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!

*

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

KV5002MA-R2	**KV5008FA-R2**
KV5004SA-R2	**KV5012FA-R2**
KV5008SA-R2	**KV5016FA-R2**

This manual also includes information about the accessories with these product codes (each comes with its own installation guide if ordered separately):

KV5000C	**RMK23S**
RMK19M	**RMK23F**
RMK19S	**RMK24M**
RMK19F	**RMK24S**
RMK23M	**RMK24F**

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

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

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

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Appendix   **Page**

1. Specifications

Hardware Required — Monitor that supports your computers' highest video standard; in multiplatform applications, should be a multisync model capable of forming video from either composite sync or separate horizontal and vertical sync signals (see **Section 4.1.1**)

Compliance — CE, FCC Part 15 Subpart J Class A, IC Class/classe A

Standards — With original Serv cabling: VGA (color or monochrome/ page white) video;
With original Serv cabling (minimal) or coaxial cabling (recommended): SVGA and Mac video;
With coaxial cabling: XGA (color or monochrome), Sun, RS/6000, and SGI video

Interfaces — RS-232 port: EIA/TIA RS-232 proprietarily pinned on RJ-12 ("6-wire RJ-11") connector, DTE;
CPU and MONITOR/KEYBOARD/MOUSE ports:
Proprietary composite of:
• IBM AT, IBM PS/2, Sun, or ADB keyboard;
• RS-232, PS/2, Sun, or ADB mouse; and
• Video (standards listed above)

Resolution — With original Serv cabling: Up to 1024 x 768 noninterlaced;
With coaxial cabling: Up to 1600 x 1280 noninterlaced;
Refer to **Section 4.1.3**

Refresh Rate — Up to 100 Hz

Protocol — RS-232: Asynchronous

Data Format — RS-232: 8 data bits, 1 stop bit, no parity (fixed)

Data Rate — RS-232: 9600 or (for firmware update only) 57,600 bps

**Maximum
Distance —**   Depending on the CPU, monitor, and video resolution
                 (see **Section 4.1.3**), either:
                     20 ft. (6.1 m) of original Serv cable from any
                         ServSwitch Ultra to any device attached to it, with
                         not more than 40 ft. (12.2 m) of total original Serv
                         cable between any CPU and any user station; or
                     20 ft. (6.1 m) of coaxial cable—possibly as much as
                         100 ft. (30.5 m), depending on CPUs—from any
                         ServSwitch Ultra to any device attached to it;
                 Also, 50 ft. (15.2 m) of serial cable from the RS-232 port
                 of any ServSwitch Ultra to a computer's serial port

User Controls — All models:
                     Keyboard commands;
                     On-screen menus;
                 KV5002MA-R2:
                     (3) Front-mounted pushbuttons:
                         "ON/OFF" (power), "+" (switch to next port), and
                             "–" (switch to previous port);
                 All models except KV5002MA-R2:
                     (2) Front-mounted pushbuttons:
                         "▲" (switch to next port) and "▼" (switch to
                             previous port);
                     (1) Rear-mounted rocker switch for power

Indicators —   All front-mounted LEDs;
                 All models: (1) for ServSwitch Ultra unit: POWER;
                 KV5002MA-R2: (4) for CPUs: (2) SELECT, (2) POWER;
                 KV5004SA-R2: (8) for CPUs: (4) SELECT, (4) POWER;
                 KV5008SA-R2, KV5008FA-R2:
                     (16) for CPUs: (8) SELECT, (8) POWER;
                 KV5012FA-R2: (24) for CPUs: (12) SELECT,
                     (12) POWER;
                 KV5016FA-R2: (32) for CPUs: (16) SELECT,
                     (16) POWER

Connectors — All rear-mounted;
(1) RJ-12 ("6-wire RJ-11") female: RS-232;
(1) DB25 female: MONITOR/KEYBOARD/MOUSE;
(1) Power inlet:
  KV5002MA-R2: 5-pin DIN female;
  All other models: IEC 320 male;
DB25 female CPU ports:
  KV5002MA-R2: (2);
  KV5004SA-R2: (4);
  KV5008SA-R2, KV5008FA-R2: (8);
  KV5012FA-R2: (12);
  KV5016FA-R2: (16)

Power — KV5002MA-R2:
  From wallmount external power supply (type may vary,
    refer to labeling on transformer):
    Either:
      Input: 90 to 260 VAC at 50 or 60 Hz, 65 to 130 mA;
      Output: +8 VDC at 1.5 A, –8 VDC at 375 mA;
    or:
      Input: 90 to 264 VAC at 47 to 63 Hz, 78 to 156 mA;
      Output: +12 VDC at 1 A, –12 VDC at 0.5 A;
  Consumption: Up to 15 VA (15 watts);
All other models;
  From AC outlet through included power cord and
    IEC 320 male inlet to UL®, CUL, and TÜV approved
    internal transformer:
    Input: 100 to 240 VAC at 50 or 60 Hz, 450 mA;
    Output: +5 VDC at 1.5 A, +12 VDC at 1 A;
  Consumption: Up to 19.5 VA (19.5 watts)

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

**Temperature
Tolerance—** 32 to 131˚F (0 to 55˚C)

**Humidity
Tolerance—** 5 to 80% noncondensing

Enclosure — Steel

Size —   KV5002MA-R2:
           1.8" (1U) H x 8.8"W x 4.8"D (4.5 x 22.5 x 12.4 cm);
        KV5004SA-R2, KV5008SA-R2:
           1.8" (1U) H x 16.8"W x 4.8"D (4.5 x 42.5 x 12.4 cm);
        KV5008FA-R2, KV5012FA-R2, KV5016FA-R2:
           3.5" (2U) H x 16.8"W x 4.8"D (8.9 x 42.5 x 12.4 cm)

Weight —   KV5002MA-R2: 2 lb. (0.9 kg);
        KV5004SA-R2: 3 lb. (1.4 kg);
        KV5008SA-R2: 4 lb. (1.8 kg);
        KV5008FA-R2: 5 lb. (2.3 kg);
        KV5012FA-R2, KV5016FA-R2: 6 lb. (2.7 kg)

2. Introduction

Thank you for choosing a ServSwitch Ultra™. Designed with your needs in mind, your new Switch will simplify your job by helping you organize your multiple-computer application. With your Switch, you can use one keyboard, monitor, and mouse to access a number of computers compatible with any of a number of hardware platforms—including IBM® PC and RS/6000®, Apple® Macintosh®, Sun Microsystems®, and SGI®—so you can significantly reduce your equipment overhead and end keyboard and monitor clutter.

This chapter describes everything that comes with the Switch, the external and operating features of the Switch, and the cabling you'll need for the Switch.

2.1 The Complete Package

Your ServSwitch Ultra package includes the Switch unit, its power supply, a modular cable and adapter for connecting one of the unit's RS-232 ports to a remote PC, and this manual. If you didn't receive everything, or if anything arrived damaged, contact Black Box.

2.2 Operating Features

Some of the useful features of the ServSwitch Ultra:

- Microprocessor-controlled keyboard and mouse switching.

- On-screen menu system for configuration and operation.

- You can access up to 256 CPUs with one keyboard, monitor, and mouse. (This would require the maximum cascaded system of seventeen 16-port Serv units.)

- You can select the desired CPU using the on-screen display, keyboard, front panel, or RS-232 port.

- Front-panel LEDs show the selected CPU and its power-on state.

- Supports IBM PC and RS/6000, Apple® Macintosh®, and Sun Microsystems® compatible computers, as well as current SGI compatible computers.

- Supports all modes of PS/2® and PC/AT® compatible keyboards, as well as ADB® (Apple Desktop Bus®) and Sun® keyboards.

- Mouse can be PS/2®, Microsoft® serial, PC Mouse® (Mouse Systems®) serial, serial 8-bit, ADB, or Sun type (although the mouse type must match the keyboard type).

- Supports SVGA, color or monochrome XGA or VGA, Apple, Sun, RS/6000, and SGI video at resolutions up to 1280 x 1024 noninterlaced (although all video types except VGA and Apple low-res require coaxial or special cables).Note that in a multiplatform environment, you will need a multisync monitor capable of syncing to the output of all your CPUs' video cards and of supporting their highest resolutions; refer to **Section 4.1**. Also note that you'll need a Mac® Adapter for ServSwitch for each CPU that outputs Apple video at resolutions over 640 x 480; see the Note on page 23.

- The units remember and restore Num Lock, Caps Lock, Scroll Lock, and keyboard mode for each CPU.

- Screen-save function can turn off video after 1 to 999 seconds of inactivity.

- Scan function can sequence between CPUs every 1 to 15 seconds.

- You can program the keyboard's typematic rate and delay.

- Custom settings for each CPU can be saved in nonvolatile memory.

- The units have flash memory, so you can upgrade their firmware through their RS-232 ports.

- Rackmount kits are available.

- Full-size 8- and 12-port units can be expanded up to 16 ports by installing 4-Port Expansion Boards. Please contact Black Box Tech Support if you ever want us to do this for you.

2.3 The Front Panel

The front panels of the ServSwitch Ultra feature two or three pushbutton switches and several LED indicators. To familiarize yourself with these controls and indicators, refer to Figures 2-1, 2-2, and 2-3 below and the descriptions that follow on the next page.
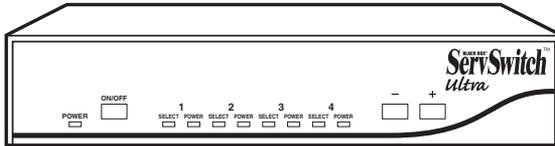
Figure 2-1. The front panel of a KV5x04M model (mini) 4 to 1 ServSwitch Ultra.

Figure 2-2. The front panel of a KV5x08S model (slimline) 8 to 1 ServSwitch Ultra.
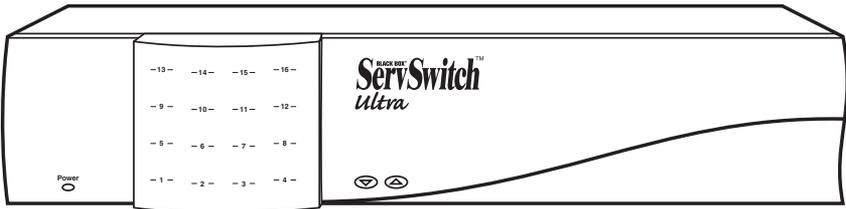
Figure 2-3. The front panel of a KV5x16F model (full-size) 16 to 1 ServSwitch Ultra.

Panel Label	Description

POWER (left)   Main Power LED: Lights to indicate that unit is powered ON.

ON/OFF   *2-port units only:* Press this button to turn the ServSwitch ON or OFF.

[Numbered]   CPU Status LEDs: Numbered pairs of LEDs indicate the status of the CPU or submaster (cascaded) Serv device connected to the corresponding port on the rear panel:

SELECT or [unlabeled left] (red)
Lights if the corresponding port is the currently selected port.

POWER or [unlabeled right] (green)
Lights if the device on the corresponding port is powered ON.

NOTE

The mini-model chassis has 4 each of the Select and [CPU] Power LED slots. The slimline-model chassis has 8 each of these slots, and the full-size chassis has 16 each of them. The extra LED slots in the chassis of the 2-port mini, 4-port slim, and the 8- and 12-port full-size models are left blank, but are protected by material mounted inside the chassis.

– or ▼   Previous Port Button: Press this button to manually switch the shared monitor, keyboard, and mouse from the currently selected computer to the previous one in sequence.

+ or ▲   Next Port Button: Press this button to manually switch the shared monitor, keyboard, and mouse from the currently selected computer to the next one in sequence.

2.4 The Rear Panel

All cable connections are made at the rear panel of the ServSwitch Ultra, as illustrated in Figures 2-4 and 2-5 and described below.
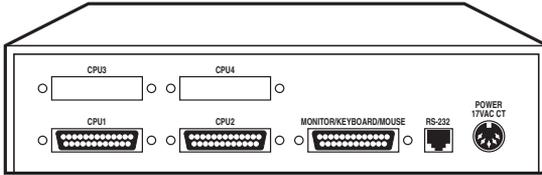
Figure 2-4. The rear panel of a 2 to 1 ServSwitch Ultra (KV5002MA-R2).
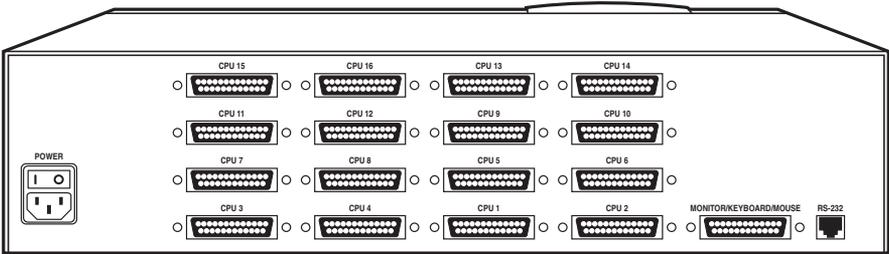
Figure 2-5. The rear panel of a 16 to 1 ServSwitch (SW725A-R4).

Panel Label	Conn.	Description
CPU *N* [*N* = a number from 1 to either 2, 4, 8, 12, or 16, depending on which model you have]	DB25 F	Connect your computers to these ports with "CPU Adapter Cables." At the ServSwitch Ultra end these cables have a DB25 male connector; at the other ends, they have appropriate connectors to plug into your CPUs' video, keyboard, and mouse ports. These cables take the signals that would normally pass between the CPUs' ports and the monitor, keyboard, and mouse, and carry them between the CPUs' ports and the Switch instead.

You could also connect "submaster" Serv type switches to these ports using "ServSwitch-to-ServSwitch Expansion Cables." These cables have DB25 male connectors at both ends; at the submaster end, they should be plugged into a MONITOR/ KEYBOARD/MOUSE port. Refer to **Sections 2.5** and **3.2.4**. |

Panel Label	Connector or Control	Description
CPU *N* (continued)	DB25 F	For each submaster you plan to connect, you must have an Expansion Cable; you must have an Adapter Cable for each CPU you plan to connect. See **Section 2.5**.

NOTE

The 2-port (mini) chassis has 4 CPU *N* connector slots; the slimline-model chassis has 8 of these slots, and the full-size chassis has 16 of them. The extra connector slots in the chassis of the 2-port, 4-port slim, and 8- and 12-port full-size models are left blank, but are protected by material mounted inside the chassis.

Panel Label	Connector or Control	Description
MONITOR/ KEYBOARD/ MOUSE	DB25 F	Connect the shared monitor, keyboard, and mouse to this port using an "MKM Adapter Cable." At the ServSwitch Ultra end, this cable has a DB25 male connector; at the other ends, it has appropriate connectors to plug into your monitor, keyboard, and mouse cables. Only one MKM Adapter Cable is needed. See **Section 2.5**.
RS-232	RJ-12 F	If you connect a more distant computer or terminal to this RS-232 serial port, you'll be able to send switching commands to the ServSwitch Ultra from a secondary location. You would also connect a computer to this port to upgrade the Switch's firmware. Refer to **Section 4.4**.
POWER [Switch], all except 2-port	Rocker switch	Flipping this switch turns the ServSwitch Ultra ON and OFF when the power cord is plugged into the unit and into a working outlet.
POWER [Inlet]	2-port: 5-pin DIN M Others: IEC 320 M	Connect the ServSwitch Ultra's power cord or power-supply cord here. The power supply is autosensing; it will accept input voltages from 90 to 264 VAC (2-port units [external transformer]) or 100 to 240 VAC (other models [internal transformer]).

2.5 Cable Requirements

Many switches of this type have what seems like ten million connectors on their rear panels: one for each CPU's video cable, one for each keyboard cable, and a third for each mouse cable. The potential for tangling or mismatching cables is high.

By contrast, you can connect the ServSwitch Ultra to your CPUs with one CPU Cable (also called a "CPU Adapter Cable") for each CPU. This single cable reaches the CPU's video-output, keyboard, and mouse ports.

Likewise, to connect "submaster" (slave) Serv type switches, you need one "ServSwitch-to-ServSwitch Expansion Cable" for each subsidiary unit.

Lastly, you can connect the ServSwitch Ultra to the shared monitor, keyboard and mouse with a single User Cable (also called an "MKM Adapter Cable").

The exact variety or varieties of these cables that you'll need will depend on the equipment you are connecting for your application. Refer to **Appendix B** for the available types of these cables and the corresponding product codes. Also refer to **Chapter 1** or the Caution notice on page 23 for information about maximum cabling distances.

NOTES

SVGA (over longer distances), XGA, and high-resolution Mac video place special demands on cabling that the regular CPU Cables and User Cables typically cannot meet. For these applications, you should use coaxial cables that can carry video signals not only farther but also at higher resolutions. See Appendix B **and the Caution notice on page 23. You'll also need a "Mac Adapter for ServSwitch" for each Mac CPU outputting high-res (greater than 640 x 480) video; see the Note on page 23.**

2.6 Equipment Requirements

If the CPUs you will be controlling through your ServSwitch Ultra are not all of the same type—especially if your CPUs represent completely different hardware platforms (IBM, Mac, etc.)—you will have to be careful to choose a common monitor, keyboard, and mouse that adequately support all of the CPUs. For full details, see **Section 4.1**.

3. Installation

3.1 Quick Setup Guide

Figure 3-1, below, shows a basic example of connecting a CPU, a submaster, a keyboard, a monitor, and a mouse to the ServSwitch unit. IBM PC equipment is shown, but the basic principles will be similar for all equipment types. Connectors will vary depending on the types of equipment you are installing.

Figure 3-1. Basic system setup for a slimline 8-port unit.

SLIMLINE 8-PORT SERVSWITCH ULTRA (KV5008SA-R2)
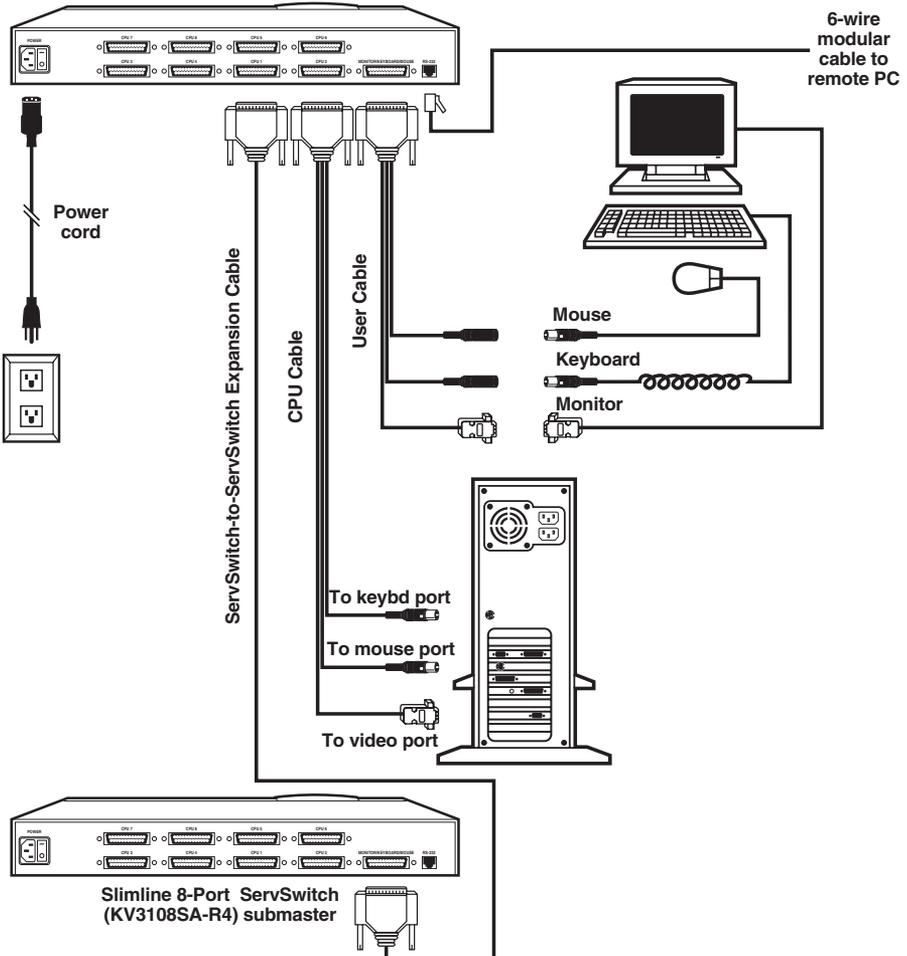
3.2 Installation Procedure

This section provides complete instructions for the hardware setup of a single ServSwitch Ultra. (For detailed instructions on the capabilities and concerns involved in installing a cascaded Switch system, see **Section 3.3**; to make troubleshooting the installation easier, we recommend that you check the master and each submaster as it is installed, rather than installing all units, then checking the entire cascade.) For an illustrated example of the elements of a basic setup, see Figure 3-1 on the previous page.

