# "-R3" BLACK BOX® ServSwitch™ &
# Original BLACK BOX® ServSwitch™ Ultra

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**NETWORK SERVICES**
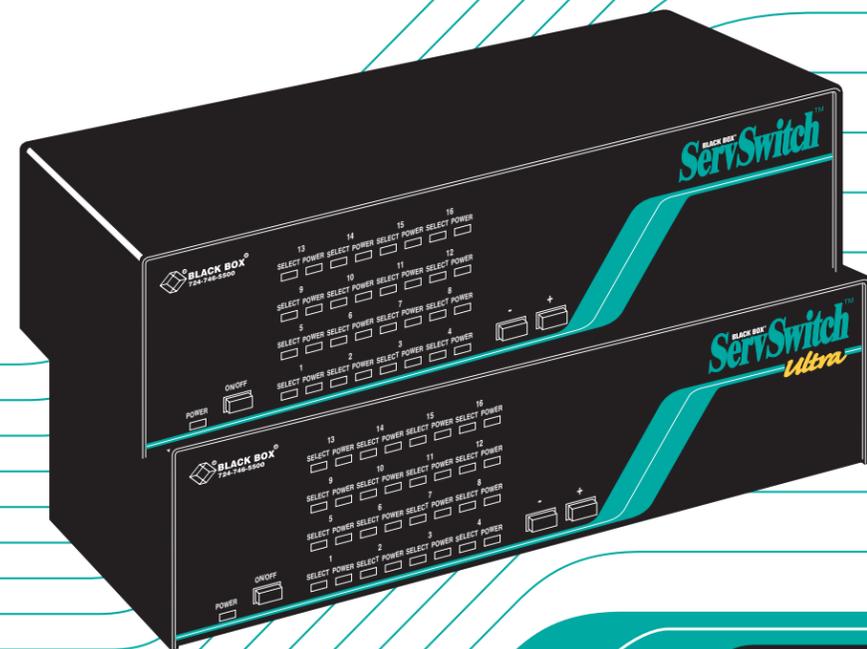
**SW721 through
SW725 (-R3) Series
KV3000, KV5000 Series
KV3100, KV5100 Series
KV3200, KV5200 Series
KV3300, KV5300 Series**

**Customer Support Information:**
FREE tech support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**.
Mailing address: **Black Box Corporation**, 1000 Park Dr., Lawrence, PA 15055-1018
World-Wide Web: **www.blackbox.com** • E-mail: **info@blackbox.com**
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◆ **BLACK BOX®**
**NETWORK SERVICES**

# Welcome to the ServSwitch™ Family!

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

That's because our ServSwitch family is all about breaking away from the traditional, expensive model of computer management. You know, the one-size-fits-all-even-if-it-doesn't model that says, "One computer gets one user station, no more, no less." Why not a single user station (monitor, keyboard, and mouse) for multiple computers—even computers of different platforms? Why not a pair of user stations, each of which can control multiple computers? Why not multiple user stations for the same computer?

With our ServSwitch products, there's no reason why not. We carry a broad line of robust solutions for all these applications. Do you have just two PCs, and need an economical alternative to keeping two monitors, keyboards, and mice on your desk? Or do you need to share dozens of computers, including a mix of IBM® PC, RS/6000®, Apple® Macintosh®, Sun Microsystems®, and SGI® compatibles, among multiple users with different access levels? Does your switch have to sit solidly on a worktable and use relatively inexpensive 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 or ServSwitch Ultra™ unit, including how to install, operate, and troubleshoot it. For an introduction to the Switch unit itself, see **Chapter 2**. The ServSwitch and ServSwitch Ultra product codes covered in this manual are (see below for accessory product codes or **Appendix B** for cable product codes):

| | | | | | |
|---|---|---|---|---|---|
| SW721A-R3 | KV3002MA | KV3208SAE | KV5002MA | KV5104FAE | KV5212FA |
| SW721AE-R3 | KV3002MAE | KV3212FA | KV5002MAE | KV5108SA | KV5212FAE |
| SW722A-R3 | KV3004MA | KV3212FAE | KV5004MA | KV5108SAE | KV5216FA |
| SW722AE-R3 | KV3004MAE | KV3216FA | KV5004MAE | KV5108FA | KV5216FAE |
| KV3104FA | KV3008SA | KV3216FAE | KV5008SA | KV5108FAE | KV5302MA |
| KV3104FAE | KV3008SAE | KV3302MA | KV5008SAE | KV5112FA | KV5302MAE |
| KV3108SA | KV3012FA | KV3302MAE | KV5012FA | KV5112FAE | KV5304MA |
| KV3108SAE | KV3012FAE | KV3304MA | KV5012FAE | KV5116FA | KV5304MAE |
| SW723A-R3 | KV3016FA | KV3304MAE | KV5016FA | KV5116FAE | KV5308SA |
| SW723AE-R3 | KV3016FAE | KV3308SA | KV5016FAE | KV5202MA | KV5308SAE |
| SW724A-R3 | KV3202MA | KV3308SAE | KV5102MA | KV5202MAE | KV5312FA |
| SW724AE-R3 | KV3202MAE | KV3312FA | KV5102MAE | KV5204MA | KV5312FAE |
| SW725A-R3 | KV3204MA | KV3312FAE | KV5104MA | KV5204MAE | KV5316FA |
| SW725AE-R3 | KV3204MAE | KV3316FA | KV5104MAE | KV5208SA | KV5316FAE |
| | KV3208SA | KV3316FAE | KV5104FA | KV5208SAE | |

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

| | | | | |
|---|---|---|---|---|
| SW720C-R3 | KV5200C | RMK19M | RMK23M | RMK24M |
| KV5000C | KV5300C | RMK19S | RMK23S | RMK24S |
| KV5100C | | RMK19F | RMK23F | RMK24F |

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# AND
# CANADIAN DEPARTMENT OF COMMUNICATIONS
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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 the Canadian Department of Communications.*

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

## 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 parato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

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

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

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

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

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

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

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

18. Servicio por personal calificado deberá ser provisto cuando:

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

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

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

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

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

# Contents

**Chapter**                                                                                                                    **Page**

