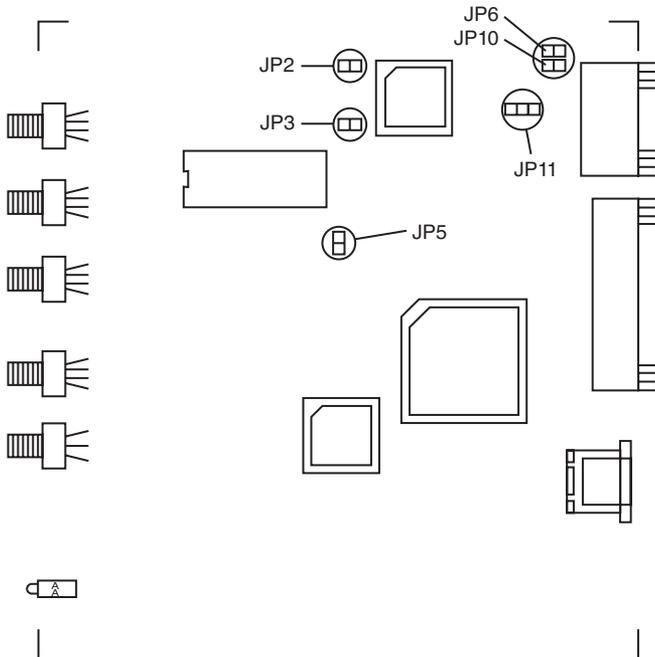
Figure 3-1. The locations of the ACS235A Local Module's jumpers.

3.2.1 THE VGA/RGB JUMPERS (JP6, JP10, AND JP11)

If you'll be using a VGA monitor in your Extender system, leave these jumpers set as they are (in their factory-default positions). But if you need to use an RGB monitor instead, take these steps (refer to Figure 3-2):

- Install a jumper on **JP6** if you want the Extender to add the HSYNC (horizontal sync) polarity signal to the red color signal.

- Install a jumper on **JP10** if you want the Extender to add the VSYNC (vertical sync) polarity signal to the red color signal.

- **JP11** is the main VGA vs. RGB control. To select RGB *on the local side* (if your computer is transmitting RGB video), move the jumper from the left-hand posts to the right-hand posts, as shown below.
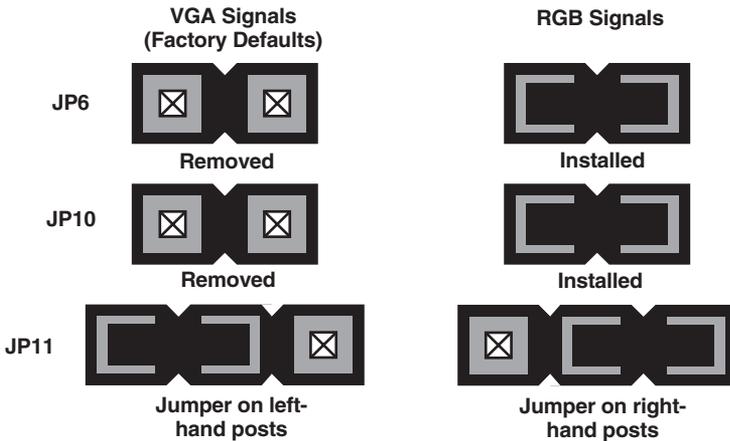
Figure 3-2. Setting the VGA/RGB jumpers.

3.2.2 VGA-TO-RGB SYNC-GENERATION JUMPER JP2

For most applications you should leave this jumper installed. However, if you are using the Extender to connect a VGA video card or other VGA source to an RGB monitor, remove this jumper as shown in Figure 3-3. (This causes the Local Module to generate a CSYNC signal for transmission to the Remote Module.)
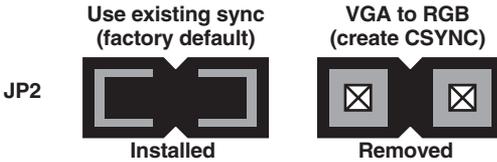
Figure 3-3. Setting VGA-to-RGB jumper JP2.

3.2.3 LOCAL GAIN-CONTROL JUMPER JP3

If you'll be using automatic gain control (AGC) in your Extender system, leave the jumper ON the **JP3** jumper posts. (We recommend this factory-default setting.) But if you'll be controlling the gain manually (see **Section 5.2**), remove the jumper from these posts as shown in Figure 3-4. (Whichever way you set this jumper, make sure that jumper **JP8** in the Remote Module is set the same way.)
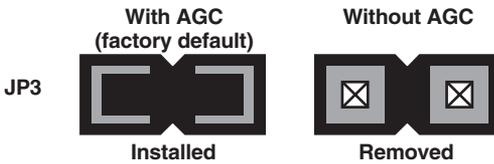
Figure 3-4. Setting gain-control jumper JP3.

3.2.4 CORE-DIAMETER JUMPER JP5

If you'll be using fiberoptic cable with a 62.5/125-µm diameter in your Extender system, leave the **JP5** jumper posts empty. (This is the factory-default setting.) But if you'll be using 50/125-µm-diameter cable, install a jumper on these posts as shown in Figure 3-5. The Extender does not work with fiber cables of any other diameter.
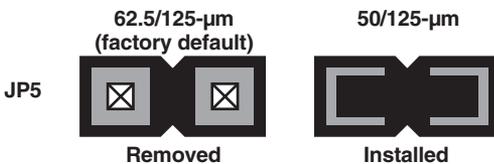
Figure 3-5. Setting core-diameter jumper JP5.

3.3 Setting the Jumpers in the Remote Module (Optional)

There are six user-settable jumpers inside the Remote Module of the ServSwitch Brand Fiber KVM Extender. They control these options:

- Whether the Remote Module strips the sync signals from the color signals (default) or leaves them in (jumpers **JP1**, **JP2**, and **JP3**).

- Whether the Remote Module uses automatic (default) or manual gain control (jumper bank **JP8**).

- Whether the Remote Module passes a separate VSYNC signal to the monitor (default) or disconnects it (jumper **JP9**).

- Whether the Remote Module uses the SYNC polarities transmitted from the local side (default) or forces both HSYNC and VSYNC to negative polarity (jumper **JP12**).

If you need to set the unit for a non-default option, open the Remote Module—being sure to take all reasonable precautions against static electricity—by unscrewing the upper part of its casing. (The jumper locations on the motherboard are shown in Figure 3-6.) Then set your desired jumpers as described in **Sections 3.3.1**, **3.3.2**, **3.3.3**, and/or **3.3.4**, and then close the unit back up.
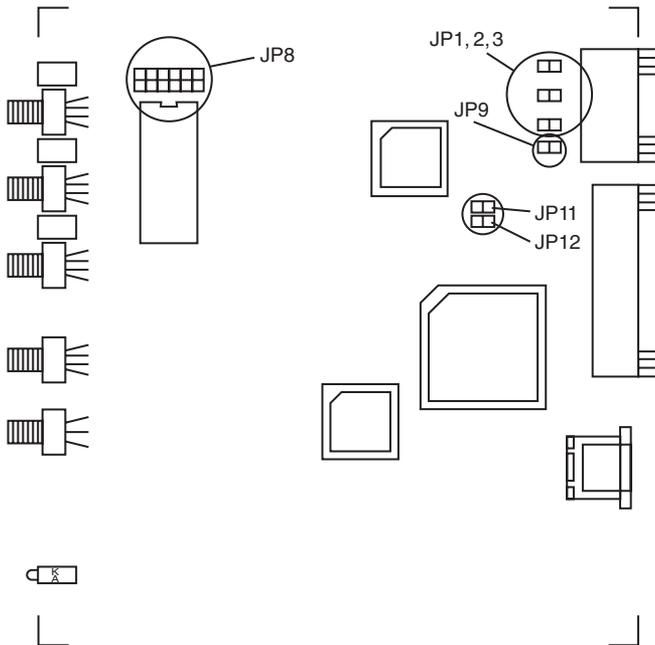
Figure 3-6. The locations of the ACS235A Remote Module's jumpers.