3.2.1 RACKMOUNTING (OPTIONAL)

If you want to mount the ServSwitch Ultra in a rack, you will need a ServSwitch Rackmounting Kit. For the 2-port mini model (KV5002MA-R2), our product code for a 19", 23", or 24" Kit is RMK19M, RMK23M, or RMK24M respectively. For the slimline models, our product code for a 19", 23", or 24" Kit is RMK19B, RMK23B, or RMK24B respectively. For the full-size models, our product code for a 19", 23", or 24" Kit is RMK19C, RMK23C, or RMK24C respectively. See **Appendix E** for more information.

3.2.2 CONNECTING THE MONITOR, KEYBOARD, AND MOUSE

A User Cable (also called a Monitor/Keyboard/Mouse ["MKM"] Adapter Cable) connects your monitor, keyboard, and mouse to the Switch. Because various styles of electrical connectors are used by different classes of equipment, we supply this cable in various styles to match (see **Appendix B**). This cable also comes in the different lengths supported by different applications (see **Section 4.1.3**, **Appendix B**, and the Caution notice on the next page).

CAUTION!

Make *very* sure that the monitor, keyboard, and mouse you plan to use can meet the demands of your application—see Section 4.1**. Also, note that the ServSwitch Ultra doesn't support keyboard-line dongles.**

1. After you verify that the Switch is turned OFF, plug the DB25 male connector of the User Cable into the port labeled MONITOR/KEYBOARD/MOUSE on the Switch's rear panel.

2. If your user-station equipment is IBM type, plug the cables from your shared monitor, keyboard, and mouse into the corresponding connectors on the other ends of the User Cable. If your equipment is Mac or Sun type, plug the mouse cable into the keyboard, and plug the monitor and keyboard cables into the corresponding connectors on the other ends of the User Cable.

3.2.3 CONNECTING CPUs

CPU Cables run from the ServSwitch to the keyboard port, mouse port, and video-output port of each CPU you want to directly attach to it. Different types of this cable fit the connectors on different computers (see **Appendix B**). This cable also comes in the different lengths supported by different applications (see **Section 4.1.3**).

CAUTION!

Avoid routing cable near fluorescent lights, air-conditioning compressors, or machines that may create electrical noise. Total length of original Serv cable from the ServSwitch Ultra to any attached device (keyboard, monitor, mouse, CPU, or submaster) should not exceed 20 ft. (6.1 m); total length of original Serv cabling from any CPU to any keyboard, monitor, and mouse shouldn't exceed 40 ft. (12.2 m). For typical equipment and video resolutions, length of coaxial cable should not exceed 20 ft. (6.1 m) from a ServSwitch Ultra to any attached device. However, we do provide coaxial cable in lengths up to 100 ft. (30.5 m), because some CPUs can drive and receive keyboard and mouse signals at greater distances than others. To go even farther, you might want to use Station Extenders or CAT5 KVM Extenders (see Appendix B**) if your common keyboard and mouse are IBM type.**

1. After you verify that the Switch is turned off and unplugged, plug the DB25 male connector of the first CPU's CPU Adapter Cable into the lowest-numbered CPU port on the Switch's rear panel that isn't going to be occupied by a submaster Serv type switch. Use consecutively higher-numbered ports for the rest of the CPUs. For example, if you planned to put three submasters and three CPUs on an 8-port master Switch, you would put the submasters on ports CPU 1 through CPU 3 (see **Section 3.2.4**), and you would plug the three CPUs into ports CPU 4 through CPU 6.

2. Plug the CPU Adapter Cable's video-, keyboard-, and (on IBM type cables) mouse-port connectors into the corresponding ports on the CPU. The CPU should be OFF when you do this; the Switch will automatically adjust to the CPU's keyboard mode when you power up the CPU. Avoid plugging CPUs into the ServSwitch Ultra if they are already ON; if you accidentally do so, see **Section 5.3.2** to make sure the Switch is set for the proper keyboard mode.)

NOTE

You'll need to attach a Mac Adapter for ServSwitch (our product code KV99MA) between the video strand of the CPU Adapter Cable and the video-output port of any Macintosh CPU that outputs video in a format other than VGA (640 x 480). This is because the video circuitry of Mac CPUs often needs to see "ID bits" from the attached monitor, which the ServSwitch Ultra doesn't supply but the Mac Adapter does.

CAUTION!

Do *not* attach docking stations for older models of the ThinkPad® or other portable computers to the ServSwitch Ultra. The Switch currently supports only "stream mode" (continuous) mouse data, but older ThinkPad models have to see "prompt mode" (burst-on-request) mouse data. Some newer docking stations and some newer ThinkPad models might work with the Switch, but determining whether a particular unit will do so will probably require trial and error.

3.2.4 CONNECTING SUBMASTERS (OPTIONAL)

To connect a submaster Serv type switch (ServSwitch Ultra, regular ServSwitch, etc.) to a master ServSwitch Ultra, run a ServSwitch-to-ServSwitch Expansion Cable (our product code EHN055 for original cable or EHN274 for [recommended] coaxial cable) from one of the master Switch's CPU ports to (one of) the submaster's MONITOR/KEYBOARD/MOUSE port(s). Connect the first submaster to the master Switch's CPU 1 port and use consecutively higher-numbered ports (CPU 2, CPU 3, and so on) for the rest of the submasters. If you are connecting each of several submaster Matrix ServSwitches to two master ServSwitch Ultras (see **Section 3.3**), connect the CPU ports of one master to the submasters' MONITOR/KEYBOARD/MOUSE A ports, and the CPU ports of the other master to the submasters' MONITOR/KEYBOARD/MOUSE B ports.

Before installing an advanced configuration, please call Black Box and discuss your application with a technician.

3.2.5 POWERING UP THE SYSTEM

3.2.5.A Initial Steps

1A. *2-port model (KV5002MA-R2):* Making sure that the connected CPUs and any connected submasters are OFF (powered down), take the output cord of the ServSwitch Ultra's power supply and plug its 5-pin DIN male connector into the power jack on the rear panel of the Switch. Plug the power supply's input cord into a working outlet.

1B. *Other models:* Making sure that the connected CPUs and any connected submasters are OFF (powered down), take the ServSwitch Ultra's power cord and plug its IEC 320 female connector into the power inlet on the rear panel of the Switch. Plug its other end into a working outlet.

2. To power up the ServSwitch Ultra, push the ON/OFF button on its front panel (if it's a 2-port unit) or move the ON/OFF switch on its rear panel to the "|" (ON) position (if it's another type of unit). The Switch should boot normally, but if the unit's firmware has become corrupted—probably as the result of a firmware upgrade going wrong—it will display this message on the attached monitor:

   ```
   Kernel is bad, load new kernel through serial port
   ```

   If you see this, you will need to download correct firmware to the unit as described in **Section 4.4.3**, starting at the point at which the unit is ready to receive the file at 9600 baud (9600 bps). (In this case, you *must* download the file at 9600 bps.)

3.2.5.B Remaining Steps If All CPUs Are Sun Models
If *all* of your CPUs are Sun models, you need to proceed with the steps in this section in order to avoid video problems. If *any* of your CPUs are *not* Sun models, use the alternative steps in **Section 3.5.2.C** on the next page.

3. Before you power up any CPUs, try to change the Switch's keyboard output on all of its CPU ports from IBM PS/2 type to Sun type. If your Switch's firmware is a recent enough version, a "universal Sun keyboard mode" command will be active until you set a password for the Switch. Press and release the [Control] key on your Sun keyboard, then type the letter [M] followed by the numbers [5] and [0], then press and release [Enter]. This should cause all of your CPU ports to switch to Sun keyboard-mode output.
   Now use the Switch's front-panel LEDs and pushbuttons to select one of your Sun CPUs (see **Section 2.3**) and power up that CPU. It should boot properly and output video. If it doesn't, power it back down, unplug the keyboard strand of the CPU cable from the CPU's keyboard port, plug a Sun keyboard into that keyboard port, and power the CPU back up; this will definitely give you video. Once the CPU boots with video active, remove the

keyboard and reattach the keyboard strand of the CPU cable; you can now use the Switch's on-screen menu system (see **Section 5.1**) to change the keyboard settings of the all of your CPU ports to "Sun" (see **Section 5.3**).

4. Power up the rest of the directly connected CPUs and any connected submasters one by one, giving each one time to boot completely before turning ON the next one. (Issue a Keep Settings command after initial bootup, so that the Switch saves its keyboard settings to nonvolatile memory.)

5. Power up any CPUs connected to submasters one by one, giving each CPU time to boot completely before turning ON the next one.

3.2.5.C Remaining Steps If Any CPUs Aren't Sun Models
If *not* all of your CPUs are Sun models—that is, if at least one of your CPUs is a PC, Mac, etc.—proceed with the steps in this section. If all of your CPUs are Sun models, use the alternative steps in **Section 3.5.2.B** on the previous page.

3. Power up any directly connected non Sun CPUs and any connected submasters one by one, giving each one time to boot completely before turning ON the next one. When the non Sun CPUs are powered up after the ServSwitch Ultra, the Switch emulates all keyboard and mouse functions for automatic bootup. (You might want to issue a Keep Settings command after initial bootup, so that the Switch saves the mode settings it has autodetected to nonvolatile memory.)

4. Power up any non Sun CPUs connected to submasters one by one, giving each CPU time to boot completely before turning ON the next one.

5. *If there are any Sun CPUs in your system:* Switch to a CPU port that has a powered non Sun CPU attached to it (see **Section 3.2.7**). Bring up the Switch's on-screen menu system (see **Section 5.1**) and change the keyboard settings of the CPU ports with Sun CPUs attached to them to "Sun" (see **Section 5.3**). Power up all of the Sun CPUs one by one, giving each CPU time to boot completely before turning ON the next one.

3.2.6 CHANGING THE KEYBOARD SETTING OF WINDOWS NT 4.0 CPUS

If any CPUs attached to your ServSwitch Ultra are running Microsoft Windows NT 4.0, you *must* change the keyboard setting in their Control Panel from the default, "Microsoft Enhanced Keyboard," to "Standard 101/102 or Microsoft Natural Keyboard." Your ServSwitch system *will not work with these CPUs* unless their keyboard settings are changed. To do this, take these steps:

1. Click on the icon for "My Computer" (or whatever you've named the computer itself).

2. Click on "Control Panels."

3. Click on "Keyboard."

4. Click on the "General" tab.

5. In the Keyboard Type field, scroll from the "Enhanced" setting to the "Standard" setting.

For more information, consult your Windows NT manual.

3.2.7 SWITCHING FROM THE KEYBOARD

Your ServSwitch Ultra is now ready for operation using its default settings. To take full advantage of the Switch's features, refer to **Chapter 4**, which gives detailed information about each of the ServSwitch Ultra commands, describing each command's function and keystroke sequence. For your convenience, this info is summarized in **Section 4.2**. To begin switching immediately, however, just press and release your keyboard's left Control key ([Ctrl] or [control]), then—within the next two seconds—type in your desired port number with the regular number keys (not the numeric keypad). (This procedure is slightly more complicated if there are more than nine CPUs in your Switch system; refer to **Section 4.3.1**.)

3.3 Cascading in ServSwitch Ultra Systems

In a normal cascaded ServSwitch Ultra system, the shared monitor(s), keyboard(s), and mouse (mice) are directly attached to one or more "master" ServSwitch Ultras, while all the CPUs are indirectly attached through "submasters" (subsidiary ServSwitch Ultras, regular ServSwitches, ServManagers, etc.) that provide port expansion but may or may not perform any control functions of their own. When you cascade in this way, you can expand your system to include up to 256 ports (sixteen 16-port submasters on a 16-port master unit).

CAUTION!

To avoid platform- and peripheral-mismatch problems, take these precautions:

1. In any application involving CPUs belonging to different platforms, we recommend that you use multiplatform masters and submasters.

2. If you own any of the older Apple only or Sun only ServSwitches we used to sell, don't try to add them to your cascade. They do not support cascading.

3. If you attach any PC-only submasters to a multiplatform master, make sure you attach *only* IBM PC compatible CPUs to those submasters.

4. If you use any PC-only masters, we recommend that you use only PC-only submasters. If you must use any ServManager or ServSwitch Ultra submasters, make sure that you have those submasters set for the keyboard and mouse type you're using with [Ctrl] M*xx* [Enter], and make sure that those settings are saved in the submasters' NVRAM with [Ctrl] K.

5. All of the CPUs attached to any PC-only submaster must use the same type of keyboard and mouse.

You can add submasters to your ServSwitch Ultra system as you need them. For each submaster you add to the system, you add as many ports as are on that submaster, minus the one port on each master "above" it that's now occupied. Refer to Figure 3-2 on page 30:

- Connecting one 4-port submaster Serv unit to a 4-port master ServSwitch Ultra (top view) gives you a total of 7 ports: 4 on the submaster and another 3 (4 minus the one that the submaster is attached to) on the master.

- Connecting four 4-port submaster Serv units to a 4-port master ServSwitch Ultra (bottom view) gives you a total of 16 ports, 4 on each submaster. (All 4 ports on the master are now occupied.)

When you use Matrix ServSwitches as submasters, the setup is a little more complicated. Refer to Figure 3-3 on page 31: Connecting two 4-port Matrix ServSwitch submasters to an 8-port ServSwitch Ultra master gives you a total of 14 ports on that master. (Each of the masters in Figure 3-3 can access 14 ports, but while both masters share CPUs 1 through 8, CPUs 9 through 14 on either master

can only be accessed by the monitors, keyboards, and mice on that master. Note that when we say that CPUs 1 through 8 are "shared," we mean that they can be accessed by either master at different times, *not* by both masters simultaneously.) Adding a third 4-port submaster unit would give you a total of 17 ports, and so on. (To reach all of the CPUs in cascaded systems like this, you must set Maximum computers, Width, and Units properly on the master unit; see **Sections 5.2.3** through **5.2.5**.)

3.3.1 CABLE REQUIREMENTS FOR EXPANSION

To connect submaster units to a ServSwitch Ultra, you'll need one ServSwitch-to-ServSwitch Expansion Cable for each submaster unit. You will also need a CPU Adapter Cable for each CPU you will be connecting to the submaster's CPU ports. (Remember that one MKM Adapter Cable is required to connect the master unit to your keyboard, monitor, and mouse.) See **Sections 3.2.2** through **3.2.4**.

3.3.2 INSTALLING A CASCADE

Laying out your ServSwitch Ultra system prior to installation will make the installation process go more smoothly. It will also help you to keep the port-selection numbers you'll use in keyboard commands in a rational sequence. Figure 3-2 on the next page illustrates the proper layout and numbering of your submasters and CPUs.

Keep these restrictions in mind when you design your ServSwitch system:

- If you use original Serv Adapter Cables and Expansion Cables, the distance from any ServSwitch Ultra to any attached device should not exceed 20 ft. (6.1 m); the total length of original Serv cabling from any CPU to any monitor, keyboard, and mouse should not exceed 40 ft. (12.2 m). Depending on your application, these distances might be less; see **Section 4.1.3**.

- If you use coaxial Adapter Cables and Expansion Cables, the maximum distance from the ServSwitch Ultra to any attached device should not exceed 20 ft. (6.1 m) with typical monitors and video resolutions, but see the Caution notice on page 23. Depending on your application, this distance might vary; see **Section 4.1.3**.

- The total number of CPU ports accessible by any ServSwitch Ultra master unit must not exceed 256.

- Do not use older ("-R2" product code or earlier) mini (SW721 or SW722) model regular ServSwitches as submasters in your ServSwitch Ultra system. Their cascading logic and command language is different from that of all other Serv type units.

• You must not cascade submasters to more than one "layer." That is, you may connect submasters to the CPU ports of one or (with Matrix ServSwitch submasters) two master ServSwitches, but do not connect any submasters to *submasters'* CPU ports. To illustrate this restriction, let's say you've installed a four-port submaster on a four-port ServSwitch master and you have a four-port submaster yet to install. You must install the second submaster on the master's CPU 2 port, not on the first submaster's CPU 1 port. A third submaster would have to go on the master's CPU 3 port, a fourth on the CPU 4 port. If it becomes necessary to attach more CPUs after "maxing out" on submasters, you must upgrade your master or submasters.
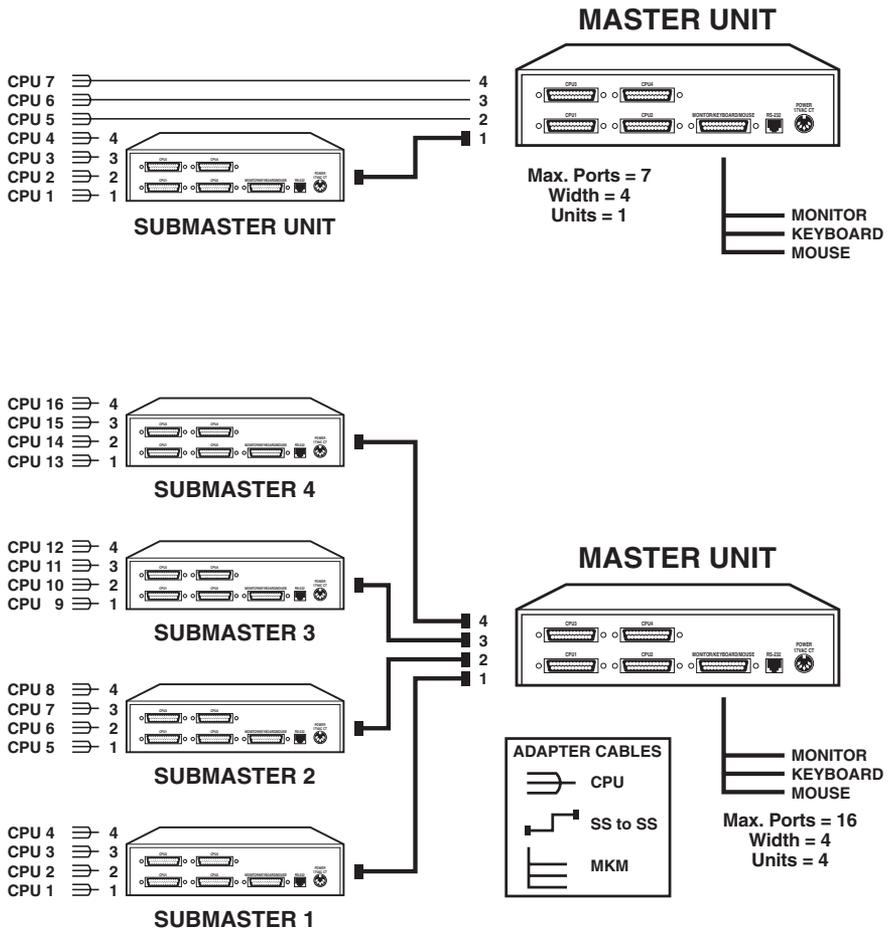
Figure 3-2. Basic ServSwitch cascading.