# Contents (continued)

# 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 —** FCC Part 15 Subpart J Class A, DOC Class/MDC classe A; 230-VAC models: CE

**Standards —** PC (SW72x, KV31xx, KV51xx) and multiplatform (KV30xx, KV50xx) models:
　　With original Serv cabling: VGA (color or monochrome/ page white) video;
　　With original Serv cabling (minimal) or coaxial cabling (recommended): SVGA video;
　　With coaxial cabling: XGA (color or monochrome) video;
Sun (KV32xx, KV52xx) and multiplatform (KV30xx, KV50xx) models:
　　Sun video (coaxial cable required);
Macintosh (KV33xx, KV53xx) and multiplatform (KV30xx, KV50xx) models:
　　Mac video (with either original Serv cable or recommended coaxial cable)

**Interfaces —** RS-232 port (all models): Proprietary variant of TIA RS-232 using RJ-12 ("6-wire RJ-11") connectors, DTE;
CPU and MONITOR/KEYBOARD/MOUSE ports:
　　PC (SW72x, KV31xx, KV51xx) models:
　　　　Proprietary composite of IBM PC/AT or PS/2 keyboard, RS-232 or PS/2 mouse, and video (standards listed above);
　　Sun (KV32xx, KV52xx) models:
　　　　Proprietary composite of Sun keyboard, video, and mouse;
　　Macintosh (KV32xx, KV52xx) models:
　　　　Proprietary composite of ADB keyboard and mouse and Mac video;

**Interfaces (continued)—**    CPU and MONITOR/KEYBOARD/MOUSE ports (continued):

Multiplatform (KV30xx, KV50xx) models:
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 1280 x 1024 noninterlaced;
Refer to **Section 4.1.3**

**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:

40 ft. (12.2 m) of total original Serv cable from the keyboard, monitor, and mouse to any CPU, including up to 5 ft. (1.5 m) from any ServSwitch or ServSwitch Ultra to any other Serv unit (submaster) attached to it; or

20 ft. (6.1 m) of coaxial cable—possibly as much as 100 ft. (30.5 m), depending on CPUs—from any ServSwitch or 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 or ServSwitch Ultra to a non-local computer

**User Controls —**    Keyboard commands;

(3) Front-mounted pushbuttons:
"ON/OFF" (power), "+" (switch to next port), and "–" (switch to previous port);

On-screen menu (ServSwitch Ultra and regular ServSwitch with optional overlay board SW720C-R3 only)

**Indicators —** SW721 and KVxx02 models: (5) Front-mounted LEDs:
(1) [Unit] POWER, (2) SELECT, (2) [CPU] POWER;
SW722 and KVxx04 models: (9) Front-mounted LEDs:
(1) [Unit] POWER, (4) SELECT, (4) [CPU] POWER;
SW723 and KVxx08 models: (9) Front-mounted LEDs:
(1) [Unit] POWER, (8) SELECT, (8) [CPU] POWER;
SW724 and KVxx12 models: (25) Front-mounted LEDs:
(1) [Unit] POWER, (12) SELECT, (12) [CPU] POWER;
SW725 and KVxx16 models: (33) Front-mounted LEDs:
(1) [Unit] POWER, (16) SELECT, (16) [CPU] POWER

**Connectors —** All rear-mounted;
All models:
(1) 5-pin DIN female: POWER;
(1) RJ-12 ("6-wire RJ-11") female: RS-232;
(1) DB25 female: MONITOR/KEYBOARD/MOUSE;
SW721 and KVxx02 models: (2) DB25 female: CPU;
SW722 and KVxx04 models: (4) DB25 female: CPU;
SW723 and KVxx08 models: (8) DB25 female: CPU;
SW724 and KVxx12 models: (12) DB25 female: CPU;
SW725 and KVxx16 models: (16) DB25 female: CPU

**Power —** *For 120-VAC, 60-Hz operation:*
Mini (SW721A, SW722A, KVxx02MA, and KVxx04MA)
models:
From wallmount power supply PS023:
Optimal input: 120 VAC, 60 Hz, 100 mA;
Output: 17 VAC CT, 700 mA;
Consumption: Up to 11.9 VA (11.9 watts);
Slimline and full-size (SW723A, SW724A, SW725A,
KV3104FA, KV5104FA, KV510xFA, KVxx12FA, and
KVxx16FA) models:
From wallmount power supply PS018:
Optimal input: 120 VAC, 60 Hz, 100 mA;
Output: 16.5 VAC CT, 1.45 amps;
Consumption: Up to 23.9 VA (11.9 watts);
*For 230-VAC, 50-Hz operation:*
Mini (SW721AE, SW722AE, KVxx02MAE, and
KVxx04MAE) models:
From wallmount power supply PS023E:
Optimal input: 230 VAC, 50 Hz, 60 mA;
Output: 17 VAC CT, 700 mA;
Consumption: Up to 11.9 VA (11.9 watts);

| | |
|---|---|
| **Power (continued)—** | *For 230-VAC, 50-Hz operation (continued):* |
| | Slimline and full-size (SW723AE, SW724AE, SW725AE, KV3104FAE, KV510xFAE, KVxx08SAE, KVxx12FAE, and KVxx16FAE) models: |
| | From wallmount power supply PS018E: |
| | Optimal input: 230 VAC, 50 Hz, 60 mA; |
| | Output: 16.5 VAC CT, 1.45 amps; |
| | Consumption: Up to 23.9 VA (11.9 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 —** | Mini (SW721, KVxx02, and KVxx04M) models: |
| | 1.8" (1U) H x 8.8"W x 4.8"D (4.5 x 22.5 x 12.4 cm); |
| | Slimline (KVxx08S) models: |
| | 1.8" (1U) H x 13.2"W x 4.8"D (4.5 x 35 x 12.4 cm); |
| | Full-size (SW723, SW724, SW725, KV3104F, KV510xF, KVxx12, and KVxx16) models: |
| | 3.5" (2U) H x 13.2"W x 4.8"D (8.9 x 35 x 12.4 cm) |
| **Weight —** | Mini (SW721, KVxx02, and KVxx04M) models: |
| | Net: 2.1 lb. (1 kg); Shipping: 3.8 lb. (1.7 kg); |
| | Slimline (KVxx08S) models: |
| | Net: 3.3 lb. (1.5 kg); Shipping: 5.8 lb. (2.6 kg); |
| | Full-size (SW723, SW724, SW725, KV3104F, KV510xF, KVxx12, and KVxx16) models: |
| | Net: 5.1 lb. (2.3 kg); Shipping: 7.8 lb. (3.5 kg) |

# 2. Introduction

Thank you for choosing a ServSwitch™ or 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—depending on which model you have—you can use one keyboard, monitor, and mouse to access a number of IBM® PC compatible, Apple® Macintosh® compatible, and/or Sun Microsystems® compatible computers, so you can significantly reduce your equipment overhead and end keyboard and monitor clutter.