3.3.1 THE SYNC-ON-COLOR JUMPERS (JP1, JP2, AND JP3)

The Local Module of the ServSwitch Brand Fiber KVM Extender adds synchronization signals to the color signals for transmission across the fiber link. If you are using a VGA monitor (which is probably not equipped to handle sync on color), you will want the Remote Module to use its decoupling diodes to strip this sync information from the color signals, so you will leave the jumper posts at locations **JP1**, **JP2**, and **JP3** empty (the default setting) so that these diodes will be active. But if you are using an RGB monitor (which is probably designed to receive sync on color), you will want the Remote Module to leave the sync signals combined with the color signals, so you should install jumpers at **JP1**, **JP2**, and **JP3** to deactivate the decoupling diodes, as shown in Figure 3-7.

CAUTION!

The on-screen image might be displayed at a different size or screen location at the remote site than it is when the monitor is attached directly to the PC's CPU. This difference can be fixed or at least minimized by using the monitor's display-size and -placement controls. Screen images that appear normal except for their size or placement can *not* be made "right" by installing these jumpers!
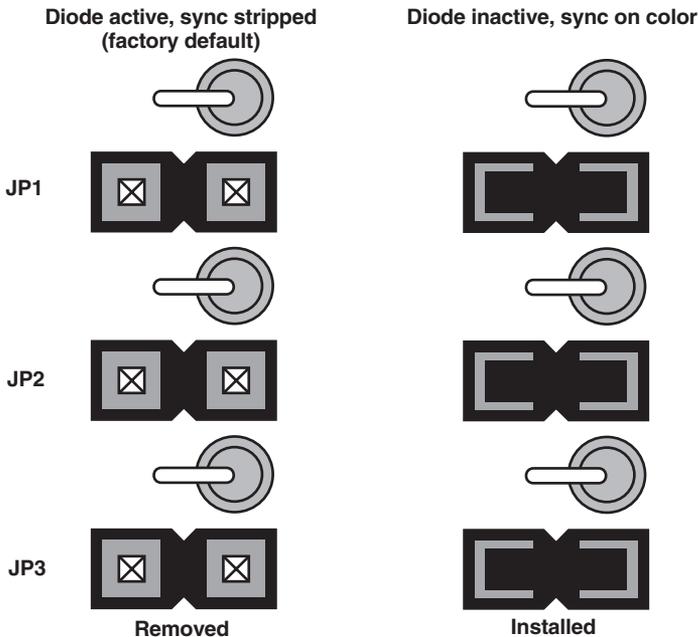
Figure 3-7. The sync-on-color jumpers and diodes.

3.3.2 REMOTE GAIN-CONTROL JUMPER BANK JP8

If you'll be using automatic gain control (AGC) in your Extender system, leave the jumpers ON the *right-hand* posts of each of the three pairs of **JP8** jumper posts, as shown below. (This is the factory-default setting as well as the recommended setting.) But if you'll be controlling the gain manually (see **Section 6.2**), move the jumper to the *left-hand* posts of each of the three **JP8** jumper-post pairs, as shown in Figure 3-8.

When you have AGC selected, the Remote Module ignores the gain-control screwdials on its rear panel and automatically adjusts the gain of each of the three color signals, which is possible because each of the signals has the same white reference value (0.7 Vpp) that the Module can use for comparison. If the colors of the picture on your monitor still seem a little off, you can tweak them with the Remote Module's brightness and contrast controls, in addition to any color controls on the monitor itself.

When AGC is turned off, the Remote Module's gain-control screwdials become activated, and you can use them to control the gain of the corresponding colors. (Be aware that when you're in this mode, chromatic aberrations can affect your display.) Adjust the gain and check your adjustments by either watching the monitor or, to get best results, by using an oscilloscope. See **Section 6.2**. As always, you can also use the Remote Module's brightness and contrast controls. We don't recommend that you turn AGC off unless you have a color problem that you can't seem to solve by any other means.

Whichever way you set these jumpers, make sure that jumper **JP3** in the Local Module is set the same way.

With AGC (factory default) | **Without AGC**

Jumpers on left-hand posts | J8 | **Jumpers on right-hand posts**
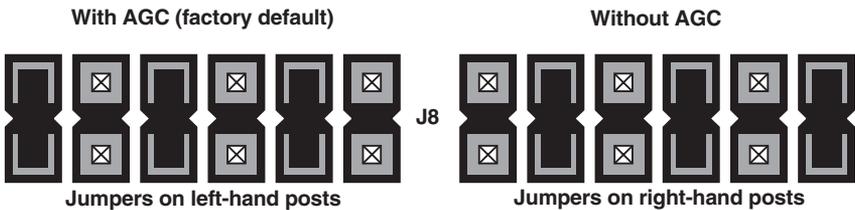
Figure 3-8. Setting gain-control jumper bank JP8.

3.3.3 VSYNC ENABLE/DISABLE JUMPER JP9

It is possible to use the Extender to connect a VGA monitor to a computer that outputs RGB video that superimposes CSYNC on the green signal. In this situation, depending on the computer, the Remote Module might express only CSYNC (composite sync) on the HSYNC lead of its VGA connector, or it might express both CSYNC on HSYNC and VSYNC (vertical sync) on the VSYNC lead. If your VGA monitor works fine even with both signals coming through, leave jumper **JP9** installed (the factory-default setting). But if your VGA monitor's picture becomes distorted if the monitor receives both CSYNC on HSYNC and VSYNC on VSYNC, remove jumper **JP9** as shown in Figure 3-9; this causes the Remote Module to suppress the VSYNC signal so that only CSYNC is expressed. Most VGA monitors, including most of those that have problems when they receive both signals, work well using the CSYNC signal alone.
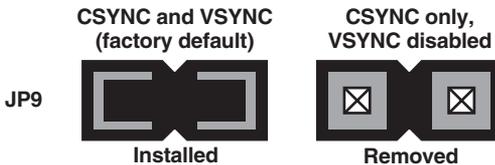
Figure 3-9. Setting VSYNC jumper JP9.

3.3.4 SYNC-POLARITY JUMPER JP12

With jumper **JP12** installed (the factory-default setting), the Remote Module restores the video SYNC signals to their original polarity as the Local Module received them. Sometimes, however, you might want the Remote Module to force both HSYNC and VSYNC to negative polarity, so that the clock is measured on the falling edges of the signals. If you do, remove jumper **JP12**, as shown in Figure 3-10. (Be careful—this jumper is right next to the reserved jumper labeled **JP11**; do *not* change the setting of **JP11**.)
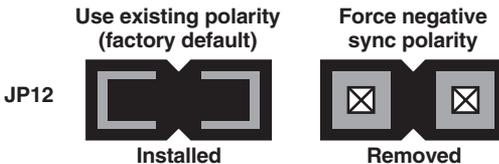
Figure 3-10. Setting SYNC-polarity jumper JP12.

4. Configuring the ACS236A

This chapter describes how to configure the Sun model of the ServSwitch™ Brand Fiber KVM Extender (ACS236A). If your Extender is the PC model (ACS235A), see **Chapter 3**.

4.1 Setting the Jumpers in the Local Module (Optional)

There are four user-settable jumpers inside the Local Module of the ServSwitch Brand Fiber KVM Extender. They control these options:

- How the Local Module handles video: VGA input to VGA output (default), VGA input to legacy Sun output, or Sun input to either VGA or Sun output (jumpers **JP2** and **JP10**).

- Whether the Local Module uses automatic (default) or manual gain control (jumper **JP3**).

- Whether the Local Module expects to transmit into 62.5/125-µm (default) or 50/125-µm fiber (jumper **JP5**).