- If you are attaching more than one submaster to a slimline or full-size master ServSwitch Ultra, we strongly recommend that all of the submasters have the same number of ports. This is because the Switch's "Expansion width" command/parameter—the value it uses to calculate how many ports each attached submaster has (see **Section 5.2.5**)—is *global* rather than *submaster-specific.* In other words, a master ServSwitch Ultra always expects every submaster attached to it to have the number of ports specified in Width.

    For example, if you attach one 8-port submaster and one 12-port submaster to a master ServSwitch Ultra, and then set Width to 8 (and Units to 2 and Max Ports to 20—see **Sections 5.2.3** and **5.2.4**), you will be unable to scan or switch to the upper 4 ports on the 12-port submaster—the Switch has no way of knowing they are even there. On the other hand, if you set Width to 12 (and Units to 2 and Max Ports to 24), your system will include 4 "phantom" ports (nonexistent ports 9 through 12 on the 8-port submaster) that the master will think are there and will try to scan or switch to, displaying a blank screen.
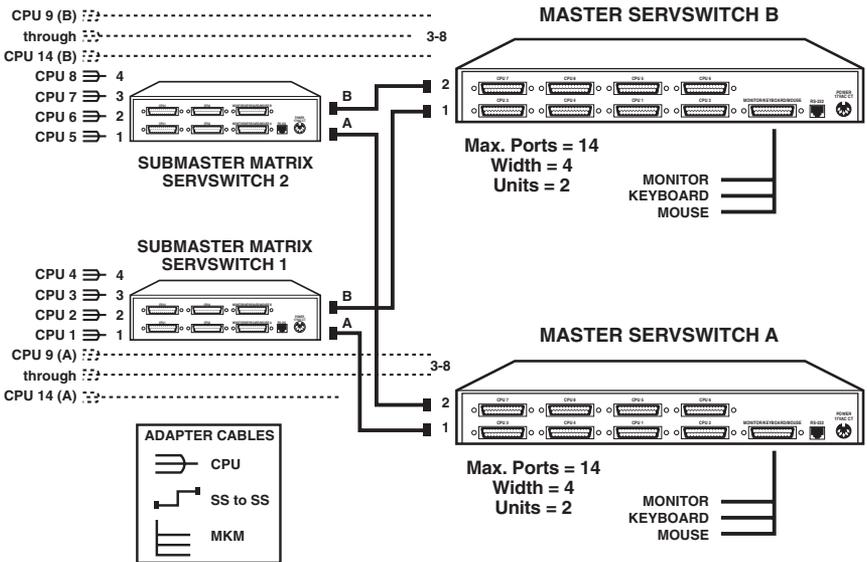
Figure 3-3. Cascading with Matrix ServSwitch submasters.

When you're ready to begin hooking up the actual units, follow these steps:

1. If this hasn't already been done, connect the monitor(s), keyboard(s), and mouse (mice) to the MONITOR/KEYBOARD/MOUSE port(s) of your master device(s) as outlined in **Section 3.2.2**.

2. Use ServSwitch-to-ServSwitch Expansion Cables (see **Section 3.2.4**) to connect all your submaster units to the master unit's CPU ports, beginning with the port labeled CPU 1 and continuing with CPU 2, CPU 3, etc. (Avoid installing submasters with different numbers of CPU ports on the same master; if possible, every Serv unit in your cascade should have the same number of ports.)

3. Using CPU Adapter Cables, attach your computers to available CPU ports: the first computer into the port identified as CPU 1, CPU #2 into its port, etc. (see **Section 3.2.3**). The computers should all be OFF; do not turn them ON yet.

4. Attach the power supplies to the master(s) and to the submasters. Plug in the power supplies, but do not turn the master(s) or submasters ON.

5. Turn ON all of the submaster units, then the master unit(s). They should boot normally, but if the firmware in any of the units has become corrupted—probably as the result of a firmware upgrade going wrong—the affected unit will display this message on all attached monitors that have it selected:

   ```
   Kernel is bad, load new kernel through serial port
   ```

   If you see this, you will need to download correct firmware to the affected unit as described in **Section 4.4.3**, starting at the point at which the unit is ready to receive the file at 9600 baud (9600 bps). (In this case, you *must* download the file at 9600 bps.)

6. If all of your computers are Sun type, see **Section 3.2.5** for the power-up procedure for your CPUs. Otherwise, turn ON the computer identified as CPU 1. Wait until the boot process is complete, then turn ON CPU 2, wait until it boots, turn ON CPU 3, etc., until all of your computers are powered up.

7. Set each master's Maximum computers, Expansion units, and Expansion width values so that the master can scan correctly and properly control the interplay of the submaster units. You can do this with the on-screen display—see **Sections 5.2.3** through **5.2.5**.

8. You might need to set some or all of each master's remaining configuration parameters, especially the keyboard mode for some of your ports (see **Sections 5.2.1**, **5.2.2**, and **5.2.6** through **5.2.10**).

9. Save the configuration changes you just made to the master unit's nonvolatile memory as described in **Section 5.1.3**.

Your cascaded ServSwitch Ultra system should now be ready for operation.

4. Operation: Hardware and Keyboard Commands

The first part of this chapter, **Section 4.1**, gives you some guidelines that you should follow to make sure your ServSwitch Ultra works properly with your equipment.

   Section 4.2 summarizes the ServSwitch Ultra's keyboard commands, and **Section 4.3** describes these commands in detail.

   Section 4.4 outlines how you can select ports or upgrade firmware from an optional computer or terminal connected to the ServSwitch Ultra's RS-232 port.

NOTES

If, as you prepare to operate the ServSwitch Ultra, you see a prompt on your screen asking you to "Enter password," you must type in the unit's access password before the ServSwitch will allow you to enter commands. See Section 5.5.2**.**

   To start any ServSwitch Ultra keyboard command, you must press and release the left Control Key ([Ctrl]). Pressing and releasing [Ctrl] cues the Switch to expect command characters from the keyboard. You then have two seconds in which to start entering a valid command. If no command is begun within two seconds or if an invalid command is entered, the ServSwitch aborts the command.

   When entering commands that contain numbers or math symbols, use only the numeral keys located at the top of your alphanumeric keyboard. Numbers and symbols entered from the numeric keypad to the right will not be recognized as valid.

4.1 Guidelines for Using the ServSwitch Ultra with Your Equipment

4.1.1 CPUs

For your IBM PC type CPUs, use only IBM PC/AT or PS/2 or 100% compatible machines. The ServSwitch Ultra does not support IBM PC/XT™ or compatible machines. It does not support machines that output CGA or EGA video. (Because the basic hardware design for Sun and Apple CPUs has remained backward-compatible, the ServSwitch Ultra supports all Apple and Sun machines.) Any SGI machines you attach must output the current type of SGI video on 13W3 connectors or standard VGA video on HD15 connectors.

4.1.2 MOUSE AND KEYBOARD

When you power up your ServSwitch Ultra system, make sure that your CPUs, mouse (mice), and keyboard(s) are properly cabled to the Switch (or to the appropriate master or submaster unit). When you boot up your CPUs, the master(s) and/or submasters to which they are connected should already be ON. (You should be able to freely disconnect and reconnect a mouse or keyboard from a ServSwitch Ultra while the Switch is ON, but if you experience problems when you do this, issue the Reset command [CTRL] R—see **Section 4.3.7**.)

Though the ServSwitch Ultra can convert any supported keyboard or mouse protocol to any other, this is not enough to overcome all of the vast differences between input devices. If all of your CPUs are of the same type, we recommend that you use the corresponding type of keyboard and mouse. If your CPUs are of different types, certain limitations tend to favor the use of certain keyboard and mouse types:

Standard PC keyboards have 101 or 102 keys. PC keyboards designed specifically for Windows 95/98/2000 have 104 or 105 keys. At this time there is no way for a 101-/102-key keyboard to emulate the functions of the Windows Start (⊞) and Windows Application (▤) keys on a 104-/105-key keyboard. Standard Apple keyboards have 105 keys. And standard (Type 5 or higher) Sun keyboards have 118 keys as well as keyclick and beep features. We have mapped several of the Apple and Sun keys to the PC keyboards (see Table 4-1 on page page 37), but many of the Sun keys simply cannot be mapped to IBM or Apple keyboards. Similarly, standard Apple mice have one button; standard PC mice have two or three buttons; and standard Sun mice have three buttons. At this time there is no way for a one- or two-button mouse attached to the ServSwitch Ultra to emulate a mouse with more buttons.

For these reasons, we recommend that you use Sun Type 5 or higher keyboards and Sun mice for mixed-platform applications that include Sun CPUs. For applications that include IBM and Apple CPUs but no Sun CPUs, we recommend that you use IBM keyboards and mice, because the IBM keyboard can emulate all of the Apple keyboard functions, but the one-button Apple mouse simply can't effectively operate IBM applications that lean heavily on the center or right mouse button. In particular, use Windows type IBM keyboards if *any* of your CPUs/ applications require the Windows keys, and use three-button IBM mice if *any* of your CPUs/applications require the center mouse button.

Other concerns:

- The ServSwitch Ultra supports a variety of IBM PC type mice; for more details, see **Section 5.2.2**.

- Because the ServSwitch Ultra currently only supports "stream mode" (continuous) mouse data, but older IBM ThinkPad models have to handle mouse data in "prompt mode" (burst-on-request), don't try to attach any older ThinkPad computers to the Switch, either directly or through docking stations. Some newer models should work with the Switch, but there's no good way to tell other than by trial and error—exercise caution!

- If you are using a PC mouse as the common mouse, make sure that the IBM PC CPUs use only the generic Microsoft mouse driver MOUSE.COM, version 4.0 at least and preferably version 9.01 or higher. If you're running Windows® 3.x, this driver must be loaded in Windows as well as in DOS. Do not, on any of your switched IBM PC CPUs, run any programs or TSRs, or enter any DOS commands, that change the settings of the mouse port after the driver has been loaded.

- When you first switch between CPUs, especially CPUs of different platforms, you might notice wide variations in mouse sensitivity (how far or fast the mouse moves) from CPU to CPU. This is normal. All three of the major platforms supported by the ServSwitch Ultra (IBM, Apple, and Sun) have ways to adjust the sensitivity of the mouse. (This is usually handled through some kind of software "control panel," but the specifics vary depending on the operating system and—in IBM applications—on the mouse driver.) To optimize mouse movement, adjust the sensitivity on each CPU according to your individual preference.

- Although the ServSwitch Ultra resists minor transient surges that can be caused by rapidly cycling power, certain keyboards are sensitive to such transients. Because your shared keyboard's power is provided by the Switch, wait at least three seconds after powering down the Switch before powering it up again, or the keyboard might not reset correctly.

- The ServSwitch Ultra is designed to support IBM PC compatible 101-, 102-, 104-, or 105-key keyboards and IBM PC keyboard-scan modes 1, 2, and 3; it's also designed to work with PC-type CPUs/keyboards that use 5-pin DIN or 6-pin mini-DIN keyboard connectors. The Switch will try to pass through keyboard codes that it doesn't recognize without altering them, which allows it to support the DEC™ LK461 keyboard (see **Appendix D** for the key mappings), Japanese 106- and 109-key keyboards, and certain other keyboards that use special or proprietary keys. However, we cannot guarantee that the ServSwitch Ultra will be able to fully support—or even work at all with—any PC-type keyboard that uses nonstandard keys, connectors, or keyboard-scan modes.

- If you are using a Sun keyboard, it must be a Type 5 or Type 5c. The ServSwitch Ultra will autodetect the keyboard's language.

Table 4-1. Keyboard Mapping by the ServSwitch Ultra

Generally, the ServSwitch Ultra interprets keys by their positions on the keyboard, so any keys that occupy more or less the same positions and perform more or less the same functions across platforms will map one-to-one. However, certain keys available on certain keyboards do not correspond well or are not available on other types of keyboards, so the Switch maps the more important of these as shown below (see also **Section 4.3.10**).

On the Sun keyboard, the ___ key:	Emulates the PC 101/102-key keyboard's ___ key:	Emulates the PC 104/105-key keyboard's ___ key:	Emulates the Apple keyboard's ___ key:
Control	Left Ctrl	Left Ctrl	Left Control
Alt	Left Alt	Left Alt	Left Option (alt)
Left Command (◆)	N/A	Left Win Start (⊞)	Left Command (⌘)
Right Command (◆)	N/A	Right Win Start (⊞)	Right Command (⌘)
Compose	Right Ctrl	Right Ctrl	Right Control
Alt Graph	Right Alt or Alt Graph	Right Alt or Alt Graph	Right Option (alt)
Power (◯ l)	N/A	Windows App (🗐)	Power (◁)

On the IBM PC 101/102-key keyboard, the ___ key:	(Maps to same key on PC 104/105-key keyboard.)	Emulates the Apple keyboard's ___ key:	(Not recommended) Emulates the Sun keyboard's ___ key:
Left Ctrl		Left Control	Left Control
Left Alt		Left Command (⌘)	Left Command (◆)
Right Alt or Alt Graph		Right Option (alt)	Alt Graph
Right Ctrl		Power (◁)	Power (◯ l)

On the IBM PC 104/105-key keyboard, the ___ key:	(Natively supports PC 101/102-key keyboard functions.)	Emulates the Apple keyboard's ___ key:	(Not recommended) Emulates the Sun keyboard's ___ key:
Left Ctrl		Left Control	Left Control
Left Win Start (⊞)		Left Command (⌘)	Left Command (◆)
Left Alt		Left Option (alt)	Alt
Right Alt or Alt Graph		Right Option (alt)	Alt Graph
Right Win Start (⊞)		Right Command (⌘)	Right Command (◆)
Win App (🗐)		Power (◁)	Power (◯ l)
Right Ctrl		Right Control	Compose

On the Apple keyboard*, the ___ key:	Emulates the PC 101/102-key keyboard's ___ key:	Emulates the PC 104/105-key keyboard's ___ key:	(Not recommended) Emulates the Sun keyboard's ___ key:
Left Control	Left Ctrl	Left Ctrl	Control
Left Option (alt)	Left Alt	Left Alt	Alt
Left Command (⌘)	N/A	Left Win Start (⊞)	Left Command (◆)
Right Command (⌘)	N/A	Right Win Start (⊞)	Right Command (◆)
Right Option (alt)	Right Alt or Alt Graph	Right Alt or Alt Graph	Alt Graph
Right Control	Right Ctrl	Right Ctrl	Compose
Power (◁)	N/A	N/A	Power (◯ l)

*You should not use the Apple keyboard to emulate an IBM or Sun keyboard unless the operating systems and applications running on your system's IBM or Sun CPUs do not require the center or right mouse button and do not require any of the "missing" Sun keys other than [Stop] (see **Section 4.3.10**).

4.1.3 MONITOR

If all of your CPUs are of the same type, we recommend that you use the corresponding type of monitor. If your CPUs are of different types, the monitor must be a multisync model, able to sync to every CPU's video-output frequencies, and compatible with all of the CPUs' video cards.

While PC-type CPUs and VGA monitors normally use two separate leads to send/receive sync signals, one lead for horizontal sync and one for vertical sync, Mac and Sun CPUs/monitors normally send/receive a composite sync signal on a single lead. This means that if you attach both IBM and Mac or Sun CPUs to your system, either your monitor must be capable of accepting both H/V and composite-sync input, or you will have to use a sync converter and special cables to convert H/V to composite sync or vice versa (call Black Box Technical Support for a special quote).

For maximum compatibility, we recommend a 17" or larger, high-quality multisync monitor capable of (a) displaying a maximum resolution of not less than 1280 x 1024 at a maximum refresh rate of not less than 75 Hz, and (b) accepting both relevant types of sync input (H/V and composite). Such monitors are available from NEC, Sony®, CTX®, and other manufacturers. (However, since these monitors usually have an HD15 video-input connector, you will need a special User Cable to use them with Mac or Sun keyboards and mice; the Sun cable is product code EHN059 [original] or EHN225 [coax], and the Mac cable is EHN532 [original] or EHN540 [coax].) The higher the resolution you use, the less distance you can run; see Tables 4-2 and 4-3 on the following pages.

Other concerns specific to IBM PC systems:

- The ServSwitch Ultra is designed to support standard VGA video, including VGA monochrome ("page white"). It does not support PCs that use CGA, EGA, or proprietary versions of VGA that depart from the original specifications. Consult your PC's manual, and if that doesn't tell you whether or not the PC uses standard VGA, consult with the PC's or the video card's manufacturer.

- The ServSwitch Ultra is also designed to support SVGA, although it doesn't handle higher resolutions or longer distances very well without coaxial cabling (see the next two pages). With coaxial cables, it will also support XGA, RS/6000, and SGI video (RS/6000 and SGI require cables with 13W3 connectors—see **Appendix B**).

If you have Mac CPUs attached, you'll need a Mac Adapter for ServSwitch (product code KV99MA) for each CPU that outputs video in a format other than VGA (640 x 480)—see the Note on page 23.

The ServSwitch Ultra will support SVGA (Super VGA) video, but with original Serv cables the video quality will decrease markedly at higher resolutions and distances. Table 4-2, below, illustrates this. The distances in the table are total cable lengths measured from the CPU to the monitor. The table assumes that one ServSwitch Ultra is between the CPU and monitor; in a cascaded application with a ServSwitch Ultra and one or more submasters between the CPU and monitor, video quality will always be lower.

This table also applies to Mac video in ServSwitch Ultra systems in which the Mac versions of the original Serv cables (product codes EHN210 and EHN215) have been installed.

Table 4-2. Video Quality vs. Distance for Original Serv Cables

Distance / Resolution	5' (1.5 m)	10' (3 m)	15' (4.6 m)	20' (6.1 m)	25' (7.6 m)
640 x 480	3	3	3	3	3
800 x 600	3	3	3	2	2
1024 x 768 interlaced	3	3	2	2	2
1024 x 768 noninterlaced	3	2	2	2	2
1280 x 1024 interlaced	2	1	1	1	1
1280 x 1024 noninterlaced	2	1	1	1	1
1600 x 1280	2	1	1	1	1

Quality **3** = Near perfect; screen defects are not conspicuous

Quality **2** = Good to very good; images are clear; there are small reflections around text lettering depending on the color; screen defects are sometimes conspicuous

Quality **1** = Fair to poor as distance increases; images run from slightly fuzzy to badly smeared; text runs from fuzzy but readable to completely washed out

By contrast, coaxial cables (standard for Sun applications, required for XGA applications, and recommended for most other applications) do much better at maintaining video quality, as shown in Table 4-3 below. (For the meaning of quality numbers **3**, **2**, and **1**, see the bottom of page 39.) As before, the distances in the table are total cable lengths measured from the CPU to the monitor. Also as before, the table assumes a single ServSwitch Ultra is between the CPU and monitor; if there is a submaster as well, video quality will always be lower. (Where "interlaced" or "noninterlaced" isn't specified, noninterlaced video is implied.)