## IMPORTANT NOTE

**In the remainder of this manual, we will use the term "ServSwitch" to refer to *both* the ServSwitch and the ServSwitch Ultra except where it is necessary to differentiate the two.**

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 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 all models of the ServSwitch:

- Microprocessor-controlled keyboard and mouse switching.

- You can select the desired CPU from keyboard, front panel, or RS-232 port.

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

- 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 also available.

- Full-size 4-, 8-, and 12-port units can be expanded up to 16 ports by installing a 4-Port Expansion Board (see **Appendix F**).

Features exclusive to the PC and multiplatform models:

- 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.)

- Support IBM PC compatible computers.

- Mouse can be PS/2®, Microsoft® serial, PC Mouse® (Mouse Systems®) serial, or serial 8-bit type.

- Support all modes of PS/2 and PC/AT® compatible keyboards.

- Support SVGA and color or monochrome XGA or VGA video at resolutions up to 1280 x 1024 noninterlaced (although all video types except VGA require coaxial or special cables).

Features exclusive to the Macintosh and multiplatform models:

- Support Mac® compatible computers and Apple Desktop Bus™ (ADB™) mice and keyboards.

- Support Apple video, at resolutions up to 1280 x 1024 noninterlaced, over coaxial cables. (You'll need a Mac Adapter for ServSwitch for each CPU that outputs video at resolutions over 640 x 480; see the Note on page 23.)

Features exclusive to the Sun and multiplatform models:

- Support Sun compatible computers, mice, and keyboards.

- Support Sun video, at resolutions up to 1280 x 1024 noninterlaced, over coaxial cables.

Please note that for the multiplatform models, the supported peripheral types will depend on the CPU types. Also, the multiplatform environment requires 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**.

The only difference between the ServSwitch and the ServSwitch Ultra is that the ServSwitch Ultra comes from the factory with on-screen display features. These features can be added to any regular ServSwitch by installing an optional daughterboard, the ServSwitch Overlay Option Board (our product code SW720C-R3; see **Appendix E**). Please call Black Box Technical Support for more details.

## 2.3 The Front Panel

The front panels of the ServSwitch feature 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.
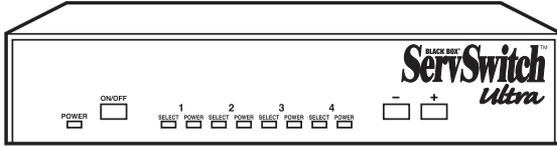


**Figure 2-1. The front panel of a KV5x04M model (mini) 4 to 1 ServSwitch Ultra.**
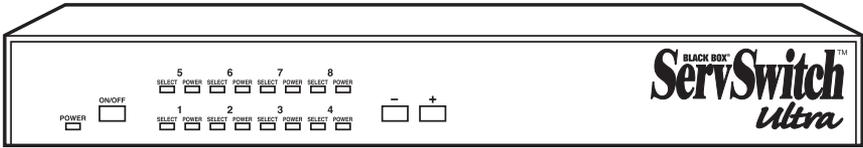


**Figure 2-2. The front panel of a KV5x08S model (slimline) 8 to 1 ServSwitch Ultra.**
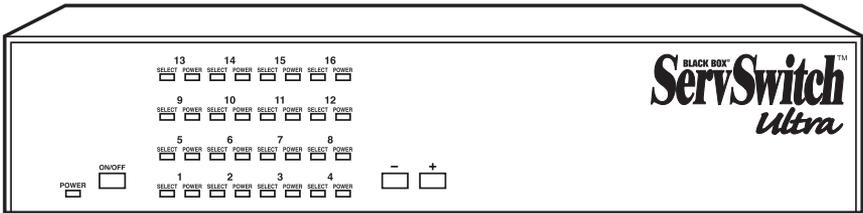


**Figure 2-3. The front panel of a KV5x16F model (full-size) 16 to 1 ServSwitch Ultra.**

**Panel Label**     **Description**

**POWER**     Main Power LED: Lights to indicate that unit is powered ON.

**ON/OFF**     Power Button: Pressing this button turns the unit ON and OFF when the power supply is plugged into the unit and into a working outlet.

**CPU STATUS**     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 (red)**
       Lights if the corresponding port is the currently selected port.

       **POWER (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 full-size chassis has 16 each of these slots. The extra LED slots in the chassis of the 2-port mini and the 4-, 8-, and 12-port full-size models are left blank, but are protected by material mounted inside the chassis.**

**+ (PLUS)**     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.

**– (MINUS)**     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.

## 2.4 The Rear Panel

All cable connections are made at the rear panel of the ServSwitch, as illustrated in Figure 2-4 and described below.
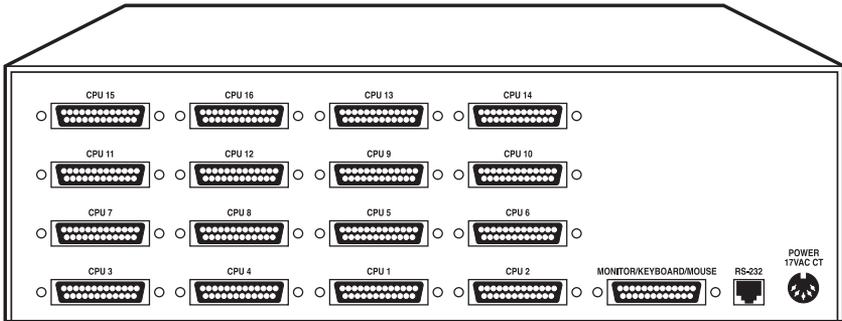