If you need to set the unit for a non-default option, open the Local Module—being sure to take all reasonable precautions against static electricity—by unscrewing the upper part of its casing. (The jumper locations on the motherboard are shown in Figure 4-1 on the next page.) Then set your desired jumpers as described in **Sections 4.1.1**, **4.1.2**, and/or **4.1.3**, and then close the unit back up.
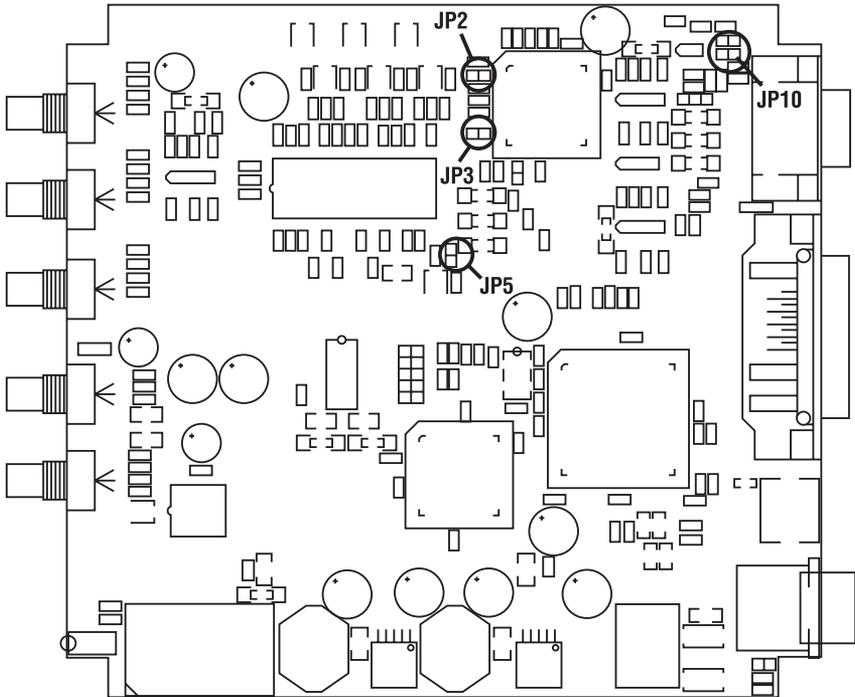
Figure 4-1. The locations of the ACS236A Local Module's jumpers.

4.1.1 THE VIDEO-HANDLING JUMPERS JP2 AND JP10

Jumpers **JP2** and **JP10** in the Local Module control how the Extender handles video signals, depending on whether the computer outputs VGA signals to the Extender's HD15 connectors or legacy Sun signals to the Extender's 13W3 connectors, as well as what type of signal input the monitor accepts. Refer to Figure 4-2 on the next page:

- If the computer attached to the Local Module outputs VGA video, and the monitor attached to the Remote Module accepts VGA input, leave jumpers **JP2** and **JP10** in their default settings: **JP2** installed, **JP10** empty.

- If the computer outputs VGA and the monitor accepts Sun input, leave jumper **JP10** in its default empty setting, but remove jumper **JP2**. In this setting, automatic gain control (AGC) isn't possible, so you'll have to turn it off at both the Local and Remote Modules (see **Sections 4.1.2** and **4.2.1**) and set the gain manually (see **Section 6.2**).

- If the computer outputs Sun video, regardless of what the monitor accepts, leave jumper **JP2** in its default installed setting, but also install a jumper on **JP10**. You might also need to set jumper **JP9** in the Remote Module (see **Section 4.2.2**).

**VGA in, VGA out
(factory default)** **VGA in, Sun out** **Sun in,
Sun or VGA out**

JP2

Removed Removed Installed

JP10

Installed Removed Installed
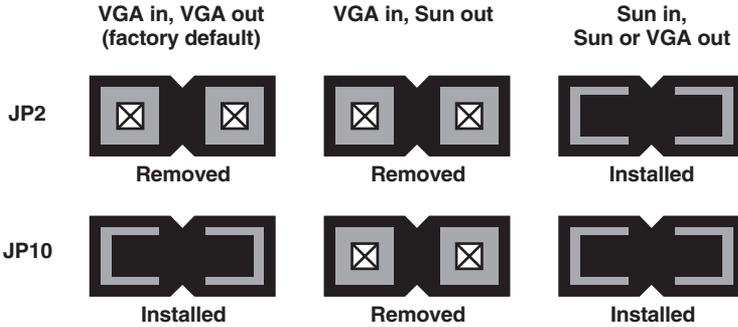
Figure 4-2. Setting video-handling jumpers JP2 and JP10.

4.1.2 LOCAL GAIN-CONTROL JUMPER JP3

If you'll be using automatic gain control (AGC) in your Extender system, leave the jumper ON the **JP3** jumper posts. (We recommend this factory-default setting.) But if you'll be controlling the gain manually (see **Section 5.2**), remove the jumper from these posts, as shown in Figure 4-3. (Whichever way you set this jumper, make sure that jumper **JP8** in the Remote Module is set the same way.)

**With AGC
(factory default)** **Without AGC**

JP3

Installed Removed
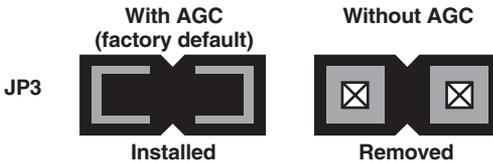
Figure 4-3. Setting gain-control jumper JP3.

4.1.3 CORE-DIAMETER JUMPER JP5

If you'll be using fiberoptic cable with a 62.5/125-µm diameter in your Extender system, leave the **JP5** jumper posts empty. (This is the factory-default setting.) But if you'll be using 50/125-µm-diameter cable, install a jumper on these posts, as shown in Figure 4-4. The Extender does not work with fiber cables of any other diameter.

**62.5/125-µm
(factory default)** **50/125-µm**

JP5

Removed Installed
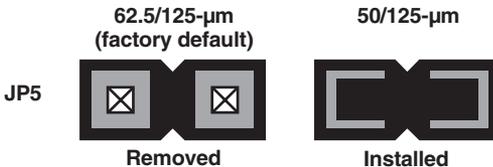
Figure 4-4. Setting core-diameter jumper JP5.

4.2 Setting the Jumpers in the Remote Module (Optional)

There are two user-settable jumpers inside the Remote Module of the ServSwitch Brand Fiber KVM Extender. They control these options:

- Whether the Remote Module uses automatic (default) or manual gain control (jumper bank **JP8**).

- Whether the Remote Module passes a separate VSYNC signal to the monitor (default) or disconnects it (jumper **JP9**).

If you need to set the unit for a non-default option, open the Remote Module—being sure to take all reasonable precautions against static electricity—by unscrewing the upper part of its casing. (The jumper locations on the motherboard are shown in Figure 4-5.) Then set your desired jumpers as described in **Sections 4.2.1** and/or **4.2.2**, and then close the unit back up.
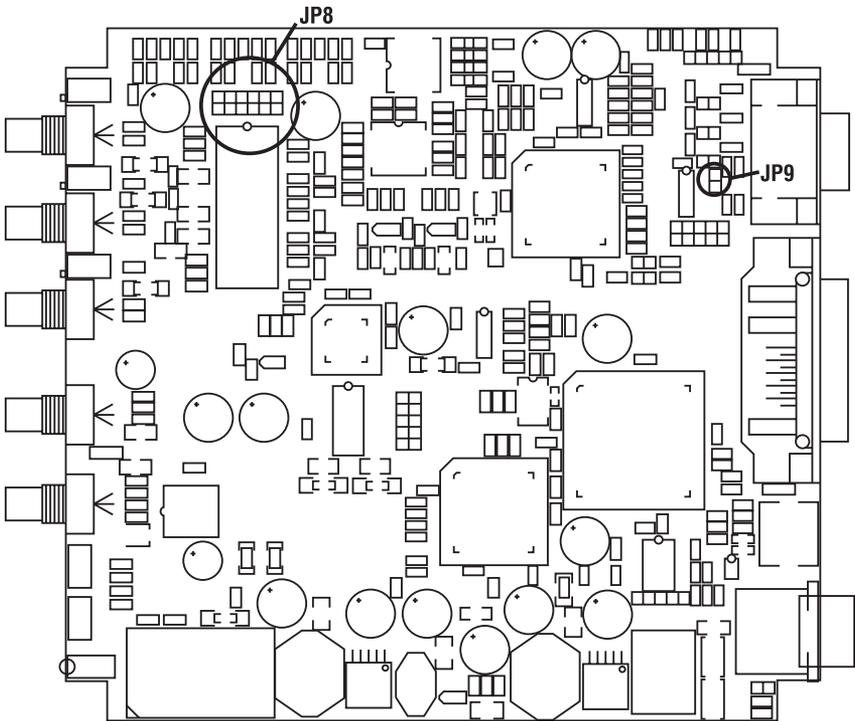
Figure 4-5. The locations of the ACS236A Remote Module's jumpers.