Table 4-3. Video Quality vs. Distance for Coaxial Cables

Resolution \ Distance	10 ft. (3 m)	20 ft. (6.1 m)	30 ft. (9.1 m)	50 ft. (15.2 m)	75 ft. (22.9 m)	100 ft. (30.5 m)	150 ft. (45.7 m)	200 ft. (61 m)
640 x 480	3	3	3	3	3	3	2	2
800 x 600	3	3	3	3	3	3	2	2
1024 x 768 interlaced	3	3	3	3	3	3	2	2
1024 x 768 noninterl.	3	3	3	3	2	2	2	1
1280 x 1024 interlaced	3	2	2	2	2	1	1	1
1280 x 1024 noninterl.	3	2	2	1	1	1	1	1
1600 x 1280	3	2	2	1	1	1	1	1

CAUTION!

Some CPUs can't drive or receive keyboard and mouse signals across longer runs of coaxial cable. Consult with the manufacturers of your CPUs before installing this cable in lengths greater than 20 ft. (6.1 m).

For CPU-to-monitor distances over 200 feet (61 m) in IBM PC applications, Station Extenders or CAT5 KVM Extenders might be required. Call Black Box for technical support to discuss this option.

4.2 Keyboard-Command Summary

Table 4-4 below and on the next two pages summarizes the commands that can be sent to the ServSwitch Ultra. To enter any command at the shared keyboard, first press and release the left Control key, represented by "[Ctrl]." (This cues the Switch to look for commands from that keyboard.) Then enter the command followed by any arguments you wish to specify (the port number, for example).

Letter commands are not case-sensitive; they are all shown in uppercase for clarity only.

When you enter numeric commands or arguments, use only the numbered keys at the top of your alphanumeric keyboard. Numbers entered from the numeric keypad to the right will not be recognized as valid commands.

All of these commands have a two-second timeout between characters. This means that if you begin entering a command, but you stop for more than two seconds at any time before you type the final character, the command is aborted and the ServSwitch Ultra returns to normal operation. This keeps the Switch from getting stuck waiting for you to finish the command.

The [Ctrl] character is always passed through to the CPU. The command characters and operands, however, are absorbed by the ServSwitch Ultra and are not sent to the CPU.

Many of these commands have factory-default values (see **Appendix A**) that can be reloaded if your Switch becomes badly misconfigured; see **Section 6.1**.

Table 4-4. The ServSwitch Ultra's Keyboard Commands

Command	Keystroke Sequence	Description
Select Port	`[Ctrl] xxx` (*xxx* = a 1- to 3-digit port number)	Connects your shared monitor, keyboard, and mouse (user station) to the specified port.
Switch to the Next Port	`[Ctrl] +`	Switches to the next port in sequence. (You can also access the next port by pressing the "▲" or "+" button on the ServSwitch Ultra's front panel.)
Switch to the Previous Port	`[Ctrl] –`	Switches to the previous port in sequence. (You can also access the previous port by pressing the "▼" or "–" button on the Switch's front panel.)
Scan ON	`[Ctrl] S`	Turns Scan mode ON, causing the ServSwitch Ultra to start scanning sequentially from the current port through the remaining ports and then begin again at Port 1.

Table 4-4. The ServSwitch Ultra's Keyboard Commands (continued)

Command	Keystroke Sequence	Description
Scan OFF	`[Ctrl] X`	Turns Scan mode OFF (the port being scanned at the time the command is entered is given access to the shared monitor, keyboard, and mouse). Note: Scan can also be stopped by entering a Select Port command.
Keep Settings	`[Ctrl] K`	Enter this command after you enter either of the following two commands (it saves new settings to nonvolatile memory):
Set Screen Saver's Delay Time	`[Ctrl] V`*xxx* `[Enter]` (*xxx* = delay in seconds)	Sets the time of inactivity, in seconds, after which the ServSwitch Ultra will blank the shared monitor's screen. (The monitor is reactivated when the mouse is moved or any key on the shared keyboard is pressed.)
Transpose Command and Alt Keys	`[Ctrl] B`	Causes the Switch to logically "swap" the mappings of the command or start keys and the adjacent alt/alt graph keys (see **Section 4.3.6**).
Reset	`[Ctrl] R`	Resets and enables the keyboard and mouse. Issue this command to correct your keyboard or mouse if one of them malfunctions or gets stuck.
Send Null Byte	`[Ctrl] N`	Causes the Switch to send a null byte to the CPU's PS/2 mouse port. Issue this command to correct the current CPU if it gets "out of sync" with the PS/2 mouse (see **Section 4.3.8**).
Identify ROM	`[Ctrl] I`	Causes the ServSwitch Ultra to report the version of ROM it is using. Issue this command if you are asked to do so by a technical-support person.
Send [Stop]	`[Ctrl] [Pause]`	Causes the ServSwitch Ultra to send the scan code for the [Stop] character (the only widely used non-mapped key on the Sun keyboard) to the currently selected CPU.
Display Label	`[Ctrl] D`	Causes the ServSwitch Ultra to display the on-screen computer label of the currently selected CPU for the currently configured fadeout time (or for three seconds if fadeout is disabled).
Activate On-Screen Menus	`[Ctrl] [F12]`	Causes the ServSwitch Ultra to display its on-screen overlay menus.

Command	Keystroke Sequence	Description
Activate Select Window	[Ctrl] [ESC]	Causes the ServSwitch Ultra to display its "computer select window" (see **Section 5.5**).
Log Out	[Ctrl] L	Logs out the current user if an access password has been set; video is blanked and keyboard and mouse input is locked until a user enters the access password. If no access password has been set, turns on the screen saver.

4.3 The Commands in Detail

4.3.1 SELECTING A PORT FROM THE SHARED KEYBOARD

To select a port from your keyboard, press and release your keyboard's left Control key ([Ctrl]), then type in the port number:

If "Maximum Ports" is set to 1 to 9: The ServSwitch Ultra will immediately switch to the desired port when you press the one-digit number's numeral key.

If "Maximum Ports" is set to 10 to 99: The ServSwitch Ultra will immediately switch to the desired port when you press the two-digit number's second numeral key. For single-digit ports, you can enter the number by including a leading zero ("01" for port 1) or by pressing [Enter] after you press the single numeral key. If you press the key of only one digit, and do not follow it with [Enter], the Switch will wait two seconds for you to press [Enter] or another numeral key; then, if no key is pressed, it will switch immediately to the single-digit port.

If "Maximum Ports" is set to 100 to 256: The ServSwitch Ultra will immediately switch to the desired port when you press the three-digit number's third numeral key. For single- and double-digit ports, you can enter the number by including one or two leading zeros ("001" for port 1 or "027" for port 27) or by pressing [Enter] after you press the single or second numeral key. As noted above, the Switch will wait two seconds for you to enter another digit, then will switch to the partially entered port number.

4.3.2 SWITCHING TO THE NEXT OR PREVIOUS PORT

From the keyboard you can go forward or backward through the ServSwitch Ultra's ports by selecting either the next or the previous port respectively. To switch to the next port, press and release the left Control key ([Ctrl]), then press the plus key (the key at the top of the keyboard marked with [=] and [+]). To switch to the previous port, press and release [Ctrl], then press the minus key (the key at the top

of the keyboard marked with [−] and [_]). The command is not case-sensitive. Do not use the [+] and [−] keys on the keyboard's numeric pad; the Switch doesn't recognize these.

You can also select the next or previous port manually from the ServSwitch Ultra's front panel by pushing the button labeled "▲" or "▼" respectively ("+" or "−" on the 2-port units). Each time you press the button, the next or previous port in sequence is selected.

4.3.3 SCAN MODE

To start scanning (switching from CPU to CPU in a continuous rotation) from the keyboard, press and release the left Control key ([Ctrl]), then press [S]. The ServSwitch Ultra will begin scanning sequentially from its currently selected port through the higher-numbered ports, then begin again at CPU Port 1. As it scans, it delays 1 to 15 seconds at each port. (This "Scan-Delay Time" is user-selectable; see **Section 5.2.6**.) To stop scanning, press and release [Ctrl], then press [X]; you can also stop a scan by entering a Select Port command. ServSwitch Ultra letter commands are not case-sensitive: You can enter upper- or lower-case letters.

To disable scanning, set the scan-delay time to zero; see **Section 5.2.6**.

4.3.4 KEEP SETTINGS

The Keep Settings command saves the current state of the ServSwitch Ultra's two keyboard-selectable settings ("Set Screen-Saver Interval" and "Transpose Command and Alt Keys," described in the next two sections) to nonvolatile memory (NVRAM), where they become the new default (loaded at power-up) settings. To enter the command, press and release the left Control key, then type [K].

4.3.5 SET SCREEN-SAVER INTERVAL

This feature reduces the wear on your shared screen and provides security for your system by blanking the screen when there has been no keyboard activity for a specified length of time. To set the screen-saver interval, press and release the left Control key, type [V] followed by the interval time in seconds (1 to 999, or 0 to disable the screen saver), and press [Enter]. Issue the Keep Settings command after you enter this command.

To reactivate the screen when it's been blanked, press any key on the keyboard or move the mouse. The default setting of this option is 0 (screen saver disabled).

NOTE

When the ServSwitch Ultra is in the Screen-Saver state, all of its SELECT LEDs (the left-hand, red port LEDs) will be OFF.

4.3.6 Transpose Command and Alt Keys

This command is designed to make life easier for people used to the Sun or Mac keyboard who now need to use a Windows 95/Windows 98 style (104/105-key) PC type shared keyboard, or vice versa. In the ServSwitch Ultra's default setting, the Start and Alt ("Alt" or "Alt/Alt Graph") keys on the Win95/Win98 keyboard map to the Command and Alt ("Alt", "Option [Alt]", or "Alt Graph") keys respectively on the Sun and Mac keyboards, even though the Win95/Win98 Start and Alt keys are reversed ("backwards") with respect to the Sun and Mac Command and Alt keys.

Many people who have grown used to typing or triggering an application's functions with "the other" type of keyboard find it difficult to adjust to this reversal. If you don't want to adjust, you don't have to; use this command to have the Switch transpose (swap) the scan codes of these keys when it does its keyboard mapping, so that when you press the Alt key, the Switch sends the corresponding Command or Start scan code to the selected CPU instead, and when you press the Command or Start key, the Switch sends the Alt scan code instead.

To issue the Transpose Command and Alt Keys command, press and release the left Control key, then type [B]. (Reissue this command to switch back to the standard mapping.) Enter the Keep Settings command after you enter this command.

4.3.7 Reset

This command, along with the commands described in the next two sections, can come in handy when certain problems arise. It will reboot your keyboard and mouse without your having to power down the station or the system, and will also re-enable PS/2 mouse communication if the selected CPU has previously disabled it. (With current PCs and operating systems, this command shouldn't be necessary, but older CPUs running DOS or Windows might need it from time to time.) Issue this command if (a) your keyboard gets stuck or begins behaving oddly, (b) you need to send mouse data to the CPU, but it hasn't enabled the mouse (this can happen if you boot up the CPU while the ServSwitch Ultra is off or disconnected), or (c) while using a PS/2 type mouse, you unplug it, plug it back in, then have problems. To issue the Reset command, press and release the left [Ctrl] key, then type [R].

If you're using a PS/2 type mouse with a DOS or Windows 3.x CPU, don't issue this command if the CPU doesn't have a mouse driver loaded—many such CPUs will crash if you send them unexpected mouse data. (CPUs running UNIX or Windows 95, 98, or NT don't have this problem.) If your shared CPU is like this, and you have chronic problems when you try to run applications that don't use the

mouse but don't disable the mouse either, take these precautions:

- If you never actually use the mouse with the CPU (as would probably be the case if, for example, the CPU were a Novell® NetWare® file server), either don't plug the mouse strand of the CPU Adapter Cable into the CPU's mouse port, or don't load a mouse driver at all. If you do use the mouse, are running Windows 3.x, and sometimes exit to DOS, make sure you load a DOS mouse driver before running Windows.

- If you've loaded a DOS mouse driver and are going to use an application such as NetWare that disables the PS/2 mouse, first REM out any statements in your startup files (AUTOEXEC.BAT, etc.) that load the mouse driver, then reboot the computer to remove the mouse driver from memory. (Having the mouse driver unload itself doesn't do the job.)

4.3.8 SEND NULL BYTE (PS/2 TYPE MICE ONLY)

PS/2 type mice send control data to CPUs in three-byte increments. Sometimes, because of electronic transients, unusual power-up effects, or plugging and unplugging of cables from live equipment, the currently selected CPU in a ServSwitch Ultra system can lose one or two bytes of this control information and get "out of sync" with the shared mouse. In this situation, the mouse might seem to refuse to move the pointer or cursor, open windows for no reason, or exhibit other strange behavior. To get the CPU back in sync, send this command to tell the ServSwitch Ultra to send a "null byte" to the CPU's PS/2 mouse port (this has no other effect than getting the CPU "caught up"). To issue the Send Null Byte command, press and release the left Control key, then type [N].

If the mouse still isn't right after you issue this command, the CPU must have been two bytes out of sync. Issuing the command again should do the trick.

The CPU will be thrown out of sync if it uses a PS/2 mouse and it's in sync when you issue this command. Issue this command two more times to get it back in sync again. This command has no effect on serial mice, or on CPUs that are not attached to your ServSwitch system through a PS/2 mouse port.

If you have version 9.01 or higher of the Microsoft mouse driver, the CPU should never get out of sync. Contact Microsoft if you would like to upgrade your Microsoft mouse driver.

4.3.9 IDENTIFY ROM

Unfortunately, as with all complex equipment, problems might arise with your ServSwitch Ultra that require the assistance of technical-support personnel. One of the things technicians might want to know when they attempt to diagnose and correct your problem is the revision level of your Switch's ROM. This command causes the ServSwitch Ultra to send the four-character "UP*xx*" ROM level to the currently selected CPU as ASCII keyboard data; these characters will be echoed back to the shared monitor if you are at some type of prompt. (You *must* be at some kind of prompt or screen capable of displaying typed-in keyboard characters, or you will not see the Switch's response.) To issue the Identify ROM command, press and release the left Control key, then type [I].

4.3.10 SEND [STOP]

The Sun keyboard has too many keys for them all to be mapped one-to-one to keys on a PC or Mac keyboard, so there are a few Sun keys that PC and Mac keyboards can't directly reproduce. (See **Section 4.1.2** and Table 4-1 on page 37.) If you absolutely have to use a PC or Mac shared keyboard, you can use this command to cause the ServSwitch Ultra to send the currently selected CPU the scan code for the Sun [Stop] key. (This key, on the left-hand end of the Sun keyboard, is the only one of the non-mapped keys that is widely used at the time of this writing; it can be used, for example, in the [Stop][A] key sequence to cause some Sun CPUs to go to a boot prompt.)

   To issue the Send [Stop] command, press and release the left Control key, then press the [Pause] key (often labeled [Pause (Break)] on PC keyboards or [F15 (Pause)] on Mac keyboards). This command is valid even if issued from a Sun keyboard. Do not send [Stop] to a PC or Mac compatible CPU; this could have unpredictable results.

4.3.11 DISPLAY LABEL

One of the ServSwitch Ultra's graphic-overlay functions is to display the on-screen "label" window that contains the number and assigned name of the currently selected CPU (see **Section 5.4.3**). If this label is not on screen, you can use this command to cause the Switch to display the label for the length of time you have configured for the label's "fadeout interval" (see **Section 5.4.3.D**), or, if fadeout is disabled, for five seconds. (If fadeout is set to 255, the label will be displayed at all times.)

   Conversely, if the label is being displayed and you want it to go away, issuing the Display Label command while the label is on screen will cause it to disappear.

   To issue the Display Label command, press and release the left Control key, then type [D].

4.3.12 ACTIVATE ON-SCREEN MENUS

You can use this command to cause the ServSwitch Ultra to display its on-screen overlay menus, beginning with the main menu (see **Section 5.1.1**). To issue the Activate On-Screen Menus command, press and release the left Control key, then press and release the [F12] key.

4.3.13 ACTIVATE SELECT WINDOW

You can use this command to cause the ServSwitch Ultra to display its "computer select window" (see **Section 5.5**). To issue the Activate Select Window command, press and release the left Control key, then press and release the [ESC] (escape) key.

4.3.14 LOG OUT

If an access password has been set for your ServSwitch Ultra system (see **Section 5.5.2**), you can use this command to log out (to relinquish access rights) when you're finished with a session at a user station. This will cause the ServSwitch Ultra to display an "Enter password" prompt and stop accepting any keyboard and mouse input except the access password; a few seconds later, it will blank the screen with the currently selected screen saver. While no one is logged in—that is, until someone correctly enters the access password—typing at the keyboard will cause the "Enter password" prompt to briefly become visible, but otherwise, no computer video will be displayed and no keyboard and mouse access will be allowed.

If no access password has been set for your system, you can use this command to cause the ServSwitch Ultra to display its currently selected screen saver (see **Section 5.4.1.C**). Normal video will be restored as soon as someone types at the keyboard or moves the mouse.

To log out, press and release the left Control key, then type [L].

4.4 Using the RS-232 Port

4.4.1 CONNECTING EQUIPMENT TO THE PORT

For your convenience, a computer or terminal with a TIA RS-232 serial port can be connected to the RS-232 serial port (RJ-12 connector) on the ServSwitch Ultra's rear panel (see **Appendix C** for a pinout of this connector). This allows you to send switching commands from a non-local keyboard rather than from the shared keyboard, and is also necessary in order to download future firmware upgrades into the Switch. You'll need a straight-through-pinned, flat-satin or twisted-pair serial cable with RJ-12 ("6-pin RJ-11") connectors plus the appropriate adapter: for IBM and Sun type PCs and most terminals, either DB25 female to RJ-11 female (our product code FA044) or DB9 female to RJ-11 female (our product code FA043), depending on your computer/terminal.

NOTE

Because the serial ports of Apple Macintosh computers use a proprietary interface with EIA/TIA RS-422/423 signal levels rather than RS-232, a special adapter or interface converter is required to connect them to the ServSwitch Ultra's RS-232 port (call Black Box for technical support if you really want to do this). We strongly recommend that you use some other type of computer to make this connection.

To connect the adapter and cable, take these steps:

1. Connect an adapter of the appropriate type to one of the computer's (or terminal's) serial ports.

2. Plug one end of the cable into the RJ-12 female connector on the adapter, and the other end into the RS-232 serial port on the ServSwitch Ultra's rear panel.

CAUTION!

Serial cabling in excess of 50 feet (15.2 m) should be routed with caution. The maximum cable length depends upon the construction of the cable and its routing. For extended runs, shielded cable should be used. Avoid routing near fluorescent lights, air-conditioning compressors, or machines that may create electrical noise. If you experience a lot of data errors, use shorter cables. The ServSwitch Ultra's lowest data rate is 9600 bps; it cannot be lowered any further to alleviate this problem.

4.4.2 SWITCHING PORTS REMOTELY (OPTIONAL)

To switch ports on a ServSwitch Ultra from a remote computer or terminal attached to the Switch's RS-232 port, take these steps:

1. Set your computer for serial communication at 9600 bps, no parity, 8 data bits, and 1 stop bit.

2. To switch the ServSwitch Ultra to a different port, use a terminal-emulation program to type or send the desired port number followed by [Enter] (a return).

NOTE

If you type or send a "?" (question mark) rather than a port number, the single or master Serv unit will send the number of the currently selected port *minus one* back to the remote computer or terminal—*as an 8-bit binary byte.* For example, if you currently have port 1 selected, the Switch will respond to "?" with the byte "00000000" (binary zero); if you have port 3 selected, the Switch will respond with "00000010" (binary two); and so on. You *must* be at some kind of prompt or screen capable of displaying serially received text characters in order to see the Switch's response.