**Figure 2-4. The rear panel of a 16 to 1 ServSwitch (KV3x16F).**

| Panel Label | Connector | Description |
| --- | --- | --- |
| **CPU** *N*<br>[*N* = a number from 1 to either 2, 4, 8, 12, or 16, depending on which model you have] | DB25 F | Connect the sharing computers to these ports with "CPU Adapter Cables." At the ServSwitch 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.<br><br>    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 | 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**. |

<div align="center">

**NOTE**

</div>

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

| Panel Label | Connector | Description |
|---|---|---|
| **MONITOR/ KEYBOARD/ MOUSE** | DB25 F | Connect the shared monitor, keyboard, and mouse to this port using an "MKM Adapter Cable." At the ServSwitch 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 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** | 5-pin DIN F | Connect the ServSwitch's power-supply cord here. This is *not* a keyboard input. Power transformers are available for 110 VAC or 230 VAC. Both have center-tapped output of 17 VAC at 700mA. |

## 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 to your CPUs with one "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 to the shared monitor, keyboard and mouse with a single "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 first Caution notice on page 23 for information about maximum cabling distances.

# NOTES

**IBM PC, Mac, and multiplatform models:**
SVGA (over longer distances), XGA, and high-resolution Mac video place special demands on cabling that the regular MKM Adapter Cables and CPU Adapter 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 first 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.
To share an IBM 9515, 9517, or 9518 monitor on an IBM type or multiplatform Switch, you will need special cabling. Call Black Box for technical support; we can give you a quote on these types of cable.

## 2.6 Equipment Requirements

If the CPUs you will be controlling through your ServSwitch are not all of the same type—especially if your Switch is a multiplatform model and the 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.**
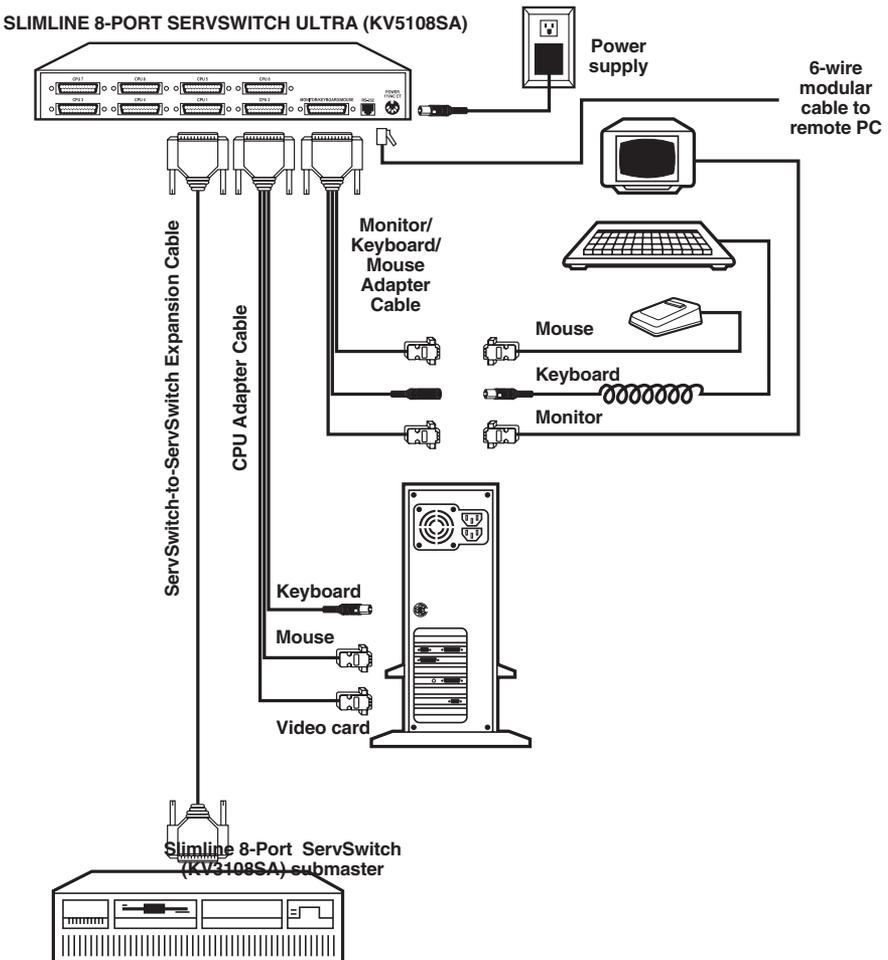
## 3.2 Installation Procedure

This section provides complete instructions for the hardware setup of a single ServSwitch. (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 Switch in a rack, you will need a ServSwitch Rackmounting Kit. For the mini models, 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 RMK19S, RMK23S, or RMK24S respectively. For the full-size models, our product code for a 19", 23", or 24" Kit is RMK19F, RMK23F, or RMK24F respectively. See **Appendix G** for more information.

### 3.2.2 CONNECTING THE MONITOR, KEYBOARD, AND MOUSE

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 first 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 doesn't support dongles at the time of this writing.**

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

2. If your common equipment is IBM type, plug the cables from your shared monitor, keyboard, and mouse into the corresponding connectors on the other ends of the MKM Adapter Cable. If your common 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 MKM cable.

### 3.2.3 CONNECTING CPUS

CPU Adapter 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 keyboard, monitor, and mouse to any given CPU should not 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 to any attached device (keyboard, monitor, mouse, CPU, or submaster). 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 (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 if they are already ON; if you accidentally do so, see **Section 4.3.7** 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 doesn't supply but the Mac Adapter does.**

## CAUTION!

**Do _not_ attach docking stations for ThinkPad® or other portable computers, no matter what type or make, to the ServSwitch. At the time**

**of this writing, it does not support docking stations; your Serv system might not function properly if any are attached.**

**Even if you connect your ThinkPad directly (rather than through a docking station) to the keyboard, video, and mouse feeds from the ServSwitch, it still won't work, because the ServSwitch currently supports only "stream mode" (continuous) mouse data but the ThinkPad has to see "prompt mode" (burst-on-request) mouse data.**

### 3.2.4 CONNECTING SUBMASTERS (OPTIONAL)

To connect a submaster Serv type switch (ServSwitch, ServSwitch Ultra, Matrix ServSwitch, ServManager, etc.) to a master ServSwitch, 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 PC-only or multiplatform master Switches (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

1. Making sure that the connected CPUs and any connected submasters are OFF (powered down), take the output cord of the ServSwitch'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 (115 VAC) or its input cord (230 VAC) into a working outlet.