4.2.1 REMOTE GAIN-CONTROL JUMPER BANK JP8

If you'll be using automatic gain control (AGC) in your Extender system, leave the jumpers ON the *right-hand* posts of each of the three pairs of **JP8** jumper posts, as shown below. (This is the factory-default setting as well as the recommended setting.) But if you'll be controlling the gain manually (see **Section 6.2**), which is necessary with VGA input and Sun output (see **Section 4.1.1**), move the jumper to the *left-hand* posts of each of the three **JP8** jumper-post pairs, as shown in Figure 4-6.

When you have AGC selected, the Remote Module ignores the gain-control screwdials on its rear panel and automatically adjusts the gain of each of the three color signals, which is possible because each of the signals has the same white reference value (0.7 Vpp) that the Module can use for comparison. If the colors of the picture on your monitor still seem a little off, you can tweak them with the Remote Module's brightness and contrast controls, in addition to any color controls on the monitor itself.

When AGC is turned off, the Remote Module's gain-control screwdials become activated, and you can use them to control the gain of the corresponding colors. (Be aware that when you're in this mode, chromatic aberrations can affect your display.) Adjust the gain and check your adjustments by either watching the monitor or, to get best results, by using an oscilloscope. See **Section 6.2**. As always, you can also use the Remote Module's brightness and contrast controls. We don't recommend that you turn AGC off unless (a) you are using VGA input with Sun output, or (b) you have a color problem that you can't seem to solve by any other means.

Whichever way you set these jumpers, make sure that jumper **JP3** in the Local Module is set the same way.

With AGC (factory default)   **Without AGC**

J8

Jumpers on left-hand posts   Jumpers on right-hand posts
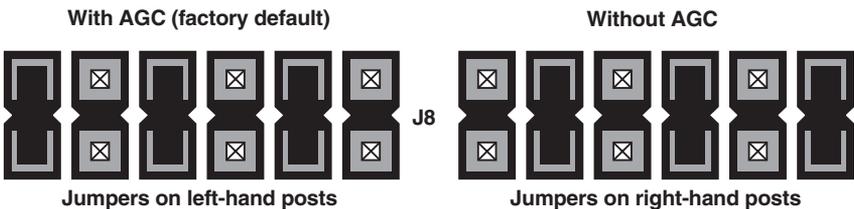
Figure 4-6. Setting gain-control jumper bank JP8.

4.2.2 VSYNC ENABLE/DISABLE JUMPER JP9

It is possible to use the Extender to connect a VGA monitor to a legacy Sun computer that outputs Sun video with CSYNC superimposed on the green signal. (If you do this, make sure that jumpers **JP2** and **JP10** in the Local Module are both installed; see **Section 4.1.1**.)

In this situation, depending on the computer, the Remote Module might express only CSYNC (composite sync) on the HSYNC lead of its VGA connector, or it might express both CSYNC on HSYNC and VSYNC (vertical sync) on the VSYNC lead. If your VGA monitor works fine even with both signals coming through, leave jumper **JP9** installed (the factory-default setting). But if your VGA monitor's picture becomes distorted if the monitor receives both CSYNC on HSYNC and VSYNC on VSYNC, remove jumper **JP9** as shown in Figure 4-7. This causes the Remote Module to suppress the VSYNC signal so that only CSYNC is expressed. Most VGA monitors, including most of those that have problems when they receive both signals, work well using the CSYNC signal alone.
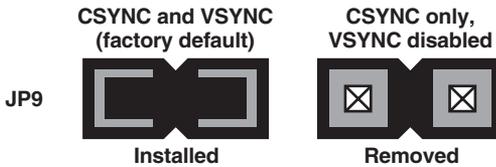
Figure 4-7. Setting VSYNC jumper JP9.

5. Installation

5.1 Guidelines and Limitations for Attaching Equipment

This section discusses a few things you need to keep in mind about the types of devices you can attach to a ServSwitch™ Brand Fiber KVM Extender. As you read the rest of this section, you might want to refer to Figure 5-1, which shows how the Extenders handle the various signals they carry. For pinouts of the Extender's connectors, see **Appendix A**.
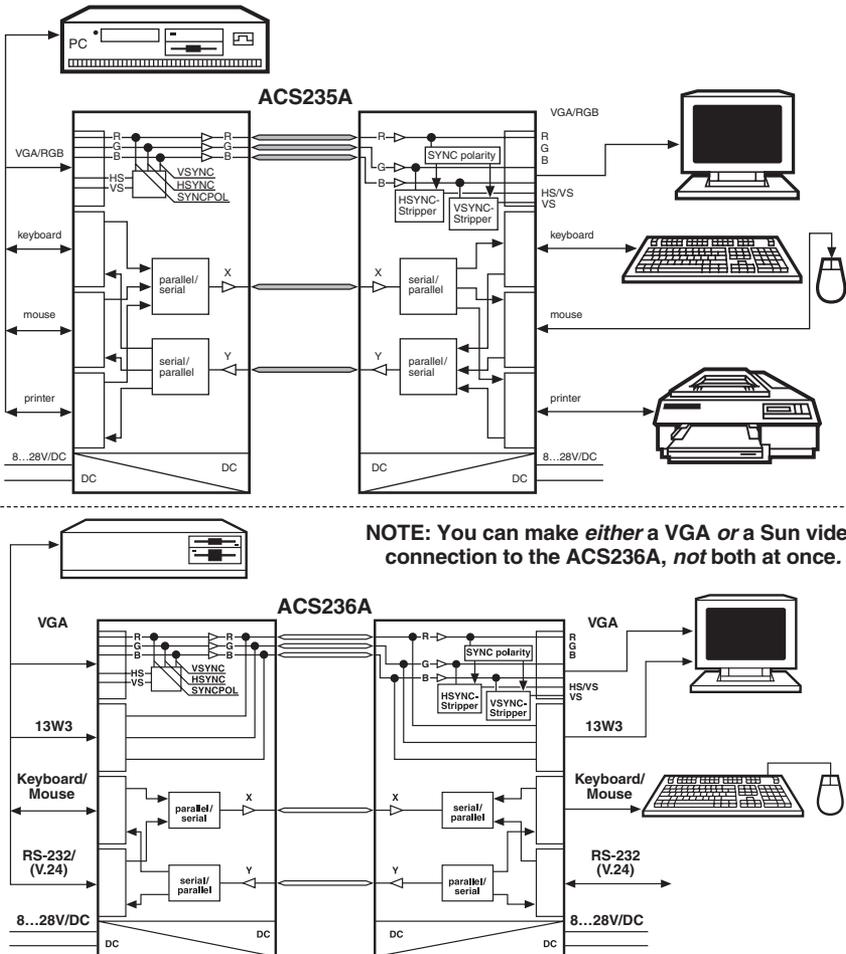
Figure 5-1. Schematics of signal processing in ACS235A (top) and ACS236A (bottom) Extender systems.