Of course, because most terminal emulators and similar programs will interpret these values as ASCII codes, they will try to display the corresponding ASCII characters instead of decimal numbers; and because binary zero through binary thirty-one are control codes in ASCII, if you're running the terminal emulator on an IBM PC you will probably see the port numbers displayed as odd text-graphics characters (smiley faces, hearts, etc.) that remain in the PC's custom character set as relics of the graphics-poor days when the PC was invented. You will probably need an IBM PC ASCII-to-decimal translation table to visually identify which port numbers these displayed characters stand for.

It is also possible to write a program to run on the computer attached to the Switch's serial port that sends "?" to determine the currently selected port and sends port numbers to switch to desired ports. If you do so, however, there's an important fact to keep in mind. Even though the Switch will *respond* to "?" with pure binary values, your program will have to *send* each digit of each port number (as well as the question-mark and [Enter] characters) to the Switch the way a terminal emulator would: as *ASCII codes.* For example:

- **To query the Switch, send it the binary value "00111111" (hex 63), the code for the ASCII "?" character, followed by the binary value "00001101" (hex 13), the code for the ASCII [CR] carriage-return character.**

- **To switch to port 1, send the Switch the binary value "00110001" (hex 31), the code for the ASCII "1" character, again followed by the carriage-return character.**

- **To switch to port 25, send the Switch "00110010" (hex 32, ASCII "2"), then "000110101" (hex 35, ASCII "5"), then the ASCII [CR] again.**

4.4.3 UPGRADING THE FIRMWARE (FLASH MEMORY)

The ServSwitch Ultra has flash memory, which means its firmware may be reloaded (upgraded) in order to support new features or fix any problems in its operation. To get new firmware revisions when they become available, you can download them from our Web site at **www.blackbox.com**. For -R2 level ServSwitch Ultras, filenames will follow these formats: "UPxx.HEX," where "xx" = the *x.x* firmware-revision level. Please make sure you get the right file; the ServSwitch Ultra will not let you load firmware intended for other Serv models (UxxP.HEX, UxxS.HEX, etc.).

There are two ways to load the firmware into the Switch, as described in the following two subsections.

4.4.3.A Upgrading the Firmware with Terminal-Emulation Software

Take these steps to upgrade the firmware of your ServSwitch Ultra with a terminal-emulation program such as ProComm® Plus or Windows HyperTerminal™:

1. Connect one of your computer's or terminal's serial ports to the Switch's RS-232 port as described in **Section 4.4.1**.

2. Run your terminal-emulation program and set it to use the serial port that's connected to the Switch (COM1:, COM2:, etc.) in "direct connect" mode. Set its serial-communication parameters to 9600 bps, 8 data bits, no parity, and 1 stop bit ("9600,8,N,1").

3. Make sure the ServSwitch Ultra is turned OFF, then turn it ON while holding in both the "▲" and "▼" buttons (the "+" and "−" buttons on the 2-port unit) on the Switch's front panel. Once the Switch has powered up, release the next port/previous port buttons, then the power button. The Switch should light LED 1 and send you the message:

   ```
   Waiting for file at 9600 baud
   ```

   If you want to download the new firmware file at 57,600 bps instead, change your terminal emulator's data-rate setting to 57,600 bps, 8 data bits, no parity, and 1 stop bit ("57600,8,N,1"), then press the Switch's "▲" or "+" button again. The Switch should light LED 4 and send the message:

   ```
   Waiting for file at 57,600 baud
   ```

   (If you need to switch back to 9600 bps, change the terminal-emulator settings back, then press the Switch's "▼" or "−" button.)

4. Use the terminal program's "send text file" or "upload" function to send the new firmware file to the Switch, using the same protocol you would to send an ASCII text file (*not* XMODEM, ZMODEM, etc.). The Switch will send back a series of ASCII period (".") characters (decimal 46, hex 2E) that shows the progress of the file-copying procedure. It will also flash LED 1 or 4 (depending on the data rate). Once the file transfer is complete, the Switch should light LED 2 and send the message:

```
Receive successful
Hit space to program
```

If something goes wrong during this process, you might receive any of these messages instead:

```
Checksum error or Record error or Data error
Receive failed
Try again Y/N?
```

These messages are usually caused by one of these problems:

• The RS-232 cable or adapter is loose, too long, defective, or incorrectly pinned;

• The terminal emulator's setting for the serial port, data rate, data format, and/or file-transfer protocol is wrong; or

• Either the PC's serial port or the Switch's RS-232 port is defective.

To try again, press "Y" on the PC's keyboard; the ServSwitch Ultra goes back to step 1 and sends "`Waiting for file...`". To abort, press "N" on the PC's keyboard; the Switch skips ahead to the "`Hit enter to boot`" message shown in step 5, but the firmware will remain unchanged. If the trouble recurs and you can't pinpoint it, call Black Box for technical support.

5. If the file transfer is successful, press the space bar on the PC's keyboard. LED 2 will go dark briefly while the ServSwitch Ultra begins reprogramming its flash memory with the new firmware. It should send the message:

```
Programming flash
```

This will be followed by another series of ASCII periods that shows the progress of the flash-reprogramming procedure. If this phase is successfully completed, the Switch will begin verifying the new firmware; it will send the message:

```
Verifying flash
```

This will be followed by a third series of progress-indicating ASCII periods. If verification is successful, the Switch will light LED 3 and send the message:

```
Verify successful
Hit enter to boot
```

If you get an error message at any time during the programming or verifying phase, call Black Box for technical support.

6. Press the Enter key on the PC's keyboard. (If your keyboard does not have an Enter key, press the Return key instead.) LED 3 will go dark briefly while the ServSwitch Ultra reboots itself and runs its new firmware. The Switch should then light LED 4 and send some diagnostic information about itself. (In particular, make sure that the firmware-revision level it reports matches the revision level of the new firmware.) It should then send the message:

```
Hit enter to continue
```

(If you get an error message at any time during this phase, call Black Box for technical support.)

7. Press the Enter (or Return) key again. The Switch should return to normal operation with port 1 selected (LED 1 lit).

This completes the terminal-emulation version of the firmware-upgrade procedure. Your Switch should now be ready for continuous operation.

4.4.3.B Upgrading the Firmware with the DOS COPY Command

Alternatively, you can, if you choose, upgrade a unit's firmware with the DOS COPY command. Use caution: The ServSwitch Ultra will attempt to send text messages back to you during this process, but DOS has no way of properly receiving and displaying them; what's more, this "unexpected" serial data could cause your computer to crash. If you want to use this method anyway, take these steps:

1. Connect one of your PC's serial ports to the Switch's RS-232 port as described in **Section 4.4.1**.

NOTE

Normally only three wires are necessary to the ServSwitch Ultra: transmit, receive, and ground. However, when you use DOS to copy the configuration file to the Switch, DOS *must* see a high DSR signal input (Pin 6 on PC COM ports, whether they are DB9 or DB25 type) in order for the COPY command to work. The Switch provides this signal using the DTR (Pin 2) output from its RS-232 Port; you can use standard cable and our standard FA043 or FA044 adapter to make this connection.

2. If the MODE command in your version of DOS supports data rates as high as 57,600 bps, send a MODE command to set the data rate of the PC's serial port to 9600 or 57,600 bps and its data format to 8 data bits, no parity, and 1 stop bit. For example, if you are using port COM1:, you would issue the command "`MODE COM1:9600,8,N,1`" or "`MODE COM1:57600,N,8,1`".

   If your DOS version's MODE command doesn't natively support 57,600 bps, you will have to either upgrade at 9600 bps or get one of the several third-party utility programs that either extend the MODE command or provide some other means of setting your serial ports to higher data rates. Call Black Box for technical support if you have difficulty finding such a utility program.

3. Make sure the ServSwitch Ultra is turned OFF, then turn it ON while holding in both the "▲" and "▼" buttons (the "+" and "−" buttons on the 2-port unit) on the Switch's front panel. Once the Switch has powered up, release the next port/previous port buttons, then the power button. The ServSwitch Ultra shows, by lighting LED 1, that it's ready to accept the flash file at 9600 bps. You can change to download at 57,600 bps by pressing the Switch's "▲" or "+" button—LED 4 will light. (Switch back and forth between the two data rates by pressing "▼"/"−" for 9600 bps or "▲"/"+" for 57,600 Kbps; LED 1 will be lit at 9600 bps, while LED 4 will be lit at 57,600 bps.)

4. At the DOS prompt, enter the "`COPY [filename] COM1:`" command if the ServSwitch Ultra is connected to port COM1: (or "`COPY [filename] COM2:`" if the Switch is connected to COM2:, etc.). During the copying process, LED 1 or LED 4 will flash (depending on whether you are copying at 9600 or 57,600 bps). Once the process is successfully completed, LED 2 will

light.

    If, however, an error occurs, LED 2 will remain dark, and there is a chance that the computer will lock up (you might have to reboot). If the computer is OK, you'll have to go back to step 3. If the second attempt doesn't work, call Black Box for technical support.

5. If the copy process works, press and release the "▲"/"+" button again. LED 2 will go dark briefly while the ServSwitch Ultra programs and verifies its flash memory. Once this phase is successfully completed, LED 3 will light.

    If, however, an error occurs, LED 3 will remain dark, and you'll have to go back to step 3. If the second attempt doesn't work, call Black Box for technical support.

6. If the program-and-verify process works, press and release the "▲"/"+" button yet again. LED 3 will go dark briefly while the ServSwitch Ultra reboots itself and runs its new firmware. Once this phase is successfully completed, LED 4 will light.

    If, however, an error occurs, LED 4 will remain dark, and you'll have to go back to step 3. If the second attempt doesn't work, call Black Box for technical support.

7. Press and release the "▲"/"+" button one final time to return the ServSwitch Ultra to normal operation with port 1 selected (LED 1 lit).

    If LED 1 doesn't light, you'll have to go back to step 3. If the second attempt doesn't work, call Black Box for technical support.

This completes the DOS COPY version of the firmware-upgrade procedure. Your Switch should now be ready for continuous operation.

5. Operation: On-Screen Display

5.1 Overview

You can use the ServSwitch Ultra's on-screen display to:

1. Configure the ServSwitch Ultra through a series of configuration menus (triggered with the [Ctrl] [F12] command, where [Ctrl] is the *left* Control key).

2. Switch to different computers from a window which shows a list of computer names (triggered with the [Ctrl] [ESC] command, where [Ctrl] is the *left* Control key). You can change the color and position of this window.

3. See the name of the computer you are currently switched to. (The font, color, position, and timing of displayed text are all user-selectable.)

5.1.1 THE MAIN MENU

Access the main menu by pressing and releasing the left [Ctrl] key and then hitting the [F12] key. The menu, shown in Figure 5-1 below, appears. (The "Enter password" prompt will appear only if you set a configuration password through the "Configure security" menu; see **Section 5.5**. If the prompt is on screen, you must enter this password before the ServSwitch Ultra will allow you to make any configuration changes through the display.)

```
ServSwitch Ultra version UP11          Copyright 1990-1999

Main configuration menu
Configure system
Configure computers
Configure overlay            Enter password
Configure security
Exit




Use arrow keys to highlight
selection and press enter          ◆ BLACK BOX ®
or press escape to exit              NETWORK SERVICES
```
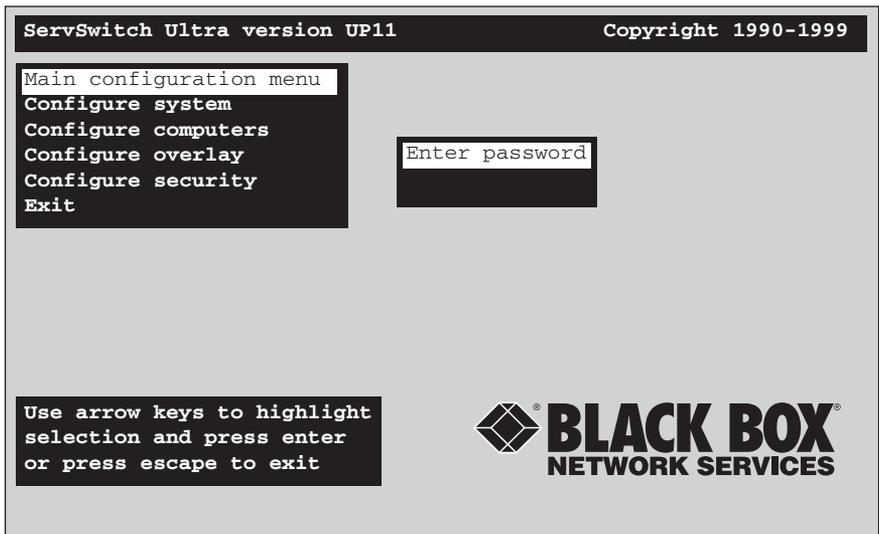
Figure 5-1. Main configuration menu.

This menu and all other on-screen display windows appear "on top of" your computer video, assuming you are switched to a computer with active video. (If no video is present, then the background is black.) If the display is not synchronized, then you should switch to a computer with active video and configure the resolution setting from the "Configure overlay" page.

5.1.2 NAVIGATING THE CONFIGURATION PAGES

Using the on-screen display is very easy and intuitive. Use the arrow keys ([←], [→], [↑], and [↓]) to highlight a menu selection and hit [Enter] to choose that selection. A help line on the very bottom of each screen explains what each selection is for.

From the main configuration page, choosing a selection by hitting the [Enter] key either exits to normal keyboard operation or goes to the "Configure system," "Configure computers," or "Configure overlay" page. From these other pages, choosing a selection by hitting the [Enter] key will bring up an input box in which you can type in text, enter a numeric value, or choose from a list of possible options. Use the [Esc] (escape) key to return to the previous page or to abort an input box.

5.1.3 SAVING CHANGES MADE WITH THE ON-SCREEN DISPLAY

If you make any changes to any settings, a message box asking if you want to save the changes will pop up when you exit the main menu. Use the arrow keys to choose "Yes" or "No" and hit [Enter]. If you choose "Yes," the changes are saved in flash memory; if you choose "No," the changes are not saved. Regardless of whether you choose "Yes" or "No," the changed settings will be active until they are changed again. If you answer "No," the settings you changed will revert to the last saved settings as soon as the ServSwitch Ultra is turned OFF.

5.2 The "Configure System" Page

Use this page, shown in Figure 5-2 below, to view and change keyboard-type, mouse, expansion, scan, and keyboard-typematic settings. Access it from the main menu by hitting [Enter] when "Configure system" is highlighted.

```
Configure system

Keyboard and mouse type                 PC 101/102
Keyboard      PC 104/105                 PC 104/105
Mouse              PS/2                   Apple
                                          Sun
Expansion
Maximum computers      8
Expansion units        0
Expansion width       16

Scan settings
Scan time (seconds)    5
Scan mode            Off
Power on scan        Off

Keyboard typematic
Rate (keys/sec)       20
Delay               Fast


Auto detected at power-up, changes PC to Apple/Sun key mapping
```
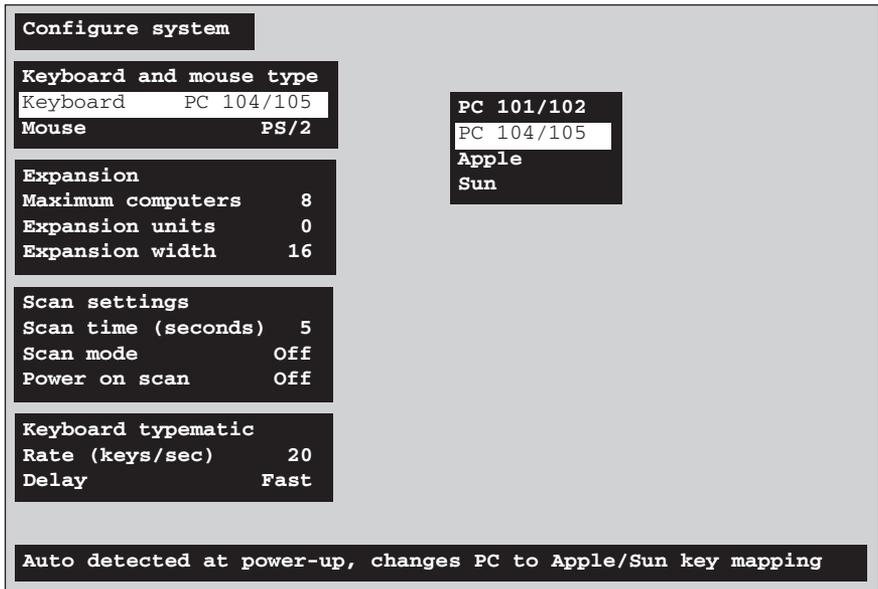
Figure 5-2. The "Configure system" page.

5.2.1 CONFIGURE SYSTEM: KEYBOARD

Except for one instance, the keyboard type (that is, what type the shared keyboard is) can be viewed but not changed; it is shown here for your information only. It will always be either "PC 101/102" (IBM PC compatible), "PC 104/105" (IBM PC Windows compatible), "Apple" (Apple compatible), or "Sun" (Sun compatible). (The one exception is that you can switch between "PC 101/102" and "PC 104/105.") ServSwitch Ultras normally autodetect the keyboard type when they are powered up. However, if you power up a Switch when no shared keyboard is attached to it, this setting will default to "PC 104/105"; if you attach an Apple or Sun keyboard later, the Switch won't recognize it until you power the unit off and back on again.

When you use a Sun keyboard, the ServSwitch Ultra also autodetects the Sun keyboard type (that is, what version of the Sun keyboard it is) and the Sun keyboard language. (This information is reported to any attached Sun CPU that requests it for a booting procedure or other process.) The keyboard language will

be displayed here as "US," "US/UNIX," "French," "Danish," "German," "Italian," "Netherlands/Dutch," "Norwegian," "Portuguese," "Spanish," "Swedish/Finnish," "Swiss-French," "Swiss-German," "United Kingdom," "Korean," "Taiwan," "Japan," "French-Canadian," or "unknown." (If the system is booted with no keyboard attached, the Switch will tell Sun CPUs that the keyboard language is "U.S.")

5.2.2 CONFIGURE SYSTEM: MOUSE

The ServSwitch Ultra will also autodetect the mouse type unless you boot the Switch without a mouse attached, in which it will default to the "PS/2" setting. To change the mouse type, press [Enter] while "Mouse" is highlighted. An input-selection box will pop up as shown in Figure 5-3 below.

```
Configure system

Keyboard and mouse type
Keyboard            PC
Mouse                           PS/2
                                PS/2 wheel
Expansion                       Serial 2-button
Maximum computers    8          Serial 3-button
Expansion units      0
Expansion width     16

Scan settings
Scan time (seconds)  5
Scan mode          Off
Power on scan      Off

Keyboard typematic
Rate (keys/sec)     20
Delay             Fast


Type of mouse used, can be changed if keyboard is PC type
```
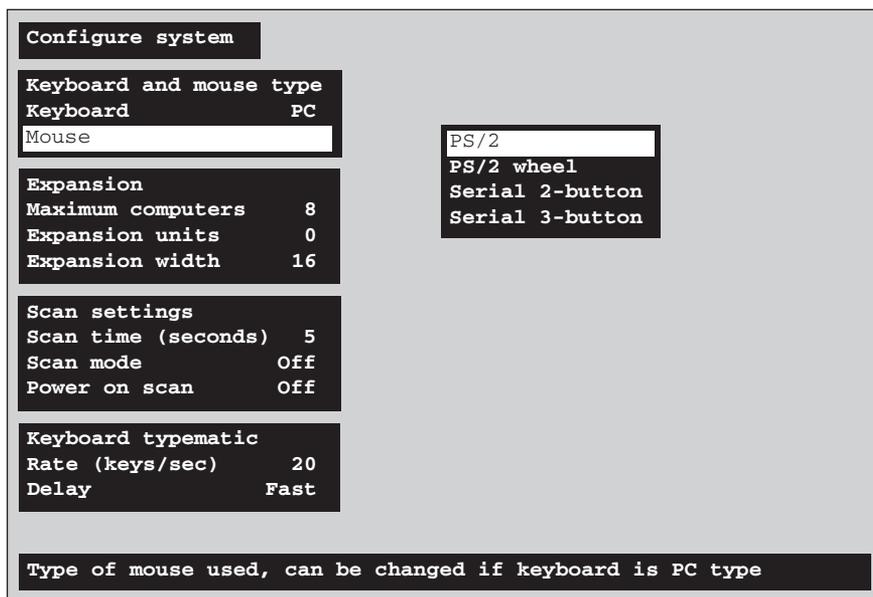
Figure 5-3. Changing the mouse type.