2. Push the ON/OFF button on the front of the ServSwitch to power it up.

3. Power up the connected CPUs and any connected submasters one by one, giving each one time to boot completely before turning ON the next one. When the CPUs are powered up after the ServSwitch, the Switch emulates all keyboard and mouse functions for automatic boot-up, although (for PC-only and multiplatform Switches) you might have to issue the Mode command **M***n* (see **Section 4.3.7**) to get proper keyboard and mouse communication.

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

**3.2.6 SWITCHING FROM THE KEYBOARD**

Your ServSwitch 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 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]), 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 Systems (IBM and Multiplatform Models Only)

In a normal cascaded ServSwitch system, the shared monitor(s), keyboard(s), and mouse (mice) are directly attached to one or more "master" Serv-Switches, while all the CPUs are indirectly attached through "submasters" (subsidiary ServSwitches, ServSwitch Ultras, 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. Do not try to cascade Apple only or Sun only ServSwitches. At this time 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 multiplatform ServSwitch or ServSwitch Ultra submasters, make sure that you have those submasters set for the keyboard and mouse type ([CTRL] M*xx* [ENTER]) you're using, and make sure that those settings are saved in the submasters' NVRAM ([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 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 the next page:

- Connecting one 4-port submaster Serv unit to a 4-port master ServSwitch (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 (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 28: Connecting two 4-port Matrix ServSwitch submasters to an 8-port ServSwitch 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 Ports, Width, and Units properly on the master unit; see **Sections 4.3.8** through **4.3.10**.)

### 3.3.1 CABLE REQUIREMENTS FOR EXPANSION

To connect submaster units to a ServSwitch, 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 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 cables, the total distance from any CPU to any monitor, keyboard, and mouse should not exceed 40 ft. (12.2 m). Depending on your application, this distance might be less; see **Section 4.1.3**.
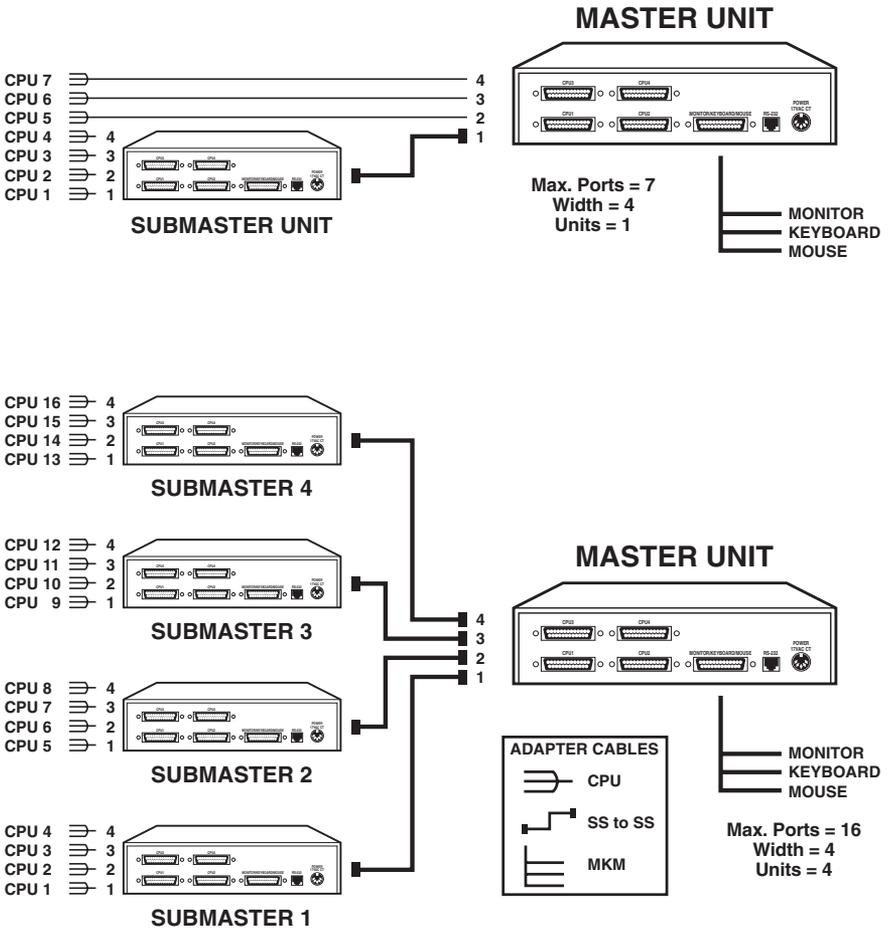
**Figure 3-2. Basic ServSwitch cascading.**

- If you use coaxial cables, the maximum recommended distance from the ServSwitch to the attached monitor, keyboard, and mouse is 20 ft. (6.1 m) with typical monitors and video resolutions, but see the first Caution notice on page 23. For typical CPUs, this is also the maximum recommended distance from any submaster to any attached CPU. Depending on your application, this distance might vary; see **Section 4.1.3**.

- The distance between any ServSwitch and any submaster plugged into one of its ports must not exceed 20 ft. (6.1 m) of original Serv cable. For coaxial cable, the maximum recommended distance is 20 ft. (6.1 m), but see the first Caution notice on page 23.