5.1.1 CPU

The ACS235A Extender supports IBM PC compatible desktop CPUs; *it does not support laptops.* A CPU must have these kinds of interfaces to work fully with the ACS235A Extender:

- *Video:* VGA, SVGA, XGA, or XGA-2. (Also supports most CPUs that output RGB.)

- *Keyboard:* IBM PS/2 style (6-pin mini-DIN). (With the included keyboard-port adapter, will also support CPUs with PC/AT [5-pin DIN] keyboard ports.)

- *Mouse:* IBM PS/2 style (6-pin mini-DIN). (With the included mouse-port adapter, will also support CPUs with RS-232 serial [DB9] mouse ports.)

- *Parallel (optional):* IBM PC style (Centronics compatible). This interface has strict limitations; see **Section 5.1.5**.

The ACS236A Extender supports most Sun compatible CPUs that output VGA video on an HD15 connector or legacy Sun Video on a 13W3 connector.

5.1.2 VGA MONITOR

The VGA red, green, and blue color signals are analog values in the range of 0 to 0.8 Vpp. The signals have no DC offset; this means that the black level meets ground (that is, that the zero-signal [black] voltage level of the color leads is equivalent to the voltage level of the color-ground leads). The horizontal and vertical synchronization signals are TTL signals with various polarities, depending on the selected monitor resolution (for example, text-only, 640 x 480, 800 x 600, etc.). For transmission across the fiber cable, the SYNC signals are added to the color-signals and separated again at the receiver.

CAUTION!

If you use a "Plug and Play" monitor, you will have to configure the video settings manually.

5.1.3 RGB MONITOR OR LEGACY SUN MONITOR

The RGB red, green, and blue color signals are analog values in the range of 0 to 0.8 Vpp. The composite (horizontal + vertical) synchronization signal is usually added to the green signal, although some devices also add synchronization or other information to the red and/or blue signals. Normally the color signals have a DC offset, or at least the green/SYNC signal does; this means that DC voltage is added to the lead so that even when there's no color signal present (when the screen is black), the color lead with the DC offset has higher voltage than the ground lead. These signals must be clamped at the remote end, for linear amplification in stages that follow.

5.1.4 KEYBOARD AND MOUSE

The ACS235A Extender's keyboard and mouse interfaces are standard PS/2 type interfaces, so you can attach just about any standard PS/2 compatible keyboard and mouse to the Extender. Do *not* attach serial mice or bus mice to the Extender; they will not work. You can attach a PC/AT style keyboard with a 5-pin DIN connector to the Extender by using a keyboard adapter, available separately as product code FA211.

The ACS236A Extender's keyboard and mouse interface is a standard Sun type interface, so you can attach just about any standard Sun compatible keyboard and mouse to the Extender. The Extender is transparent to Sun keyboard type and keyboard language.

5.1.5 PARALLEL PRINTER (OPTIONAL WITH ACS235A)

The ACS235A Extender's printer interface is an IBM PC style (Centronics compatible) parallel interface, so you can attach any basic parallel printer (IBM PC or Centronics type) to the Extender.

CAUTION!

This is a printer interface *only*. It cannot be used to attach Zip® drives and other parallel devices, nor can it be used for parallel file transfer using utilities such as Laplink®.

The Extender also doesn't support the newer IEEE 1284 or Bitronics® signaling (and the transmission delay would cause timeout problems for these protocols anyway), so don't try to establish bidirectional, Extended Capabilities Port (ECP), or Enhanced Parallel Port (EPP) communication with an attached parallel printer.

Lastly, you should be aware that the latest version of the standard parallel-printer device driver from Hewlett-Packard® (HP®) will not work with printers attached to a CPU across an Extender link. If you have problems with your printer driver, contact your printer dealer or HP support.

5.1.6 SERIAL DEVICE (OPTIONAL WITH ACS236A)

The ACS236A Extender's serial interface is an EIA/TIA RS-232 serial interface, pinned according to TIA-574 on DB9 connectors just like the serial ports of an IBM PC compatible computer. The serial port on the Local Module is a DCE and the serial port on the Remote Module is a DTE. The Extender supports the TD, RD, RTS, CTS, DSR, and DTR signals. This means that you can attach just about any serial device to this port that you would directly attach to a PC's serial port, including a printer, plotter, scanner, or touchscreen. Keep in mind, though, that the maximum data rate that the Extender can transmit across the fiber link is 38,400 bps.

5.2 Connecting a CPU or KVM Switch to the Local Module

NOTE

In the universal directions in this section and in Section 5.3**, we'll sometimes refer to separate keyboard and mouse connections even though there will only be one keyboard/mouse connection when the Sun Extender (ACS236A) is involved.**

Your ServSwitch Brand Fiber KVM Extender comes with a KVM-extension cable that you can use to connect a computer CPU or ServSwitch family KVM switch to the Extender's Local Module:

- The extension cable that comes with the ACS235A is a three-strand cable. The two outside strands carry keyboard and mouse data, and have 6-pin mini-DIN male connectors at both ends. The central strand carries video data; it has an HD15 female connector at the Extender end and an HD15 male connector at the other end.

- The extension cable that comes with the ACS236A is a two-strand cable. The outside strand carries keyboard and mouse data, and has 8-pin mini-DIN male connectors at both ends. The central strand carries video data; it has an HD15 female connector at the Extender end and an HD15 male connector at the other end. (If you're using the ACS236A with a legacy Sun CPU that outputs Sun video on a 13W3 connector, you'll need a Sun video-extension cable such as product code EVMVDT02-MF to take the place of the included cable's video strand. **Important note:** Do *not* use a standard HD15-to-13W3 "Sun video adapter" or "Sun video adapter cable" to patch the included cable's video strand to the CPU! These are *not* pinned correctly for use with the Extender!)

Take these steps (making sure the CPU or KVM switch is turned OFF):

1A. *ACS235A:* Take the end of the included KVM-extension cable with the *female* video connector and plug its connectors into the matching connectors on the front panel of the Extender's Local Module. Attach the cable's video strand to the Module's HD15 male connector, the cable's keyboard strand to the 6-pin mini-DIN female connector on the Module labeled with the picture of a keyboard, and the cable's mouse strand to the 6-pin mini-DIN female connector on the Module labeled with the picture of a mouse.

1B. *ACS236A:* Take the *female* end of the included KVM-extension cable's video strand, or of your Sun video-extension cable, and plug it into the matching male video connector (HD15 for VGA, 13W3 for Sun video) on the front panel of the Extender's Local Module. (Do *not* plug video cables into both video connectors at the same time!) Plug the keyboard/mouse strand of the included KVM-extension cable into the Local Module's 8-pin mini-DIN female keyboard/mouse connector.

2. Take the connectors at the other end of the cable and plug them into the equipment you want to attach. *ACS235A only:* Be very careful not to get the cable's keyboard and mouse strands backwards.

   • *If you're attaching a CPU or a KVM switch with separate user-side connectors:* Plug the included cable's connectors into the CPU's or switch's video, keyboard, and mouse ports.

   • *If you're attaching a KVM switch with a single, composite user-side connector:* These types of switches are used with monitor/keyboard/mouse "breakout" cables that patch from the single composite connector to multiple connectors; connect one of these to the switch's monitor/keyboard/mouse/(etc.) port. Then plug the connectors of the Extender's KVM-extension cable into the matching monitor, keyboard, and mouse connectors on the breakout cable. (Alternatively, if the breakout cable is long enough, you can run it directly to the switch's monitor, keyboard, and mouse ports.)

NOTE FOR ACS235A

If the CPU, switch, or breakout cable doesn't have a PS/2 style (6-pin mini-DIN female) keyboard interface, but *does* have a PC/AT style (5-pin DIN female) keyboard interface, connect the keyboard-port adapter included with the Extender between that interface and the KVM-extension cable's keyboard-port connector. If the CPU, switch, or breakout cable doesn't have a PS/2 style (6-pin mini-DIN female) mouse interface, but *does* have a PC/AT style RS-232 serial (DB9 female) mouse interface, connect the mouse-port adapter included with the Extender between that interface and the KVM-extension cable's mouse-port connector.