Use the up- and down-arrow keys to select the desired mouse type and hit [Enter]. Once [Enter] is pressed, the input box disappears and the new setting appears in the "Mouse" field.

"PS/2 mouse" refers to those IBM PS/2 compatible mice that have a 6-pin mini-DIN connector and either two or three buttons. They use an interface integrated onto the CPU's motherboard, completely independent of the CPU's serial interface. Choosing the "PS/2 mouse" option also resets the shared PS/2 mouse and enables data to be sent from it, even if you didn't attach the PS/2 mouse to the ServSwitch Ultra until after the Switch had been powered on.

"PS/2 wheel" mice, such as the Microsoft IntelliMouse, are similar to regular mice, but have a clickable and scrollable wheel control instead of a middle button.

"Serial 2-button mouse" refers to those mice that have serial RS-232 interfaces (usually with a DB9 connector), are Microsoft compatible, and use a 3-byte, 7-bit, 1200-bps, no-parity data format. Most PC serial mice with two buttons fall into this category.

"Serial 3-button mouse" refers to those mice which have serial RS-232 interfaces (usually with a DB9 connector), are Mouse Systems compatible, and use a 5-byte, 8-bit, 1200-bps, no-parity data format. Most PC serial mice with 3 buttons fall into this category.

Certain commonly available serial mice made in Asia have the usual three buttons and a switch on the bottom. This switch is usually labeled "MS/PC"; when it is in the "MS" position, the mouse is compatible with the "serial 2-button" setting, and when it is in the "PC" position, the mouse is compatible with the "serial 3-button" setting.

5.2.3 CONFIGURE SYSTEM: MAXIMUM COMPUTERS

This setting corresponds to the number of computers (CPUs) connected to the ServSwitch Ultra system. It comes in handy when you are cascading, or are only using some of the CPU ports on a single Switch: When the Switch knows how many CPUs there are, it can handle switching and scanning more intelligently.

Actually, the Switch will usually autodetect this value, but if for whatever reason you have no CPUs attached the first time you boot the Switch, it will use its factory-default values instead ("4" for 2-port units, the number of CPU ports on the box for other units).

To change this setting, press [Enter] while "Maximum computers" is highlighted. An "Input new value" box appears, as shown in Figure 5-4 below.

```
Configure system

Keyboard and mouse type
Keyboard           PC
Mouse              PS/2

Expansion
Maximum computers     8        Input new value
Expansion units       0
Expansion width      16

Scan settings
Scan time (seconds)   5
Scan mode           Off
Power on scan       Off

Keyboard typematic
Rate (keys/sec)      20
Delay              Fast


Total number of computers connected to switch (2-256)
```
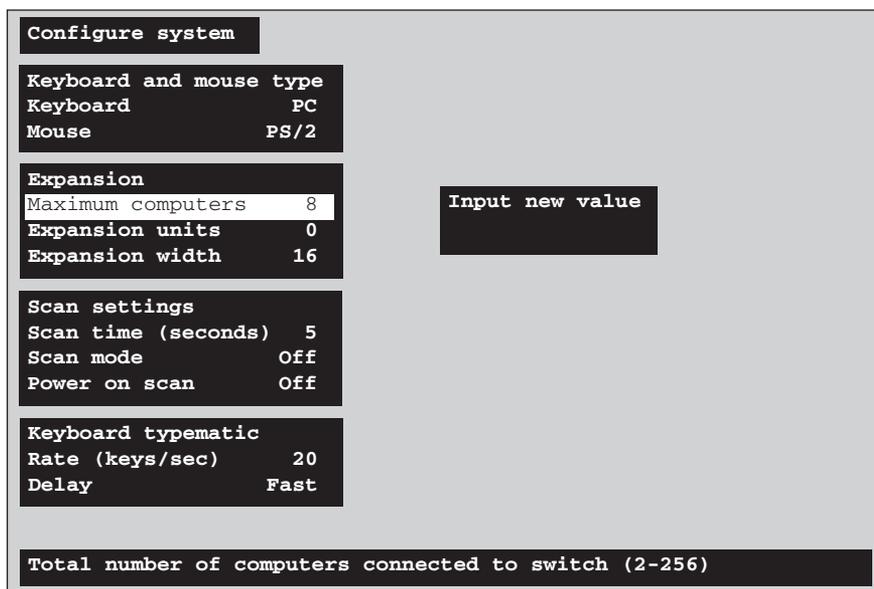
Figure 5-4. Changing the maximum number of computers.

Use the shared keyboard's number keys to input a new value from 2 to 256 and hit [Enter]. The input box disappears and the new setting appears in the "Maximum computers" field.

5.2.4 CONFIGURE SYSTEM: EXPANSION UNITS

This setting corresponds to the number of "submaster" (expansion) Serv units that are connected to the main master ServSwitch Ultra. It helps to determine which CPU number is associated with which physical connector. If you aren't cascading, this number should be set to zero. If one submaster is connected, the value should be set to one, and so on.

To change this setting, press [Enter] while "Expansion units" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new value from 0 to 16 and hit [Enter]. The input box disappears and the new setting appears in the "Expansion units" field. (The factory-default value is zero.)

5.2.5 CONFIGURE SYSTEM: EXPANSION WIDTH

This setting corresponds to the number of CPU ports that each submaster attached to a ServSwitch Ultra master has. It helps to determine which CPU number is associated with which physical connector. For example, if you are using four-port submasters, then the expansion width should be set to four. (Do not use submasters that have different numbers of CPU ports—both 4-port and 8-port submasters, for example—because this will cause switching and scanning problems.)

To change this setting, press [Enter] while "Expansion width" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new value from 1 to 16 and hit [Enter]. The input box disappears and the new setting appears in the "Expansion width" field.

An example: Suppose your system consists of 32 computers that you'd like to cluster in four groups of eight. You connect each group to an 8-port submaster, and each of the four submasters to an 8-port master. You would then set maximum computers to 32, expansion units to four, and expansion width to eight. If at some point you connected four more computers to the four extra CPU ports on the master, units and width would not change, but you would set maximum computers to 36.

The factory-default value for this option is 16.

5.2.6 CONFIGURE SYSTEM: SCAN TIME

This item determines the time, in seconds, that the ServSwitch Ultra will pause at each of the computers when scanning. The factory-default setting is 5 seconds. To change the scan time, press [Enter] while "Scan time" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new value from 1 to 999 seconds and hit [Enter]. (You can also set this value to zero to disable scanning completely.) The input box disappears and the new setting appears in the "Scan time" field.

5.2.7 CONFIGURE SYSTEM: SCAN MODE

This item turns scanning on or off. (Factory default is off.) To change the scan mode, press [Enter] while "Scan mode" is highlighted. An off/on input box appears. Use the arrow keys to select "on" or "off" and hit [Enter]. The input box disappears and the new setting appears in the "Scan mode" field.

5.2.8 CONFIGURE SYSTEM: POWER-ON SCAN

This item determines whether the ServSwitch Ultra operates normally when it is powered up or begins scanning immediately. To change the power-on scan setting, press [Enter] while "Power on scan" is highlighted. An off/on input box appears. Use the arrow keys to select "On" (Serv unit defaults to scan mode at power-up) or "Off" (unit operates normally at power-up) and hit [Enter]. The input box disappears and the new setting appears in the "Power on scan" field. (You must save this change, as described in **Section 5.1.3**, for it to be effective. The factory-default value for this option is "off.")

5.2.9 CONFIGURE SYSTEM: TYPEMATIC RATE (IBM COMPATIBLE KEYBOARDS ONLY)

This item determines how quickly repeated keystrokes are sent to the attached CPUs when a key is held down on a shared IBM PC compatible keyboard. The factory-default setting is 20 characters per second. To change the typematic rate, press [Enter] while "Typematic rate" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new "rate value" from 0 to 31 and hit [Enter]. (This rate value corresponds to a certain number of keystrokes per second, as shown in Table 3-1 on the next page.) The input box disappears and the new setting appears in the "Typematic rate" field.

   Apple and Sun keyboards do not support the typematic function, so the ServSwitch Ultra ignores this setting if you have an Apple or Sun compatible keyboard attached.

Table 3-1. Typematic Rate

Rate Value	Actual Rate in Keystrokes per Second	Rate Value	Actual Rate in Keystrokes per Second
0	2	16	8
1	2.1	17	8.6
2	2.3	18	9.2
3	2.5	19	10
4	2.7	20	10.9
5	3	21	12
6	3.3	22	13.3
7	3.7	23	15
8	4	24	16
9	4.3	25	17.1
10	4.6	26	18.5
11	5	27	20
12	5.5	28	21.8
13	6	29	24
14	6.7	30	26.7
15	7.5	31	30

5.2.10 CONFIGURE SYSTEM: TYPEMATIC DELAY (IBM COMPATIBLE KEYBOARDS ONLY)

This item determines how soon keystrokes will begin to repeat after the operator begins holding down a key on the shared IBM PC compatible keyboard. There are four possible settings: slow (1 second), medium (750 msec.), fast (500 msec.—the factory default), and fastest (250 msec.).

To change the typematic delay, press [Enter] while "Typematic delay" is highlighted. A typematic-delay input box appears. Use the arrow keys to select slow, medium, fast, or fastest, then hit [Enter]. The input box disappears and the new setting appears in the "Typematic delay" field.

Apple and Sun keyboards do not support the typematic function, so the ServSwitch Ultra ignores this setting if you have an Apple or Sun compatible keyboard attached.

5.3 The "Configure Computers" Page

Use this page to set the name, keyboard type, and mouse type for each of the
ServSwitch Ultra's CPU ports. Access it from the main menu by hitting [Enter]
when "Configure computers" is highlighted. The page is shown below in
Figure 5-5. (The arrow in the column after the computer number points to the
currently selected computer.)

```
Configure computers

Number Computer name    Keyboard Mouse
     1>Computer  1       PC2      PS/2
     2 Computer  2       PC2      PS/2
     3 Computer  3       PC2      PS/2
     4 Computer  4       PC2      PS/2
     5 Computer  5       PC2      PS/2
     6 Computer  6       PC2      PS/2
     7 Computer  7       PC2      PS/2
     8 Computer  8       PC2      PS/2
     9 Computer  9       PC2      PS/2
    10 Computer 10       PC2      PS/2
    11 Computer 11       PC2      PS/2
    12 Computer 12       PC2      PS/2
    13 Computer 13       PC2      PS/2
    14 Computer 14       PC2      PS/2
    15 Computer 15       PC2      PS/2
    16 Computer 16       PC2      PS/2


Name of computer up to 16 characters
```

Figure 5-5. The "Configure computers" page.

Use the left- and right-arrow keys to move the highlight bar to the column you
want to change: the computer name, keyboard type, or mouse type. Use the up-
and down-arrow keys to move the highlight bar to the row (that is, to the individual
CPU port) whose setting(s) you want to change. Use the page-up and page-down
keys to access computers 17 through 256.

5.3.1 CONFIGURE COMPUTERS: COMPUTER NAME

Each computer can be given a name consisting of up to 16 characters. These names appear as labels in the "Computer select" window (see **Section 5.5**). To change a computer name, press [Enter] while the corresponding "Computer name" field is highlighted. An "Input new name" box appears, as shown in Figure 5-6 below. (The default computer names are "Computer *n*," where *n* is the port number, also as shown below.)

```
Configure computers

Number Computer name    Keyboard Mouse
      1>Computer   1     PC2      PS/2        Input new name
      2 Computer   2     PC2      PS/2
      3 Computer   3     PC2      PS/2
      4 Computer   4     PC2      PS/2
      5 Computer   5     PC2      PS/2
      6 Computer   6     PC2      PS/2
      7 Computer   7     PC2      PS/2
      8 Computer   8     PC2      PS/2
      9 Computer   9     PC2      PS/2
     10 Computer 10     PC2      PS/2
     11 Computer 11     PC2      PS/2
     12 Computer 12     PC2      PS/2
     13 Computer 13     PC2      PS/2
     14 Computer 14     PC2      PS/2
     15 Computer 15     PC2      PS/2
     16 Computer 16     PC2      PS/2

Name of computer up to 16 characters
```

Figure 5-6. Changing a computer's name.

Type in a new name at the shared keyboard. All ASCII characters are valid in the name field. The backspace key can be used to edit the field. When you have finished typing in the name, hit [Enter]. The input box disappears and the new name appears in the appropriate "Computer name" field.

5.3.2 CONFIGURE COMPUTERS: KEYBOARD

Use this field to tell the ServSwitch Ultra what type of keyboard or keyboard mode (PC mode 1, 2, or 3, Apple, or Sun) a given CPU uses. To change a CPU port's keyboard mode, press [Enter] while the corresponding "Keyboard" field is highlighted. A keyboard-mode input box appears, as shown in Figure 5-7 below.

```
Configure computers

Number Computer name   Keyboard Mouse
     1>Computer  1     PC2      PS/2        PC1
     2 Computer  2     PC2      PS/2        PC2
     3 Computer  3     PC2      PS/2        PC3
     4 Computer  4     PC2      PS/2        Apple
     5 Computer  5     PC2      PS/2        Sun
     6 Computer  6     PC2      PS/2
     7 Computer  7     PC2      PS/2
     8 Computer  8     PC2      PS/2
     9 Computer  9     PC2      PS/2
    10 Computer 10     PC2      PS/2
    11 Computer 11     PC2      PS/2
    12 Computer 12     PC2      PS/2
    13 Computer 13     PC2      PS/2
    14 Computer 14     PC2      PS/2
    15 Computer 15     PC2      PS/2
    16 Computer 16     PC2      PS/2


Type of computer keyboard used
```

Figure 5-7. Changing a CPU port's keyboard mode.

Use the arrow keys to select the desired keyboard mode and hit [Enter]. The input box disappears and the new setting appears in the appropriate "Keyboard" field.

For PCs there are three possible keyboard modes: mode 1 (PC1), mode 2 (PC2—the factory default), or mode 3 (PC3). Most regular PCs are mode 2 and don't require you to change the default setting. Most UNIX workstations and servers, including many IBM RS/6000, SGI®, HP® 700 or 9000 series, and DEC Alpha® computers, use mode 3. Certain IBM brand PCs, especially PS/2 models, can be either mode 1 or mode 2; short of rebooting, there is no way to know for sure except by trial and error. (If you are able to reboot the computer while it is connected to the Serv unit, the unit should autodetect which mode it is and display it in this field.)

For Apple or Sun CPUs attached to your multiplatform ServSwitch Ultra system, choose the Apple or Sun setting respectively.

Once all of your CPU ports have been configured for the proper keyboard mode, make sure you save the changes.

5.3.3 CONFIGURE COMPUTERS: MOUSE

Use this field to tell the ServSwitch Ultra what type of mouse a given IBM PC compatible CPU uses. The factory default is "PS/2" (non-wheel). To change a CPU port's mouse type, press [Enter] while the corresponding "Mouse" field is highlighted. A mouse-type input box appears, as shown in Figure 5-8 below.

```
Configure computers

Number Computer name   Keyboard Mouse
     1>Computer  1      PC2     PS/2     PS/2
     2 Computer  2      PC2     PS/2     PS/2 wheel
     3 Computer  3      PC2     PS/2     Serial 2-button
     4 Computer  4      PC2     PS/2     Serial 3-button
     5 Computer  5      PC2     PS/2
     6 Computer  6      PC2     PS/2
     7 Computer  7      PC2     PS/2
     8 Computer  8      PC2     PS/2
     9 Computer  9      PC2     PS/2
    10 Computer 10      PC2     PS/2
    11 Computer 11      PC2     PS/2
    12 Computer 12      PC2     PS/2
    13 Computer 13      PC2     PS/2
    14 Computer 14      PC2     PS/2
    15 Computer 15      PC2     PS/2
    16 Computer 16      PC2     PS/2

Type of computer mouse attached (change for PCs only)
```

Figure 5-8. Changing a CPU port's mouse type.

Use the arrow keys to select the desired mouse type and hit [Enter]. The input box disappears and the new setting appears in the appropriate "Mouse" field.

The appropriate mouse driver must be loaded and configured on the CPU for mouse communication to work properly. The differences between the various mouse types are discussed in **Section 5.2.2**.

This option can only be set when the "Keyboard" setting is PC1, PC2, or PC3. If the CPU is using an Apple or Sun keyboard, it *must* be configured for the same type of mouse.

5.4 The "Configure Overlay" Page

Use this page to set the color of the configuration menus, the resolution of video generated by the ServSwitch Ultra, the type and timing of the Switch-generated screen saver, the appearance of the "Computer select" window, and the appearance of the Switch-generated computer label (see **Section 5.4.3.A**). Access this page, shown in Figure 5-9 below, from the main menu by hitting [Enter] when "Configure overlay" is highlighted.

```
Configure overlay

Miscellaneous
Color scheme                    Aquarium
Resolution          PC1 640x480x60Hz
Screen saver              Black screen
Screen saver time (seconds)         0

Computer select window
Background color    Transparent blue
Text color                     White
Position              X=  3   Y=  3

Computer label
Background color Transparent magenta
Text color                    Yellow
Position              X=  3   Y= 90
Show computer number             Yes
Fade out (seconds)                20
Font              16x32 classic

Colors of the configuration menu
```

Figure 5-9. The "Configure overlay" page.

5.4.1 CONFIGURE OVERLAY: MISCELLANEOUS

5.4.1.A Color Scheme

This item determines which colors the ServSwitch Ultra uses for the configuration menus. There are four color-scheme choices: "Aquarium" (cyan, magenta, white, and blue—the factory default), "Tuxedo" (black, red, and white), "Festival" (yellow, magenta, blue, cyan, and white), and "Forest" (green, black, cyan, and blue).

To change the color scheme, press [Enter] while "Color scheme" is highlighted. A color-scheme input box appears. Use the arrow keys to select the desired color scheme and hit [Enter]. The input box disappears and the new setting appears in the "Color scheme" field.

5.4.1.B Resolution

This item gives you maximum monitor-type flexibility by determining the resolution and refresh rate of the video signal that the ServSwitch Ultra sends to the shared monitor while the unit isn't receiving any video from the CPU. The possible choices are:

- "PC1" (640 x 480 at 60-Hz refresh rate—the factory default),
- "PC2" (640 x 480 at 72 Hz),
- "PC3" (640 x 480 at 75 Hz),
- "MAC1" (640 x 480 at 67 Hz),
- "MAC2" (832 x 624 at 75 Hz),
- "SUN1" (1152 x 900 at 66 Hz), and
- "SUN2" (1152 x 900 at 76 Hz).