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

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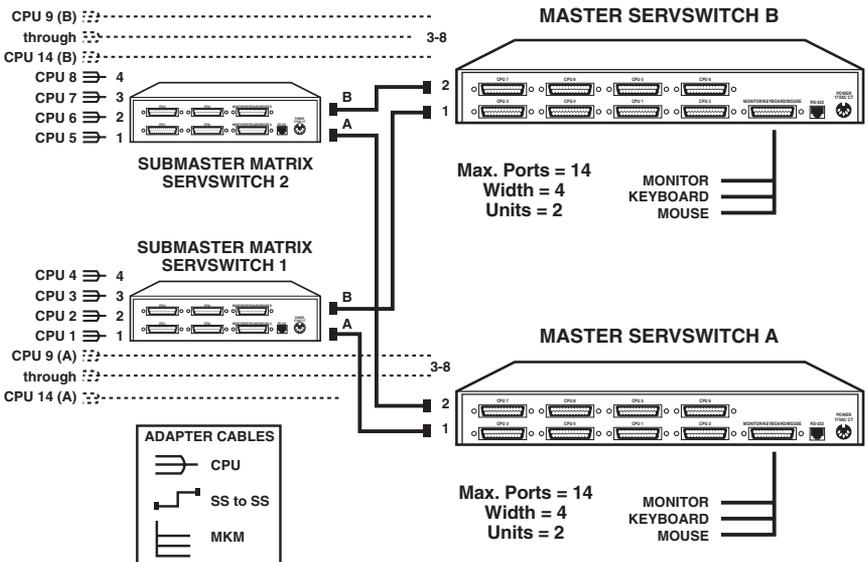


**Figure 3-3. Cascading with Matrix ServSwitch submasters.**

- 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.

- If you are attaching more than one submaster to a slimline or full-size master ServSwitch, we strongly recommend that all of the submasters have the same number of ports. This is because the Switch's Width command/parameter—the value it uses to calculate how many ports each attached submaster has (see **Section 4.3.9**)—is *global* rather than *submaster-specific*. In other words, a master ServSwitch 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, and then set Width to 8 (and Units to 2 and Max Ports to 20—see **Sections 4.3.8** and **4.3.10**), 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.

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).

6. 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.

# NOTE

**In the next three steps, "[CTRL]" represents pressing and releasing the left Control Key, "[ENTER]" represents pressing and releasing the Enter or Return Key, and "*xxx*" represents a number consisting of one to three ASCII digits.**

7. Set each master's Maximum Ports, Units, and Width values so that the master can scan correctly and properly control the interplay of the submaster units. You can do this with these keyboard commands (see **Sections 4.3.8** through **4.3.10**):

   • The Units command, to tell the master how many submasters there are: `[CTRL] U`*xxx* `[ENTER]`

   • The Width command, to tell the master how many CPU ports are on each submaster: `[CTRL] W`*xxx* `[ENTER]`

   • The Maximum Ports command, to tell the master the total number of ports available in the system: `[CTRL] P`*xxx* `[ENTER]`

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 4.3.4** through **4.3.7**, **4.3.11**, and **4.3.12**).

9. To save the "Maximum Ports," "Units," and "Width," numbers you entered to the master unit's nonvolatile memory, along with any of the other configuration settings you might have changed, enter the "Keep Settings" command, `[CTRL] K [ENTER]`.

Your cascaded ServSwitch 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 works properly with your equipment.

   **Section 4.2** summarizes the ServSwitch'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's RS-232 port.

## NOTES

**To start any ServSwitch 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 with Your Equipment

### 4.1.1 CPUs

- *IBM and multiplatform models:* Use only IBM PC/AT or PS/2 or 100% compatible machines. The ServSwitch does not support IBM PC/XT™ or compatible machines. It does not support machines that output CGA or EGA video.

- *Apple, Sun, and multiplatform models:* Since the basic hardware design has remained backward-compatible for these CPUs, the ServSwitch supports all Apple and Sun machines.

### 4.1.2 MOUSE AND KEYBOARD

When you power up your ServSwitch 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. Unless it's absolutely necessary, don't disconnect and reconnect a mouse or keyboard from a ServSwitch while the Switch is ON; if you have to do this, issue the Reset command ([CTRL] R—see **Section 4.3.13**) after you reconnect the mouse or keyboard.

Though the ServSwitch 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/Windows 98 have 104 or 105 keys; 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 34), 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 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.

Other concerns:

- The ServSwitch supports a variety of IBM PC type mice; for more details, see **Section 4.3.7**.

- Because the ServSwitch currently only supports "stream mode" (continuous) mouse data but the IBM ThinkPad has to handle mouse data in "prompt mode" (burst-on-request), don't try to attach any ThinkPad computers to the Switch, either directly or through docking stations.

- 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 the base operating system. 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 (with the multiplatform ServSwitches) 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 (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 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 ServSwitch, wait at least three seconds after powering down the Switch before powering it up again, or the keyboard might not reset correctly.

- *IBM and multiplatform models:* The ServSwitch 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 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.

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

## Table 4-1. Keyboard Mapping by the Multiplatform ServSwitches

Generally, the ServSwitch 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 multiplatform Switch maps the more important of these as shown below (see also **Section 4.3.16**).

| 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 | Rt. Alt or Alt Graph | Rt. Alt or Alt Graph | Right Option (alt) |
| Power (○ l) | N/A | Win 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 (◆) |
| Rt. 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 | Control |
| Left Win Start (⊞) | | Left Command (⌘) | Left Command (◆) |
| Left Alt | | Left Option (alt) | Alt |
| Rt. 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) | Rt. Alt or Alt Graph | Rt. Alt or Alt Graph | Alt Graph |
| Right Control | Right Ctrl | Right Ctrl | Compose |
| Power (◁) | N/A | Win App (▤) | 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 4.3.16**).

**4.1.3 MONITOR**

# NOTE

**At resolutions up to 800 x 600, the video quality for most ServSwitch applications will be excellent. At higher resolutions, however, you might see a little fuzziness on your monitor no matter how close to ideal your ServSwitch system is.**

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.

*Multiplatform ServSwitches:* 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 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). The NEC Multisync 5SG is one such monitor, and others are available from NEC, Sony®, CTX®, etc. (However, since these monitors usually have an HD15 video-input connector, you will need a special M/K/M Adapter Cable to use them with Mac or Sun keyboards and mice; the Sun cable is stock product code EHN059, but for a Mac cable you'll have to call Black Box Technical Support for a special quote.) 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 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 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.

Mac systems: You'll need a Mac Adapter for ServSwitch for each CPU that outputs video in a format other than VGA (640 x 480). See the Note on page 23.

The IBM and multiplatform ServSwitches 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 is between the CPU and monitor; in a cascaded application with a ServSwitch 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 systems in which the Mac versions of the original Serv cables (our product codes EHN210 and EHN215) have been installed.