3A. *ACS235A: If you're going to be using a parallel printer at the remote site:* The included parallel-extension cable has only one strand; it has a DB25 male connector at one end and a DB25 female at the other. Plug the male end into the CPU's parallel port—or the parallel-printer port of your KVM switch if it has one—and the female end into the Local Module's DB25 male printer port (labeled with the picture of a printer).

3B. *ACS236A: If you're going to be transmitting serial data across the fiber link:* We don't include a serial-extension cable with the Extender because (a) applications requiring serial extension will be rare and (b) the necessary type of extension cable will vary depending on what type of equipment you're attaching. Please call Black Box Tech Support for assistance in selecting any serial cables and adapters you'll need. Keep in mind that in order to be attached to the Local Module's DB9 female port (which is pinned as a DCE), a serial cable must have a DB9 male connector.

5.3 Connecting User Equipment or a KVM Switch to the Remote Module

NOTE FOR ACS236A

Do *not* plug monitors, switches, etc., into *both* of the Remote Module's video connectors at the same time.

Take these steps to attach your user equipment directly to the Extender's Remote Module:

1. Plug the monitor into the Remote Module's HD15 or 13W3 female video port (labeled with the picture of a monitor). If you're using an RGB monitor with the ACS235A, run an HD15-to-multiple-BNC video-adapter cable between the Module and the monitor.

2. Plug the keyboard into the 6-pin or 8-pin mini-DIN female keyboard port on the Remote Module (the port labeled with the picture of a keyboard). *ACS235A:* Use a keyboard adapter such as FA211 if the keyboard is a PC/AT type with a 5-pin DIN connector on its cable.

3. *ACS235A:* Plug the PS/2 mouse into the 6-pin mini-DIN female mouse port on the Remote Module (the port labeled with the picture of a mouse). (The mouse *must* be PS/2 type.)
   ACS236A: Plug the Sun mouse into the mouse port on your keyboard.

4A. *ACS235A:* To attach an optional parallel printer, run a standard parallel cable from the printer to the Remote Module's DB25 female printer port (labeled with the picture of a printer).

4B. *ACS236A:* To attach an optional serial device, run a serial cable from the device to the Remote Module's DB9 male serial port (pinned as DTE, labeled "Serial"). This cable should be the same type that you'd use to attach the device to one of the serial ports on an IBM compatible PC.

Take these steps to attach a KVM switch with separate CPU-side connectors (that is, one connector for each interface) to the Extender's Remote Module:

1. Run a video-extension cable from the switch's CPU-video port to the Remote Module's HD15 or 13W3 female video port (labeled with the picture of a monitor).

2. Run a keyboard-extension cable from the switch's CPU-keyboard port to the 6-pin or 8-pin mini-DIN female keyboard port on the Remote Module (the port labeled with the picture of a keyboard). *ACS235A:* Use a keyboard adapter such as FA212 if the switch has a PC/AT style 5-pin DIN CPU-keyboard port.

3. *ACS235A:* Run a PS/2 mouse-extension cable from the switch's PS/2 CPU-mouse port to the 6-pin mini-DIN female mouse port on the Remote Module (the port labeled with the picture of a mouse). (The switch's CPU-mouse port *must* be PS/2 type.)

4A. *ACS235A:* If the switch has an input-only CPU-parallel port that is pinned (and functions) the same way as a parallel printer's port, you can run a parallel cable from this port to the Remote Module's DB25 female printer port (labeled with the picture of a printer).

4B. *ACS236A:* If the switch has a serial port, you can run a serial-cable from the port to the Remote Module's DB9 male serial port (pinned as DTE, labeled "Serial"). This cable should be the same type that you'd use to attach the device to one of the serial ports on an IBM compatible PC.

Take these steps to attach a KVM switch with single, composite CPU-side connectors to the Extender's Remote Module:

1. Attach a CPU-video/keyboard/mouse/etc. "breakout" cable to one of the switch's composite CPU ports.

2. Plug the video strand of this cable into the Remote Module's HD15 or 13W3 female video port (labeled with the picture of a monitor).

3. Plug the keyboard strand of this cable into the 6-pin or 8-pin mini-DIN female keyboard port on the Remote Module (the port labeled with the picture of a keyboard). *ACS235A:* If the cable's keyboard strand is 5-pin DIN PC/AT type, use a keyboard adapter such as our FA211.

4. *ACS235A:* Plug the PS/2 mouse strand of this cable into the 6-pin mini-DIN female mouse port on the Remote Module (the port labeled with the picture of a mouse). (The mouse strand of this cable *must* be PS/2 type.)

5A. *ACS235A:* If the switch supports parallel-interface switching, you can plug the parallel strand of the breakout cable into the Remote Module's DB25 female printer port (labeled with the picture of a printer).

5B. *ACS236A:* If the KVM switch supports serial-interface switching, you can plug the serial strand of the breakout cable into the Remote Module's DB9 male serial port (pinned as DTE, labeled "Serial").

5.4 Running Fiber Cable Between the Local and Remote Modules

You'll need breakout-style fiberoptic cabling with at least five fibers to connect the Extender's Local Module to its Remote Module. What type of cable(s) you use will depend on where you're going to run them:

- **Indoors:** Use bulk preterminated cable (such as product code EFN1006A-ST for six fibers, EFN1008A-ST for eight fibers, etc.—specify length) or cable you'll terminate yourself (such as EFN1006A for six fibers, etc.) for your direct indoor runs between Local and Remote Modules.

- **Outdoors (Moderate):** First use our preterminated ServSwitch Fiber Patch Cord (product code EFN235 for ACS235A or EFN236 for ACS236A) to run from the Local or Remote Module to the demarc (demarcation point). Then use bulk loose-tube outside-plant cable, either the preterminated type (such as product code EFN3006A-ST for six fibers, EFN3008A-ST for eight fibers, etc.— specify length) or the type you'll terminate yourself (such as EFN3006A for six fibers, etc.) for your direct outdoor runs in mild to moderate conditions between Local and Remote Modules.

- **Outdoors (Extreme):** First use our preterminated ServSwitch Fiber Patch Cord (product code EFN235 for ACS235A or EFN236 for ACS236A) to run from the Local or Remote Module to the demarc (demarcation point). Then use bulk armored outside-plant cable (such as product code EFN4070A-1000 for a 1000-ft. [304-m] spool of unterminated 6-fiber type or EFN4075A-1000 for similar 12-fiber type) for your direct outdoor runs in extreme conditions between Local and Remote Modules.

Connect five of the strands of the cable that will be directly attached to the Extender Modules to the corresponding ST® female connectors on the back of the Modules:

- Red dot "R" strand to red dot "R" port (red color signal);

- Green dot "G" strand to green dot "G" port (green color signal);

- Blue dot "B" strand to blue dot "B" port (blue color signal);

- Black dot "1" strand to black dot "1" port (other signals, one direction)—the *fourth* port from the left on the Local Module, the *fifth* port from the left on the Remote Module; and

- White dot "2" strand to white dot "2" port (other signals, other direction)—the *fifth* port from the left on the Local Module, the *fourth* port from the left on the Remote Module.

CAUTION!

One of the most common errors in cabling the Extender is to attach fiber strands "1" and "2" to the Remote Module backwards (strand 1 to port 2, strand 2 to port 1). Notice that while the fiber ports on the *Local* Module are arranged in left-to-right order as "R," "G," "B," "1," and "2," the ports on the *Remote* Module are arranged in the order "R," "G," "B," "2," and "1".