To change the resolution/refresh rate, press [Enter] while "Resolution" is highlighted. An input box appears. Use the arrow keys to select the desired combination of resolution and refresh rate and hit [Enter]. The input box disappears and the new setting appears in the "Resolution" field.

5.4.1.C Screen Saver

The ServSwitch Ultra has a built-in screen saver that reduces the wear on your screen. When there has been no shared-keyboard or -mouse activity for the length of time specified in the "Screen saver time" field (see the next section), the screen saver turns on. You can blank the screen or choose one of three possible display patterns: "Fireflies" (the factory default), "Weaving," or "Bounce." Normal video is restored when any key on the shared keyboard is pressed or the shared mouse is moved. If you are not in an on-screen display menu, then the computer name (label) is also displayed as if you had just switched to a new computer. While the screen saver is on, all of the Serv unit's "SELECT" LEDs (the left-hand red port LEDs) will be turned off.

To change the screen-saver setting, press [Enter] while "screen saver" is highlighted. A screen-saver input box appears. Use the arrow keys to select the desired screen saver and hit [Enter]. The input box disappears and the new setting appears in the "Screen saver" field.

If an access password has been set (see **Section 5.5.2**), this screen saver also appears when no user is logged in. The screen saver will remain on-screen, blocking view of any computer video, until a user enters the access password correctly.

5.4.1.D Screen-Saver Time

This item determines how long (in seconds) the ServSwitch Ultra waits for shared-keyboard or -mouse activity before turning on its screen saver. The factory-default value for this option is 600 seconds (10 minutes). To change the screen-saver time, press [Enter] while "Screen saver time" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new number of seconds from 0 to 999, then hit [Enter]. The input box disappears and the new setting appears in the "Screen saver time" field.

5.4.2 CONFIGURE OVERLAY: COMPUTER SELECT WINDOW

5.4.2.A Background Color and Text Color

These items determine the background and text colors of the "Computer select window" (see **Section 5.5**). The "solid" colors available are black, red, green, yellow, blue, magenta, cyan, and white; these are opaque and cause the window to hide part of the video coming from the CPUs. The "transparent" colors available are clear, red, green, yellow, blue, magenta, cyan, and white; these are translucent, so the video coming from the CPUs is tinted but can be seen through the window. (In fact, the "clear" setting makes the background or text completely transparent; don't set both to clear, or the window will become totally invisible, and you will probably have to reset the Switch to its factory defaults to get the window to reappear.)

To change either of these colors, press [Enter] while "background color" or "text color" is highlighted in the "Computer select window" box. A color-selection input box appears. Use the arrow keys to point to the desired color. As you move the pointer, the name of each color is shown in that color so you can see how it looks. Hit [Enter] to select the color pointed to. The input box disappears and the new setting appears in the appropriate "Background color" or "Text color" field.

The factory-default settings for these options are "transparent blue" for the background color and "white" for the text color.

5.4.2.B Position

This item determines where the "Computer select window" pops up. You can put the window anywhere on the shared monitor's screen; it will automatically scale to the resolution of the incoming video and maintain a constant position on screen.

To change the window position, press [Enter] while "Position" is highlighted in the "Computer select window" box. The overlay page disappears and the computer select window is shown. Use the arrow keys to move the window and hit [Enter] when it reaches the desired position. The overlay page returns with the horizontal (X) and vertical (Y) position numbers updated in the appropriate "Position" field.

The range of horizontal (X) movement is represented by the numbers 0 to 64. The range of vertical (Y) movement is represented by the numbers 0 to 99. The window will wrap around the edge of the screen at minimum and maximum points. Factory defaults are X=3, Y=3.

5.4.3 CONFIGURE OVERLAY: COMPUTER LABEL

5.4.3.A Background Color and Text Color

These items determine the background and text colors of the computer label. The ServSwitch Ultra displays this label on the shared monitor's screen as you switch between CPUs to identify individual CPUs. The "solid" colors available are black, red, green, yellow, blue, magenta, cyan, and white; these are opaque and cause the label to hide part of the video coming from the CPUs. The "transparent" colors available are clear, red, green, yellow, blue, magenta, cyan, and white; these are translucent, so the video coming from the CPUs is tinted but can be seen through the window. (In fact, the "clear" setting makes the background or text completely transparent; don't set both to clear, or the label will be totally invisible.)

To change either of these colors, press [Enter] while "background color" or "text color" is highlighted in the "Computer label" box. A color-selection input box appears. Use the arrow keys to point to the desired color. As you move the pointer, the name of each color is shown in that color so you can see how it looks. Hit [Enter] to select the color pointed to. The input box disappears and the new setting appears in the appropriate "Background color" or "Text color" field.

The factory-default settings for these options are "transparent blue" for the background color and "white" for the text color.

5.4.3.B Position

This item determines where the computer label pops up. You can put the label anywhere on the shared monitor's screen; it will automatically scale to the resolution of the incoming video and maintain a constant position on screen.

To change the label position, press [Enter] while "Position" is highlighted in the "Computer label" box. The overlay page disappears and the computer label is shown. Use the arrow keys to move the label and hit [Enter] when it reaches the desired position. The overlay page returns with the horizontal (X) and vertical (Y) position numbers updated in the appropriate "Position" field.

The range of horizontal (X) movement is represented by the numbers 0 to 64. The range of vertical (Y) movement is represented by the numbers 0 to 99. The label will wrap around the edge of the screen at minimum and maximum points. Factory defaults are X=3, Y=90.

5.4.3.C Show Computer Number

This item determines whether or not the computer number is displayed along with the computer label. To change this setting, press [Enter] while "Show computer number" is highlighted. A yes/no input box appears. Use the arrow keys to select "Yes" or "No" and hit [Enter]. The input box disappears and the new setting appears in the "Show computer number" field. Factory default is "Yes."

5.4.3.D Fade Out

This item determines how long the ServSwitch Ultra continues to display the computer label after you switch to a different CPU before allowing it to "fade out." If you set "Fade out" to anything from 1 to 254, the Serv unit will wait that number of seconds before fading out the computer label. If you set "Fade out" to 255, the unit will display the label at all times. If you set "Fade out" to 0, the unit will never display the computer label at all.

This item also determines how long the Switch displays the computer label after receiving a Display Label ([Ctrl] [D]) keyboard command (see **Section 4.3.11**). The Switch will display the label for five seconds if "Fade out" is set to 0, for the corresponding number of seconds if "Fade out" is set to 1 to 254, or always if "Fade out" is set to 255. Factory default is 5 seconds.

To change the fadeout setting, press [Enter] while "Fade out (seconds)" is highlighted. An "Input new value" box appears. Use the shared keyboard's number keys to input a new value from 0 to 255 and hit [Enter]. The input box disappears and the new setting appears in the "Fade out (seconds)" field.

5.4.3.E Font

This item determines in which font the ServSwitch Ultra displays the computer label. The choices are: 8x16 modern, 8x16 classic, 16x24 modern (the factory default), 16x24 classic, 16x32 modern, and 16x32 classic.

8x16 is the size of the text in the configuration menus. 16x24 is twice as tall and half again as wide. 16x32 is both twice as tall and twice as wide. The "modern" font is a sans-serif font similar to Helvetica®. The "classic" font is a serifed font similar to Times®. The actual size of the font on the screen depends on the resolution of the input video from the CPUs. At higher resolutions the fonts are proportionally smaller, so use larger sizes to keep the labels legible.

To change the font, press [Enter] while font is highlighted. A font-input box appears. Use the arrow keys to select the desired font and hit [Enter]. The input box disappears and the new setting appears in the "Font" field.

5.5 The "Configure Security" Page

Use this page to set security options for the ServSwitch Ultra. Access this page, shown in Figure 5-10 below, from the main menu by hitting [Enter] when "Configure security" is highlighted.

```
Configure security

Security                              New password
Configuration password    ********
Access password           ********
Access time                    999








Protects access to configuration menu, up to 8 characters
```

Figure 5-10. The "Configure security" page.

5.5.1 THE CONFIGURATION PASSWORD

This option protects the configuration settings of the ServSwitch Ultra system from unauthorized changes. To lock the main configuration menu activated by [Ctrl] [F12], set a configuration password here, using the procedure spelled out in **Section 5.5.4**. Once you do, an "Enter password" box will appear whenever the configuration menu is requested, and the ServSwitch Ultra will not permit any changes to options in the menu until the user enters that password. Factory default is no password.

5.5.2 THE ACCESS PASSWORD

This option protects your CPUs from unauthorized viewing or access. To secure the CPUs, set an access password here, using the procedure spelled out in **Section 5.5.4**. Once you do, an "Enter password" box will pop up on a user station's monitor as soon as the user at that station logs out with the [Ctrl] [L] command (see **Section 4.3.14**) or is logged out automatically when the access timeout expires (see the next section). If no password is entered within a few seconds, the

ServSwitch Ultra will begin displaying its currently selected screen saver (see **Section 5.4.1.C**) over the whole screen.. The Switch will not display any computer video, nor will it accept any keyboard commands, until a user logs in by entering the access password. (The "Enter password" box—but nothing else—will reappear as soon as a user begins typing in a password.) Factory default is no password.

5.5.3 THE ACCESS TIMEOUT

Along with the access password (see the previous section), this option protects your unattended user stations from unauthorized use. If you've set an access password, specify a time of keyboard and mouse inactivity in minutes after which the user at any idle station is automatically "logged out." When a user is automatically logged out this way, the "Enter password" box comes up, and so forth (again, see the previous section).

   Possible values for the access timeout range from 1 minute to 999 minutes (16 hours 39 minutes; this is actually the factory-default value). You can also disable the timeout by setting it to zero; in this setting, users will never be automatically logged out, so the "Enter password" box will only be displayed when users log out manually with the {ctrl} [L] command (see **Section 4.3.14**) and when you cycle power to the ServSwitch Ultra.

5.5.4 SETTING THE PASSWORDS

When you select either "Configuration password" or "Access password" from this menu, this prompt appears:

```
New password
```

After you type in a password (up to eight ASCII characters long, case-sensitive—only asterisks will appear on your screen) and press [Enter], the ServSwitch Ultra displays this prompt:

```
Confirm password
```

If you type in the same string of characters at this prompt, the new password is accepted and saved. Otherwise, this message is displayed:

```
Invalid password
Hit escape to exit
```

Once you have successfully set these passwords, you should keep a record of them in a secure location; if nobody can remember a given password, you will have to call Black Box Technical Support for help to recover your system.

   To remove either of these passwords, delete the password and press Enter with no text in the "New password" box.

5.6 The "Computer Select Window"

You can bring up a "computer select window" on the shared monitor's screen to select a specific computer from a list of computers attached to the ServSwitch Ultra. Access the window, shown in Figure 5-11 below, by pressing and releasing the left [Ctrl] key and then hitting the [Esc] (escape) key. The arrow in the column after the computer number points to the currently selected computer.

```
Computer select window
   1>Computer  1
   2 Computer  2
   3 Computer  3
   4 Computer  4
   5 Computer  5
   6 Computer  6
   7 Computer  7
   8 Computer  8
```
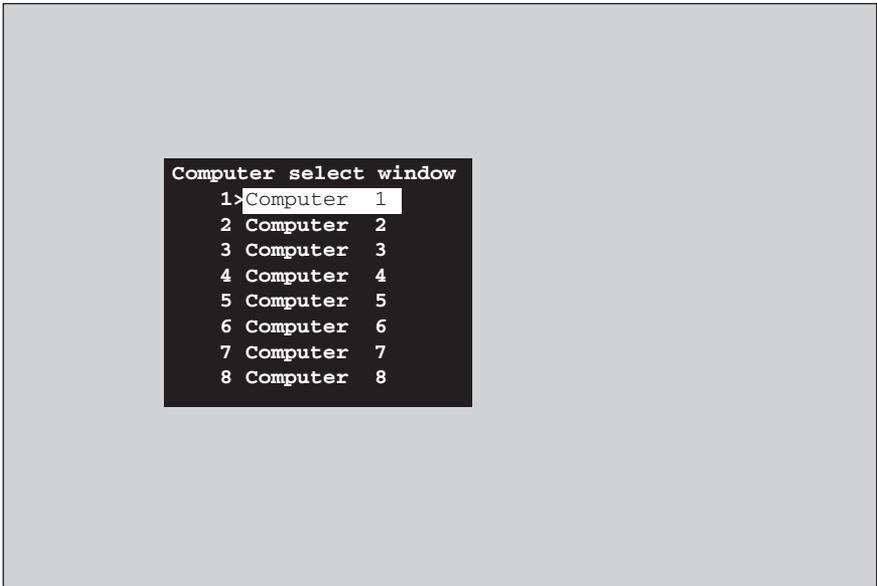
Figure 5-11. The "computer select window."

Just as it does with the configuration menus and computer labels, the ServSwitch Ultra overlays the "computer select window" on top of your current video. Use the up- and down-arrow keys on the shared keyboard to select the desired computer; when it is highlighted, hit [Enter] to immediately switch to that computer (its label will be shown). If you have more than 16 computers in your ServSwitch Ultra system, use the [PageUp] and [PageDown] keys to access the other computers, at up to 16 computers per window. Hit [Esc] to exit the window and remove it from the screen.

Use the "Configure overlay" page to set the position and color of the window (see **Section 5.4.2**). The height of the window will vary depending on the current "maximum computers" (maximum ports) setting. For instance, if maximum computers is set to 6, the window will have slots for only 6 computer names.

6. Troubleshooting

The first two sections of this chapter discuss things to try when problems arise in a ServSwitch Ultra system. If the trouble you're having with the Switch is something you haven't seen before, or if the trouble seems minor, try the procedures detailed in **Section 6.1** before doing anything else. The second section of this chapter suggests possible causes of and solutions to frequently encountered problems; if the trouble is chronic, see **Section 6.2**. **Sections 6.3** and **6.4** discuss what's involved in calling Black Box and shipping your Switch.

CAUTION!

Do *not* open the ServSwitch Ultra's cover. You could easily damage the Switch and attached devices, and if the Switch is powered you could hurt yourself as well.

6.1 Restoring Factory-Default Settings

If you're having difficulty with a ServSwitch Ultra, something that often helps is resetting the Switch to its factory defaults. Follow these steps *carefully:*

1. Make sure that the ServSwitch Ultra, any submasters attached to it, and all CPUs directly or indirectly connected to it are turned OFF.

2. Press and hold in the ▼ or "–" (previous port) button on the front of the Switch. While holding in this button, turn the Switch back ON.

3. Wait until the red (SELECT) LED of the Switch's highest-numbered port (port 4 on a 4-port unit, port 12 on a 12-port unit, etc.) lights up, then release the minus button.

4. Cycle power to the Switch (push the ON/OFF button once to turn the Switch OFF, then push it again to turn the Switch ON).

5. Select Port 1 on the ServSwitch Ultra. Power up the device on Port 1; if the device is a CPU, wait for it to go completely through its boot-up process. Then select Port 2, power up that device, and so on.

6. Starting with the lowest-numbered CPU and proceeding to the highest-numbered one, power up the CPUs on the Switch's submasters one at a time, waiting for each to boot completely before going to the next.

Now reconfigure the box to your desired settings. If you're still having difficulty, refer to **Section 6.2**. If it doesn't help you to solve your problem, call Black Box for technical support.

6.2 Common Problems

6.2.1 A CPU CONNECTED TO YOUR SERVSWITCH ULTRA OR A SUBMASTER DOESN'T BOOT, AND YOU GET A KEYBOARD OR MOUSE ERROR

A. First make sure your ServSwitch Ultra and (if one is involved) your submaster are plugged in and powered up.

B. If the Switch and submaster are ON, check the master's configuration. The keyboard and mouse settings for that CPU might not be correct.

C. If the configuration is OK, check your cables. Tighten any loose connections. If the keyboard and mouse strands of either the CPU cable or the MKM cable have been reversed, plug them into the proper ports.

D. If you don't find a cable error, try swapping in different keyboards and/or mice one at a time. If the problem goes away when you substitute a device, the old one might have gone bad.

E. If swapping input devices doesn't solve the problem, begin swapping your cables one at a time. If the problem goes away when you substitute a cable, the old cable is probably defective.

F. If swapping cables doesn't solve the problem, try plugging the CPU into a different CPU port on the ServSwitch Ultra. If the CPU boots when it's connected to a different port, the old port is probably defective.

G. If swapping ports doesn't solve the problem, try plugging a known-good keyboard and mouse directly into the CPU that's having the problem. If the CPU boots, the ServSwitch Ultra or submaster might be defective; call Black Box.

H. If the CPU still doesn't boot, the CPU's keyboard or mouse port (or other components) might be defective. (If the CPU's power LED doesn't light, the fuse on the CPU's motherboard might be blown.) If you still have them, plug that CPU's original monitor, keyboard, and mouse into it and try again. If the CPU does not boot with its original equipment, something in the CPU is defective; call the CPU's manufacturer. If the CPU *does* boot, there is some kind of unusual mismatch between that CPU and the shared monitor, keyboard, or mouse; call Black Box for technical support.

6.2.2 YOU CAN'T SWITCH PORTS FROM THE KEYBOARD

A. Can you do *anything* from the keyboard? If not, the keyboard strand of your MKM cable has probably come loose. Reconnect it.

B. The ServSwitch Ultra might have lost power for less than three seconds. (This can cause the keyboard to lock up.) Disconnect the keyboard and plug it back in.

C. The keyboard might simply have gotten a little off kilter. If the Switch can see the keyboard at all, try reinitializing the keyboard with the Reset command, [Ctrl] R (see **Section 4.3.7**).

D. The keyboard mode that the currently selected CPU port is set for might not match the mode that the CPU on that port expects. Use the on-screen display to change the port's mode (see **Section 5.3.2**). Sometimes this situation can confuse the CPU or keyboard so badly that it is necessary to reboot the CPU or to reset the keyboard by unplugging it and plugging it back in.

E. For PS/2 type equipment, if the keyboard and mouse strands of either the CPU cable or the MKM cable have been reversed, plug them into the proper ports.

F. You might be using the keyboard incorrectly. Make sure to use the *left* Control key to start port-switching commands. Make sure to use the numeric keys at the top of the keyboard rather than the numeric keypad when you type in port numbers. Make sure to release the Control key before you start typing in a port number. Make sure you don't wait too long before you enter a port number. Make sure you don't accidentally hit keys such as Shift, Caps Lock, or Alt.

6.2.3 CHARACTERS THAT YOU TYPE COME UP WRONG OR MISSING

The keyboard mode that the currently selected CPU port is set for might not match the mode that the CPU on that port expects. See item C under **Section 6.2.2**.

6.2.4 YOU CAN'T SEEM TO SCAN OR SWITCH TO CERTAIN PORTS AT ALL

A. The "Maximum computers" setting is too low. (If any of the CPUs you *can* access are receiving garbage characters, this is a good indicator.) Set "Maximum computers" to match the number of CPUs in your system (see **Section 5.2.3**).

B. The "Expansion units" and/or Expansion width" setting is wrong. To reach all ports, set Units equal to the number of submasters in your system, and Width equal to the greatest number of CPUs you have on any submaster (see **Sections 5.2.4** and **5.2.5**).

6.2.5 THE SERVSWITCH ULTRA SCANS OR SWITCHES TO EMPTY OR NONEXISTENT PORTS

A. The "Maximum computers" setting is too high. (If any of the CPUs you *can* access are receiving garbage characters, this is a good indicator.) Set Maximum Ports to match the number of CPUs in your system. See **Section 5.2.3**.