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

| Resolution \ Distance | 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 noninterlaced | 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 |

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 36.) 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 is between the CPU and monitor; if there is a submaster as well, video quality will always be lower.

**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 noninterl. | 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 |

## 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 might be required. Call Black Box for technical support to discuss this option.

One last note of caution about video: The IBM 9515, 9517, and 9518 monitors that come with some PS/2 systems are not normal VGA monitors and require special cabling in order for video to be correctly sized and synchronized. Call Black Box for technical support if you want to use one of these monitors.

## 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. 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 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 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'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 "+" button on the ServSwitch'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 "−" button on the ServSwitch's front panel.) |
| Scan ON | `[CTRL]` `S` | Turns Scan mode ON, causing the ServSwitch to start scanning sequentially from the current port through the remaining ports and then begin again at Port 1. |

| 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).<br>    Note: Scan can also be stopped by entering a Select Port command. |
| Keep Settings | `[CTRL] K` | Enter this command after you enter any of the following eight commands (it saves new settings to nonvolatile memory): |
| Set Scan-Delay Time | `[CTRL] T`*xx* `[ENTER]`<br>(*xx* = delay in seconds from 1 to 15) | Sets the time, in seconds, that the ServSwitch will pause at each port when scanning. |
| Set Screen Saver's Delay Time | `[CTRL] V`*xxx* `[ENTER]`<br>(*xxx* = delay in seconds) | Sets the time of inactivity, in seconds, after which the ServSwitch 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.) |
| Set Keyboard or Mouse | `[CTRL] M`*xx* `[ENTER]`<br>(*xx* = a 1- or 2-digit number from 1 to 32) | *IBM/multiplatform only:* Tells the ServSwitch either the type of shared keyboard you're using, the keyboard mode expected by the CPU on the currently selected port, the type of shared mouse you're using, or the mouse type expected by the CPU on the given port. Issue this command to force a port to operate in a given mode, or before any time you attach an already-booted CPU to the ServSwitch. |
| Set Maximum Number of Ports | `[CTRL] P`*xxx* `[ENTER]`<br>(*xx* = a 1- to 3-digit number from 2 to 256) | Tells the ServSwitch the total number of ports to which devices are (or will be) connected. Issue this command when you're not using all of the ports on a unit with 4 or more ports, or when you cascade units. |
| Set Width of Submasters | `[CTRL] W`*xxx* `[ENTER]`<br>(*xxx* = a 1- to 3-digit number from 2 to 255) | *IBM/multiplatform only:* Tells the ServSwitch how wide all of the attached submasters are (that is, how many CPU ports each submaster has). |
| Set Units | `[CTRL] U`*xxx* `[ENTER]`<br>(*xxx* = a 1- to 3-digit number from 0 to 255) | *IBM/multiplatform only:* Tells the ServSwitch how many submasters are attached to it. |

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

| Command | Keystroke Sequence | Description |
|---------|--------------------|-------------|
| Set Keyboard Typematic | `[CTRL] A`*xxx* `[ENTER]` (*xxx* = a decimal value from 0 to 127) | *IBM/multiplatform only:* Sets the keyboard typematic (automatic key-repeat) function of the currently selected CPU. This command works only with IBM PC type CPUs that have standard keyboards and CMOS that allows users to program the typematic function. |
| 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 4.3.12**). |
| 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 ServSwitch 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 4.3.14**). |
| Identify ROM | `[CTRL] I` | Causes the ServSwitch 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 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 (or ServSwitch with Overlay Option Board installed) 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 (or ServSwitch with Overlay Option Board installed) to display its on-screen overlay menus. |
| Activate Select Window | `[CTRL] [ESC]` | Causes the ServSwitch Ultra (or ServSwitch with Overlay Option Board installed) to display its "computer select window" (see **Section 5.5**). |

## 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 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 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 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'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's front panel by pushing the button labeled "+" or "−" respectively. 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 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 4.3.5**.) To stop scanning, press and release [CTRL], then press [X]; you can also stop a scan by entering a Select Port command. ServSwitch letter commands are not case-sensitive: You can enter upper- or lower-case letters.

### 4.3.4 KEEP SETTINGS

The Keep Settings command saves the current state of the ServSwitch's keyboard-selectable settings 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]. The eight keyboard-selectable settings are described in the next eight subsections.

### 4.3.5 SET SCAN-DELAY TIME

Issue the Set Scan-Delay Time command to set the time, in seconds, that the ServSwitch will pause at each of the CPU ports when it's scanning them. The factory-default setting is 5 seconds. To set a different delay time, press and release the left Control key, type [T] followed by the new delay time in seconds (1 to 15), and press [ENTER]. Issue the Keep Settings command after you enter this command.

If you issue this command with an argument of zero, the ServSwitch will set the scan-delay time to the default value most recently saved in NVRAM.

### 4.3.6 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 is in the Screen-Saver state, all of its SELECT LEDs will be OFF.**

### 4.3.7 SET KEYBOARD/MOUSE (IBM AND MULTIPLATFORM REGULAR SERVSWITCHES ONLY)

If your ServSwitch is a Macintosh only or Sun only model, this command is ignored (the keyboard and mouse choices are "locked in"), because the Apple and Sun keyboard and mouse interfaces are consistent across the board and do not vary from model to model. You don't have to enter this command on a ServSwitch Ultra or a regular ServSwitch with an Overlay Board installed, because setting the keyboard and mouse can be done easily through the on-screen display (see **Sections 5.2.1**, **5.2.2**, **5.3.2**, and **5.3.3**).

For PC only or multiplatform regular ServSwitches in their original state, howver—unless you have the default setup (104/105-key keyboard, PS/2 or PS/2 wheel mouse, all CPUs IBM PC type and set for Mode 2 keyboard input and PS/2 mouse input)—you might have to specify your keyboard type, your mouse type, and/or the types of keyboard and mouse interfaces required by each of your CPUs. On the *output* side of the ServSwitch, PCs can have any of three different keyboard modes and several types of mouse interfaces; each of the ServSwitch's CPU ports can be configured for any mix of keyboard mode and supported mouse interface. (The multiplatform Switch does not support using a keyboard from one platform with a mouse from a different platform: for example, an Apple keyboard with a PC or Sun mouse.) On the *input* side, the ServSwitch can accept input from any of three types of PC mice and either a standard multipurpose 101/102-key PC keyboard or a 104/105-key Windows 95/Windows 98 PC keyboard.