5.5 Connecting Power to the Local and Remote Modules

The ServSwitch Brand Fiber KVM Extender comes with a pair of identical autosensing power supplies. Take these steps to attach them to your Extender's Local and Remote Modules:

1. Attach input cords to the IEC 320 male power inlets on the two power supplies' transformers. (This cord will be included for North American customers; other customers might have to get a cord appropriate for their local outlets.)

2. Attach the transformers' output cords to the 6-pin DIN connectors on the Local and Remote Modules (the connectors labeled "Power").

3. Plug the input cords into a standard utility-power (mains) outlet providing between 100 and 240 volts of AC power.

The Extender units will begin operating immediately; they don't have ON/OFF switches.

5.6 Powering Up the Rest of the System

To power up the other devices attached to the Extender units, take these steps:

1. Plug in and turn ON the monitor.

2. Plug in and turn ON the CPU. It should boot normally.

This completes the installation of your ServSwitch Brand Fiber KVM Extender system. It should be ready for continuous operation.

6. Operation

The ServSwitch™ Brand Fiber KVM Extender Modules should begin operating as soon as they (and all attached devices) are plugged in; the green and red Power LEDs on the units' rear panels should light. (If either LED on a Module fails to light, that Module has had an internal failure; contact Black Box Technical Support as described in **Section 7.2**.) While the Extender is ON, the Remote Module's 7-segment display will continuously indicate system status; see **Section 6.1** for how to interpret the various characters you might see on this display. If the color of the picture on your remote monitor doesn't look right, see **Section 6.2** for suggestions on how to fix it.

6.1 Interpreting the Remote Module's 7-Segment Display

Here are the various indications you might see on the Remote Module's display, along with what they mean. The numbers "0" through "3" and the blinking dot will only appear when AGC is enabled (see **Sections 3.2.2** and **3.3.2** or **4.1.3** and **4.2.1**). If more than one error has occurred, all of the corresponding error codes are displayed in a repeating sequence, one each second.

Zero (AGC enabled only): The "OK" display. No trouble; AGC is not currently active.
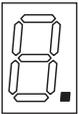
Blinking dot (AGC enabled only): The unit is applying AGC to the video signal, which is normal, and everything else is OK.
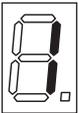
One (AGC enabled only): Low red. Even applying max AGC, the unit can't equalize the color signals, of which red is at the lowest level. There's trouble with the red transmit diode, fiber, or receive diode.

Two (AGC enabled only): Low green. Even applying max AGC, the unit can't equalize the color signals, of which green is at the lowest level. There's trouble with the green transmit diode, fiber, or receive diode.
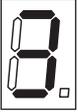
Three (AGC enabled only): Low blue. Even applying max AGC, the unit can't equalize the color signals, of which blue is at the lowest level. There's trouble with the blue transmit diode, fiber, or receive diode.
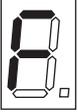
F: Contrast is turned up too high at the Remote Module for AGC to work properly. Turn the contrast down using the contrast dial on the Remote Module's rear panel.

H: HSYNC missing. Either there's a problem with the green/HSYNC fiber or the CPU-side extension cables, or a jumper has been set wrong in the ACS235A Local Module—probably **JP6** or **JP11** (see **Section 3.2.1**).

V: VSYNC missing. Either there's a problem with the blue/VSYNC fiber or the CPU-side extension cables, or a jumper has been set wrong in the Local Module, probably **JP10** or **JP11** (see **Section 3.2.1** or **4.1.1**).

b: Blank pulse missing. There's a problem with the green/HSYNC fiber.
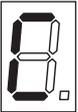
C: Distortion at receiver's data interface. Either there's a problem with fiber 1, fibers 1 and 2 have been transposed, or there's an internal error in the Local Module.
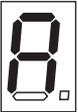
A: Distortion at transmitter's data interface. There's an internal error in the Remote Module.

6.2 Making Video Adjustments with the Remote Module's User Controls

If the image from your computer that's displayed on the remote monitor is badly distorted, this might be the result of a video-signaling problem. Refer to **Chapter 3** (especially **Section 3.2.1**) or **Chapter 4** for ways in which you can modify the way the ServSwitch Brand Fiber KVM Extenders handle the sync and color signals.

If the image is not distorted but the colors are off, we first suggest that you try tweaking the contrast and brightness dials on the rear panel of the ServSwitch Brand Fiber KVM Extender's Remote Module. Once you get the image as close as you can to how it should look, try adjusting the image with the monitor's controls.

If this doesn't work, you might try disabling the Extenders' automatic gain control (see **Sections 3.2.2** and **3.3.2** for the ACS235A PC model or **Sections 4.1.2** and **4.2.1** for the ACS236A Sun model), then using a tiny screwdriver to turn any of the three gain-control screwdials with which you can manually control the gain of the red, green, and blue color signals. These are also on the rear panel of the Remote Module: Each screwdial is just above and to the left of the fiberoptic connector carrying the color signal it controls, so the red screwdial is next to the red connector, green next to green, and blue next to blue. Be careful if you do this; when you make manual adjustments like these, it's very easy to throw the color of your monitor display entirely out of whack.

7. Troubleshooting

7.1 Things to Try First

Here are a few problems that sometimes occur in a ServSwitch™ Brand Fiber KVM Extender system, along with possible causes and solutions.

Problem: I can't get a picture on my monitor screen.
Check the LEDs on the rear panels of the Extender units:

- If they're lit: Is the monitor plugged in and turned ON? Is it in screen-saver mode? Is its cable loose?

- If they're dark: Are the Extender units plugged into a working outlet? Is the CPU actually plugged in, turned ON, and running? Is the CPU-extension cable loose? Is the fiber cable loose? Are any strands of the fiber broken—at the remote site, can you see a small red dot when you hold each fiber connector up to a white sheet of paper? Is the fiber the right type (50/125-µm or 62.5/125-µm gradient-index multimode)? (If everything seems like it ought to be working, the power supplies of one or both Extender units might be damaged.)

Problem: The picture on my monitor screen rolls uncontrollably.
The monitor isn't receiving a synchronization signal. The usual cause of this is plugging a color-signal fiber into the wrong port on an Extender unit (the red strand into the green port and vice versa, for example).

Problem: My keyboard, mouse, and printer don't work.
Fiber 1 and fiber 2 might be loose or connected backwards at one of the Extender units. They might also be broken—at the remote site, can you see a small red dot when you hold each fiber connector up to a white sheet of paper? Is the fiber the right type (50/125-µm or 62.5/125-µm gradient-index multimode)?

Problem: My mouse works but my keyboard doesn't.
The keyboard probably needs more current than the power supply can provide. Attach a keyboard whose power consumption does not exceed 100 mA.

7.2 Calling Black Box

If you determine that your ServSwitch Brand Fiber KVM Extender is malfunctioning, *do not attempt to alter or repair the unit.* It has no user-serviceable components. 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, what type of computer, what type of keyboard, brand of mouse, make and model of monitor, type and make of fiber 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.

7.3 Shipping and Packaging

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

- Package it carefully. We recommend that you use the original container.

- If you are returning the unit, include everything you received with it. Before you ship the unit back to Black Box for repair or return, contact us to get a Return Authorization (RA) number.

Appendix A: Pinouts

Here are the pinouts for the ServSwitch™ Brand Fiber KVM Extender's device and power connectors.

A.1 Connectors on Both Models

A.1.1 THE VGA VIDEO CONNECTORS

**On Local Module
(HD15 male)**

**On Remote Module
(HD15 female)**
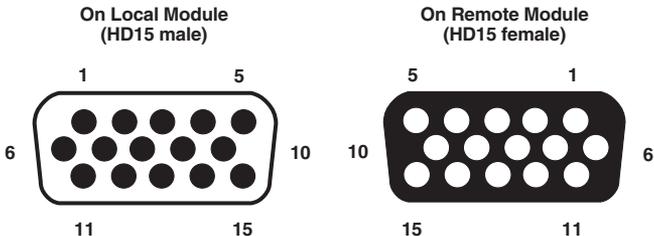
Pin	Signal	Pin	Signal
1	Red	8	Blue Ground
2	Green	10	Sync Ground
3	Blue	13	Horizontal Sync (HSYNC)
6	Red Ground	14	Vertical Sync (VSYNC)
7	Green Ground	(Other pins are not used or not connected.)	