B. The "Expansion units" and/or "Expansion width" setting is wrong. To reach only occupied ports, set Units equal to the number of submasters in your system, and Width equal to the smallest number of CPUs you have on any submaster (see **Sections 5.2.4** and **5.2.5**).

6.2.6 YOUR MOUSE DRIVER DOESN'T LOAD (IBM PC TYPE MICE ONLY)

A. What type of mouse are you using? If it's an RS-232 serial mouse, see steps B and D. If it's a PS/2 or PS/2 wheel mouse, see steps C and D. If it's a Microsoft BallPoint mouse, see step D. At the time of this writing, the ServSwitch Ultra does not support other types of mice.

B. RS-232 serial mouse: Make sure that you're using the right COM port, and that the mouse driver is looking for the correct port.

C. PS/2 or PS/2 wheel mouse: To recognize the mouse, the CPU must be directly connected to it, or indirectly connected to it through the ServSwitch Ultra and (if one is involved) the submaster, at boot-up time. Make sure that all cables are properly seated and that the Switch and submaster are ON, then reboot the CPU.

D. Your mouse driver might be old or incompatible with your mouse. Try the latest version of the Microsoft mouse driver.

6.2.7 YOU CAN'T ACCESS ALL THE FUNCTIONS OF YOUR MOUSE (IBM PC TYPE MICE ONLY)

A. What type of mouse is it? If it is any other IBM PC type than those listed as being supported in item A under **Section 6.2.6**, chances are that the ServSwitch Ultra doesn't support it.

B. If your mouse is a Microsoft BallPoint, you need the latest version of the Microsoft mouse driver.

C. If your mouse is a Logitech mouse, the ServSwitch Ultra supports the two-button models but not the three-button models.

6.2.8 YOUR PS/2 MOUSE GETS OUT OF SYNC

Cabling might have been disturbed during mouse movement. Issue the Send Null Byte command (see **Section 4.3.8**) once or twice to get the mouse back in sync. You need the latest version of the Microsoft mouse driver to stop this from happening.

6.2.9 YOUR MOUSE DOESN'T MOVE THE POINTER/CURSOR

A. What type of mouse is it? If it is any IBM PC type other than those listed as being supported in item A under **Section 6.2.6**, chances are that the ServSwitch Ultra doesn't support it.

B. The mouse might not be configured properly.

C. Your mouse must be connected to a powered ServSwitch Ultra when the CPUs are booted and when mouse applications are run. Try exiting and re-entering your application; if this doesn't work, issue the Reset command (see **Section 4.3.7**).

6.2.10 YOUR MONITOR DISPLAY IS FUZZY

A. Check the settings of your monitor, especially the sharpness control.

B. If you can't solve the problem by changing the monitor settings, you might have run cable too far. No single original Serv cable in your system should be longer than 20 ft. (6.1 m), and the maximum total length of original Serv cable from any CPU to any monitor, keyboard, and mouse is 40 ft. (12.2 m). (If you're using SVGA or high-res Mac video, even these distances might too far.) No single coaxial cable in your system should be longer than 100 ft. (30.5 m), and this assumes that your CPUs can drive keyboard and mouse signals that far—you might only be able to run 20 ft. (6.1 m).

Bottom line: If you're running IBM or Mac video over original Serv cable, you might need to upgrade to coaxial cables that carry the video signal better. If you are already using coax cables, you might need to add Station Extenders (our product codes AC253A etc.) or CAT5 KVM Extenders (our product codes ACU9001A etc.); call Black Box for technical support. See **Section 4.1.3** and **Appendix B**.

6.2.11 YOUR VIDEO IS NOT SYNCHRONIZED OR IS THE WRONG COLOR

A. If you are trying to use an IBM 9515, 9517, or 9518 monitor, you need special cables to carry the video correctly. Call Black Box for technical support.

B. Check the settings of your monitor, especially the sync or color controls.

C. Your monitor might not be capable of synching to the selected video resolution or frequency (refresh rate). Try a lower resolution or frequency or a more powerful monitor.

D. The CPU is sending video with composite sync and the monitor only accepts horizontal or vertical sync, or vice versa. Change the settings of the CPU or monitor so that the two are compatible. If this is not possible, swap in a different monitor that can handle all of your CPUs' synchronization types.

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E. The CPU is sending video with sync on green, which the ServSwitch Ultra does not currently support. Call Black Box for technical support.

F. If the video problem is not centered on the monitor, check the video strands of your cables. Tighten any loose connections.

G. If no cable connectors are loose, begin swapping your cables one at a time. If the problem goes away when you substitute a cable, the old cable is probably defective.

H. If swapping cables doesn't solve the problem, try plugging the CPU into a different CPU port on the ServSwitch Ultra or submaster. If the problem goes away when the CPU is connected to a different port, the old port is probably defective.

6.2.12 YOUR VIDEO IS OK IN LOW-RESOLUTION MODE, BUT YOU CAN'T GET INTO HIGH-RESOLUTION MODE

A. If you're using XGA, you *must* use coaxial cables (see **Section 4.1.3** and **Appendix B**).

B. Check your video driver or control panel. It might not be set up correctly for your desired resolution.

6.2.13 YOUR ON-SCREEN DISPLAY IS NOT SYNCHRONIZED

A. This can happen when no video is coming from the currently selected port or CPU and the "Configure overlay: Resolution" setting is wrong. Set the resolution properly (see **Section 5.4.1.B**).

B. The CPU is sending video with composite sync and the monitor only accepts horizontal or vertical sync, or vice versa. Change the settings of the CPU or monitor so that the two are compatible. If this is not possible, swap in a different monitor that can handle all of your CPUs' synchronization types.

C. The CPU is sending video with sync on green, which the ServSwitch Ultra does not currently support. Call Black Box for technical support.

6.2.14 ONE OR MORE OF YOUR CPUS LOCK UP WHEN YOU LOAD WINDOWS 3.X

The usual cause of this problem is that the affected CPUs are set to load a Logitech or other type of mouse driver when Windows starts up. Set the CPU to load the generic Microsoft mouse driver instead.

6.2.15 THE SERVSWITCH ULTRA DOESN'T WORK WITH YOUR DOCKING STATION

The ServSwitch Ultra does not support docking stations for portable computers.

6.2.16 THE SERVSWITCH ULTRA DOESN'T WORK WITH YOUR DONGLE-PROTECTED SOFTWARE

The ServSwitch Ultra does not support keyboard-line dongles (the devices required to be inserted into the keyboard line by some software for copy protection).

6.2.17 THE SERVSWITCH ULTRA DOESN'T WORK WITH YOUR IBM THINKPAD

The Switch supports only "stream mode" (continuous) mouse data. It doesn't support the "prompt mode" (burst-on-request) method for handling mouse data that the IBM ThinkPad uses, regardless of whether the ThinkPad is connected to the Switch directly or through a docking station (and see **Section 6.2.15**).

6.2.18 YOU'VE LOST YOUR PASSWORD

If you've lost your access password or configuration password and you have no record of what they are set to, you will have to call Black Box Technical Support. They will help you to recover your system.

6.3 Calling Black Box

If you determine that your ServSwitch Ultra is malfunctioning, *do not attempt to alter or repair the unit.* It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

   Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.
- the results of any testing you've already done.

6.4 Shipping and Packaging

If you need to transport or ship your ServSwitch Ultra:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the ServSwitch Ultra for repair, make sure you include its power supply and the adapter cables you're using with it. If you are returning the Switch, make sure you include everything you received with it. Before you ship, contact Black Box to get a Return Authorization (RA) number.

Appendix A: NVRAM Factory Defaults

A.1 Keyboard-Command Settings

The table below shows, for the ServSwitch Ultra's keyboard-command configuration options, the default values stored in nonvolatile memory (NVRAM) when the ServSwitch Ultra is shipped from the factory. It also shows what commands or actions can change these settings for the Switch's current operating period, as well as what commands or actions (if any) can save changed settings to NVRAM, so that they become the new defaults.

Option	Factory-Default Setting	To Change	To Save Changes
Caps/Scroll/ Num Lock	Num Lock ON (fixed)	Select port, then press the corresponding button on the keyboard	Can't be saved
Scan	OFF	Type [Ctrl] S (to turn ON) or	Can't be saved
Screen-Saver Delay Time	0 (disabled)	Type [Ctrl] Vxxx [Enter] (*xxx* = any 1- to 3-digit number,	[Ctrl] K
Transpose Command and Alt Keys	Pressing the key produces the same scan code	Type [Ctrl] B	[Ctrl] K

A.2 On-Screen Configuration Settings

The table below and on the next page shows, for the ServSwitch Ultra's saveable on-screen display options, the default values stored in nonvolatile memory (NVRAM) when the ServSwitch is shipped from the factory.

Option	Default setting
System	
Keyboard	PC 104/105
Mouse	PS/2
Maximum computers	2-port models: 4;
	Other models: No. of ports on unit
Expansion units	0
Expansion width	16
Scan time	5 seconds
Scan mode	Off
Power-On Scan	Off
Typematic rate	20 characters per second
Typematic delay	Fast
Computer	
Computer name	Computer n (n = CPU-port number)
Computer keyboard	PC2 (PC mode 2)
Computer mouse	PS/2 (non-wheel)
Overlay	
Color scheme	Aquarium
Resolution	PC1 (640x480 at 60 Hz)
Screen saver	Fireflies
Screen-saver timeout	600 seconds (10 minutes)
Computer-select window	
Background color	Transparent blue
Text color	White
Position	X=3, Y=3

Option   **Default setting**

Computer label
  Background color   Transparent blue
  Text color   White
  Position   X=3, Y=90
  Show computer number   Yes
  Fade out   5 seconds
  Font   16x24 modern

Security
  Configuration password   None
  Access password   None
  Access time   999 seconds (16 hours, 39 minutes)

Appendix B: Cable Product Codes

The tables below and on the next two pages list the product codes for all the types of cables we currently offer for use with the ServSwitch Ultra. The four digits that follow the dash in each product code indicate how long each cable is in feet (one foot = 30.5 cm).

For most of these cables, *xxx*'s are shown in place of the last three digits of the product code because the cables come in several stock lengths. For original (standard) CPU and MKM adapter cables, these last three digits can be "001" (MKM cables only), "005," "010," or "020" for 1-foot (0.3-m), 5-foot (1.5-m), 10-foot (3-m) or 20-foot (6.1-m) cables respectively. For coaxial cables, these last three digits can be "005," "010," "020," "035," "050," "075," or "100" for 5-foot (1.5-m), 10-foot (3-m), 20-foot (6.1-m), 35-foot (10.7-m), 50-foot (15.2-m), 75-foot (22.9-m), or 100-foot (30.5-m) cables respectively. (The two exceptions to this are the RS/6000 and SGI cables, which come in 5- and 10-ft. [1.5- and 3-m] lengths only.)

The table also lists the product codes for the Mac Adapter, Station Extenders, and CAT5 KVM Extenders. Depending on your equipment—which must be IBM type—and the video resolution you're using, you might be able to use one of the Extender types to connect the ServSwitch Ultra to monitor/keyboard/mouse stations or CPUs as much as 200 ft. (61 m) away.

If your monitor/keyboard/mouse-sharing system has cabling requirements that can't be met by what you see here, call Black Box for a possible quote on custom cables or adapters.

Standard User Cables:

Monitor Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 female)	IBM PC/AT (5-pin DIN female)	Serial RS-232 (DB9 male)	EHN052-0xxx
VGA (HD15 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN054-0xxx
Mac (DB15 female)	Mac (4-pin mini-DIN female)	N/A	EHN210-0xxx
Multisync (HD15 female)	Mac (4-pin mini-DIN female)	N/A	EHN532-0xxx
Multisync (HD15 female)	Sun (8-pin mini-DIN female)	N/A	EHN059-0xxx

Coaxial User Cables:

Monitor Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 female)	IBM PC/AT (5-pin DIN female)	Serial RS-232 (DB9 male)	EHN270-0xxx
VGA (HD15 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN283-0xxx
Mac (DB15 female)	Mac (4-pin mini-DIN female)	N/A	EHN202-0xxx
Multisync (HD15 female)	Mac (4-pin mini-DIN female)	N/A	EHN540-0xxx
Sun (13W3 female)	Sun (8-pin mini-DIN female)	N/A	EHN200-0xxx
Multisync (HD15 female)	Sun (8-pin mini-DIN female)	N/A	EHN225-0xxx
RS/6000 (13W3 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN521-0001
SGI (13W3 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN501-0001

Standard CPU Cables:

Video Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 male)	IBM PC/AT (5-pin DIN male)	Serial RS-232 (DB9 female)	EHN048-0xxx
VGA (HD15 male)	IBM PS/2 (6-pin mini-DIN male)	PS/2 (6-pin mini-DIN male)	EHN051-0xxx
Mac (DB15 male)	Mac (4-pin mini-DIN male)	N/A	EHN215-0xxx
Mac G3 (HD15 female)	Mac (4-pin mini-DIN female)	N/A	EHN550-0xxx

Coaxial CPU Cables:

Video Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 male)	IBM PS/2 and PC/AT	PS/2 and serial RS-232	EHN282-0xxx
Mac (DB15 male)	Mac (4-pin mini-DIN male)	N/A	EHN208-0xxx
Mac G3 (HD15 female)	Mac (4-pin mini-DIN female)	N/A	EHN560-0xxx
Sun (13W3 male)	Sun (8-pin mini-DIN male)	N/A	EHN205-0xxx
Sun (HD15 male)	Sun (8-pin mini-DIN male)	N/A	EHN515-0xxx
RS/6000 (13W3 male)	IBM PS/2 (6-pin mini-DIN male)	PS/2 (6-pin mini-DIN male)	EHN520-0xxx
SGI (13W3 male)	IBM PS/2 (6-pin mini-DIN male)	PS/2 (6-pin mini-DIN male)	EHN500-0xxx

Original ServSwitch to ServSwitch Expansion Cable: EHN055-0001

Coaxial ServSwitch-to-ServSwitch Expansion Cable: EHN274-0xxx

6-wire straight-through-pinned flat-satin cable with RJ-12 connectors for communicating with ServSwitch Ultra through its RS-232 port: EL06MS-MM (specify length)

Mac Adapter for ServSwitch: KV99MA

Station Extenders:

CPU to ServSwitch Ultra (RS-232 Mouse): AC254A

ServSwitch Ultra to Station (RS-232 Mouse): AC255A

CPU to ServSwitch Ultra (PS/2 Style Mouse): AC257A

ServSwitch Ultra to Station (PS/2 Style Mouse): AC258A

Station-Extender Cables: EHN250-0zzz, where "zzz" = 050, 100, 150, or 200

CAT5 KVM Extenders (Kits include local and remote modules and interconnecting cables):

Single-Access Kit (remote user station only): ACU1001A

Dual-Access Kit (local and remote user stations contend): ACU1009A

AT→PS/2 Mouse Ghost (for PC/AT connections): AC244A

Keyboard Adapter (for PC/AT connections): FA212

Appendix C: Pinout of RS-232 Port

The table below shows the pinout of the ServSwitch Ultra's RJ-12 ("6-wire RJ-11") female RS-232 port.
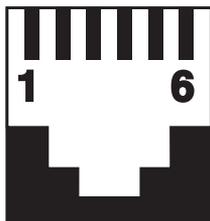
Pin	Signal Name	Abbrev.	Direction	Description
1	Data Set Ready	DSR	Input	Reserved (not used)
2	Data Terminal Ready	DTR	Output	Pulled high with 1-kΩ resistor
3	Transmit Data	TD	Output	Serial data from port
4	Signal Ground	SGND	N/A	DC ground reference
5	Receive Data	RD	Input	Serial data to port
6	Request to Send	RTS	Output	Pulled high with 1-kΩ resistor

Appendix D: The LK461 Keyboard

Some of the computers manufactured by Compaq® subsidiary Digital Equipment Corporation come with a special keyboard called the DEC LK461. The ServSwitch Ultra supports this keyboard by passing through unaltered the scan codes of certain proprietary keys (such as [Help] and [Do]) and remapping others (such as [PF1] through [PF4]). The ServSwitch Ultra maps the special keys of the LK461 as shown in the table below. Note that the LK461 has no Num Lock LED and its Hold Screen LED is equivalent to the Scroll Lock LED on other keyboards.

Key Pressed on LK461 Keyboard	Scan Code Sent to U.S. CPU
[Find]	[Home]
[Insert Here]	[Insert]
[Remove]	[Delete]
[Select]	[End]
[Prev]	[Page Up]
[Next]	[Page Down]
[F13]	Same (passed through unaltered)
[F14]	Same (passed through unaltered)
[F15] / [Help]	Same (passed through unaltered)
[F16] / [Do]	Same (passed through unaltered)
[F17]	Same (passed through unaltered)
[F18]	[Print Screen]
[F19]	[Scroll Lock]
[F20]	[Pause]
[PF1]	[Num Lock]
[PF2]	Keypad [/] (slash or divide key)
[PF3]	Keypad [*] (asterisk or multiply key)
[PF4]	Keypad [–] (minus key)
Keypad [–] (minus key)	Keypad [+] (plus key)*
Keypad [,] (comma key)	Keypad [+] (plus key)
Left [Compose]	Same (passed through unaltered)
Right [Compose]	Right [Control]
[<] / [>] (grtr. than/less than key)	[`] / [~] (accent grave/tilde key)**

*Keypad [–] is always mapped this way in Mode 2; in Mode 3, the mapping varies by country.

**This mapping varies by country; that is, the key is mapped differently depending on what keyboard country or language the CPU is configured to accept.

Appendix E: Rackmounting the ServSwitch Ultra

If you want to mount your ServSwitch Ultra in a 19", 23", or 24" rack, make sure you get the right ServSwitch Rackmounting Kit: product code RMK19M, RMK23M, or RMK24M respectively for the mini-chassis Switch models, RMK19S, RMK23S, or RMK24S respectively for the slimline-chassis models, or RMK19F, RMK23F, or RMK24F respectively for the full-size-chassis models. Each of these Kits consists of two rackmounting "ears" and four screws. To use a kit to mount a ServSwitch Ultra or ServSwitch Ultra, take these steps, referring to Figure G-1 below:

1. Match up the two holes in the "Switch end" of each Kit ear with the two empty screwholes on the side of the Switch, then fasten the ear to the Switch with two of the screws included with the Kit.

2. Once you've attached both ears, match the holes in the "rack end" of each ear to an appropriate set of matching holes on your equipment rack, then screw the Switch assembly to the rack using your own screws, bolts, or cage nuts (not included).
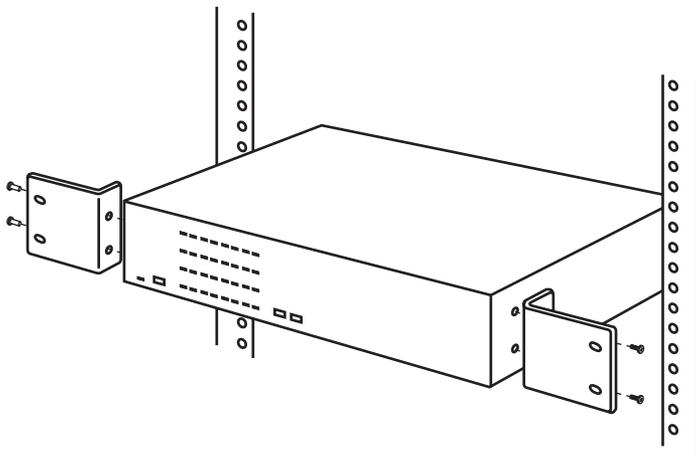

Figure G-1. Rackmount assembly.