A.1.2 THE POWER CONNECTOR

**On Local and
Remote
Modules
(6-Pin DIN
Female)**
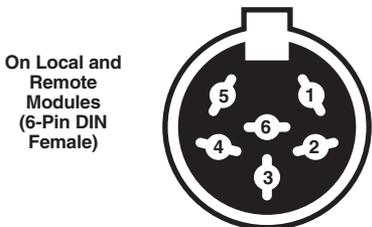
Pin	Signal
Shell	Shield
1	Ground
2	+12 VDC
3	Ground

(Other pins are not connected.)

A.2 Connectors on the ACS235A

A.2.1 THE PS/2 KEYBOARD CONNECTOR

**On Local and Remote Modules
(6-pin mini-DIN female)**

Pin	Signal
1	Keyboard Data
2	(No Connection)
3	Keyboard Ground
4	VCC (+5 VDC)
5	Keyboard Clock
6	(No Connection)

A.2.2 THE PS/2 MOUSE CONNECTOR

**On Local and Remote Modules
(6-pin mini-DIN female)**

Pin	Signal
1	Mouse Data
2	(No Connection)
3	Mouse Ground
4	VCC (+5 VDC)
5	Mouse Clock
6	(No Connection)

A.2.3 THE PARALLEL PRINTER CONNECTORS

On Local Module (DB25 male)

1   13

On Remote Module (DB25 female)

13   1

14   25

25   14

Pin	Signal	Direction
1	\STROBE	To printer
2	DATA1	To printer
3	DATA2	To printer
4	DATA3	To printer
5	DATA4	To printer
6	DATA5	To printer
7	DATA6	To printer
8	DATA7	To printer
9	DATA8	To printer
10	\ACK	To computer
11	BUSY	To computer
12	PE	To computer
13	*Local Module:* (+5V pull-up resistor); *Remote Module:* (No connection)	
14	(+5V pull-up resistor)	
15	*Local Module:* (+5V pull-up resistor); *Remote Module:* (No connection)	
16	INIT	To printer
17	(No connection)	
18-25	GND	N/A

A.3 Connectors on the ACS236A

A.3.1 THE SUN VIDEO CONNECTORS

On Local Module
(HD15 male)

A1   1   5   A2   A3

6   10

On Remote Module
(HD15 female)

A3   A2   5   1   A1

10   6
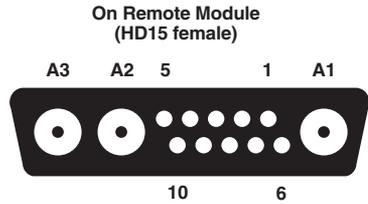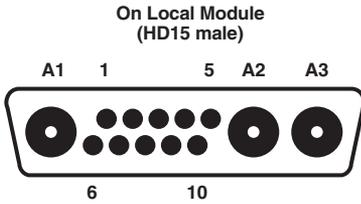
Pin	Signal	Pin	Signal
A1	Red	4	Ground
A2	Green	5	Composite Sync. (CSYNC)
A3	Blue	10	Ground

(Other pins are not connected.)

A.3.2 THE SUN KEYBOARD/MOUSE CONNECTOR

On Local and Remote Modules
(8-pin mini-DIN female)

Pin	Signal
1	Ground
2	Ground
3	Sun Power ON
4	Mouse IN
5	Keyboard OUT
6	Keyboard IN
7	Keyboard Power ON
6	Sun Power ON

A.3.3 THE SERIAL CONNECTORS

**On Local Module
(DB9 female)**

**On Remote Module
(DB9 male)**
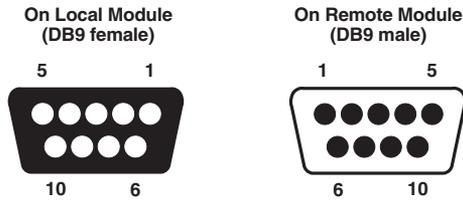
Pin	Signal	Direction
1	(No connection)	
2	RD (Receive Data)	Input to Remote, output from Local
3	TD (Transmit Data)	Output from Remote, input to Local
4	DTR (Data Terminal Ready)	Output from Remote, input to Local
5	SGND (Signal Ground)	N/A
6	DSR (Data Set Ready)	Input to Remote, output from Local
7	RTS (Request to Send)	Output from Remote, input to Local
8	CTS (Clear to Send)	Input to Remote, output from Local
9	(No connection)	

Appendix B:
Rackmounting the Extender

If you want to mount one or two ServSwitch™ Brand Fiber KVM Extender Local or Remote Modules in a standard 19" equipment rack, you can use the Single-Module Rackmount Kit (product code RMK235) or the Dual-Module Rackmount Kit (RMK235-2) respectively. The RMK235 kit is shown in Figure B-1:
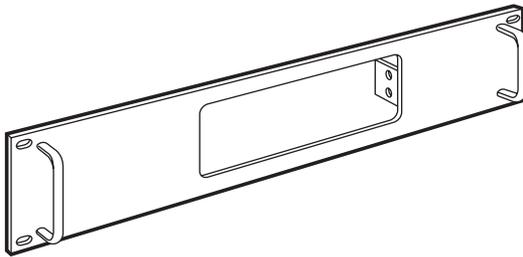
Figure B-1. The RMK235 Rackmount Kit.

Each of these Kits consists of a single rackmounting frame, two handles, four Philips-head screws, a hex tool, and four (RMK235) or eight (RMK235-2) hex-head screws. To use a Kit to mount an Extender Module, take these steps, referring to Figure B-2 on the next page:

1. Using a Philips-head screwdriver (not included), attach the handles to the front of the Kit frame with the four Philips-head screws.

2. Unscrew and remove two screws from each side of the case of the Module you want to mount:

   • If you want the *front-panel device connectors*—the ones on a Local Module that will be attached to the CPU, or the ones on a Remote Module that will be attached to the user station—to protrude from the front of the rack, remove the screws closest to the *front* of the Module.

   • If you want the *rear-panel fiberoptic connectors* to protrude from the front of the rack, remove the screws closest to the *rear* of the Module.

3. Insert the Module into the Kit frame from behind, through the matching hole (or, on the Dual Kit, either matching hole); the end of the Module that you removed the screws from in step 2 must go in first. Match up those now-vacant screwholes in the sides of the Module with the holes in the two small flanges welded to the back of the Kit frame.

4. Using the included hex tool, screw four of the included hex screws *through* the holes in the flanges and *into* the Module to secure the Module to the frame.

5. *Dual-Module Kit only:* Repeat steps 2 through 4 for the other Module.

6. Match the mounting holes at the opposite ends of the Kit frame to an appropriate set of matching holes on your equipment rack, then attach the Module-and-frame assembly to the rack using your own screws, bolts, or cage nuts (not included).
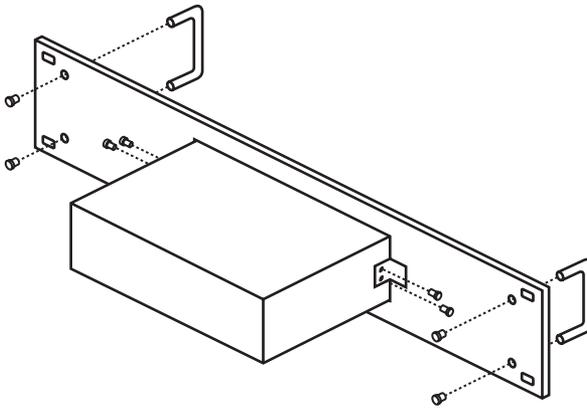
Figure B-2. The rackmount assembly (RMK235 shown).