The following subsections explain keyboard types and modes and mouse interfaces in more detail, and also describe the command procedure and possible settings.

### 4.3.7.A Keyboard Types (IBM Type Keyboard Only)

At the time of this writing, there are two basic types of keyboards most commonly used with IBM PS/2 and PC/AT compatible computers. The older type, standard for several years, has either 101 or 102 keys depending on which country and language it was designed for. The newer type, originally developed by Microsoft, is designed for use with machines running Windows 95 or Windows 98; it has three additional Windows specific keys (the left and right Start keys and the App [application] key), for a total of 104 or 105 keys.

The newer 104/105-key keyboard is now the default shared-keyboard setting for the ServSwitch. Send a Set Keyboard/Mouse command to change the shared-keyboard type if you are using a 101/102-key type shared keyboard, or if you have been using a 101/102-key keyboard and are swapping it out for a 104/105-key keyboard. (If you have a Sun or Apple keyboard attached to the ServSwitch and you send it a Set Keyboard/Mouse command that attempts to change the shared-keyboard type, the command will be ignored.)

### 4.3.7.B Mouse Types (IBM Type Mouse Only)

IBM compatible CPUs can use several types of mice as well. The ServSwitch supports three of these (on both its input and output sides): PS/2 (including PS/2 wheel), Microsoft serial, and PC Mouse (Mouse Systems).

PS/2 mice have a 6-pin mini-DIN connector; their interface is similar to that of the PS/2 keyboard. The advantage of the PS/2 mouse is that its I/O circuitry is built onto the CPU's motherboard and doesn't occupy any of the CPU's serial ports. PS/2 mice come in two varieties: an older style that has only buttons, and a newer "wheel mouse" style—developed by Microsoft and introduced with its IntelliMouse™—that has a clickable wheel (instead of a center button) between its left and right buttons; you can use this wheel to scroll through menus (among other things). PS/2 is the factory-default shared-mouse setting for the ServSwitch.

Serial mice all use the TIA RS-232 serial standard, implemented on either a DB25 or a DB9 connector, and communicate with the PC at a data rate of 1200 bps. There are two common serial-mouse types: Microsoft serial mice use a 3-byte/7-bit protocol; unlike the other two types of mice you can choose from, they do not support a third button. PC Mouse (also known as Mouse Systems) serial mice use a 5-byte/8-bit protocol; many lower-cost mice have a switch that you can set for either Microsoft compatible operation or PC Mouse compatible operation.

The Switch will always autodetect the presence of a PS/2 mouse (with or without the wheel), and it will autodetect if you change from a PS/2 mouse to a Microsoft serial mouse. Send a Set Keyboard/Mouse command to change the Switch's shared-mouse type setting if you are using a PC Mouse serial mouse, or if you

change from a PC Mouse to a Microsoft serial mouse. (If you send the ServSwitch a Set Keyboard/Mouse command that attempts to change the shared-mouse type, but the shared mouse is Sun or Apple type or the Switch can autosense that the mouse is otherwise not of the type you've indicated, the Switch will ignore the command.)

### 4.3.7.C Keyboard Modes

Keyboard "modes" are electrical signaling protocols that determine how a powered IBM compatible CPU and keyboard interact. A CPU and keyboard must use the same mode in order to work with each other. Of the three standard IBM keyboard modes currently in use, mode number 2 is the one used by the vast majority of CPUs. It is also the default state of all 101-, 102-, 104-, and 105-key keyboards. Mode 1 is used primarily by certain PS/2 CPUs. Mode 3 is used by RS/6000® CPUs, some other UNIX® based computers, and certain specialized servers.

The ServSwitch supports all three of these modes: As it receives signals from the keyboard, it sends them to the currently selected CPU by emulating a keyboard of the appropriate mode for that CPU; as it receives signals for the keyboard from the currently selected or scanned CPU, it sends them to the keyboard by emulating a CPU of the appropriate mode.

Most CPUs that use keyboard mode 1 or 3 send a "mode command" to the keyboard at power-up, to put the keyboard in the proper mode. ServSwitches (even submaster units) can use these commands to automatically detect each such CPU's keyboard mode when you turn on the CPU *after* it has been cabled to the Switch. However, unless you issue a Keep Settings command, the ServSwitches will forget the modes they have detected when they are turned OFF, then default to each port's most recently saved setting when they're turned ON again.

The ServSwitch can't detect the CPU's keyboard mode if your CPU doesn't send "mode commands" (most CPUs that use mode 2 fall into this category) or the CPU is already ON when you connect it to the Switch (it shouldn't be). In these situations, the ServSwitch tries to use the keyboard-mode setting stored in its nonvolatile memory for that port. The factory default is mode 2 for all ports. Send a Set Keyboard/Mouse command to change the keyboard mode for a port if:

- the CPU that is or will be on that port is a Sun or Mac or uses mode 1 or 3;

- it uses mode 2, but the default setting of the port you want to connect it to has been changed; or

- you don't know which mode the CPU uses or the port is set for, but the keyboard's behavior makes you suspect that the port's setting is wrong.

### 4.3.7.D Mouse Interfaces

IBM compatible CPUs can have several types of mouse interfaces. The ServSwitch supports three of these: PS/2 (including PS/2 wheel), Microsoft serial, and PC Mouse (Mouse Systems); see **Section 4.3.7.B**. PS/2 is the factory-default mouse-interface setting for all of the CPU ports of PC-only and multiplatform ServSwitches. Send a Set Keyboard/Mouse command to change the mouse interface for a port if that CPU requires mouse input other than PS/2, or if you've had the port set for a different mouse interface but are swapping in a CPU that requires PS/2 mouse input. If you send the Switch a Set Keyboard/Mouse command that attempts to change the mouse interface of a CPU port that is still set for Sun or Mac keyboard input, the command will be ignored; you must change the keyboard-mode setting first.

Note that the ServSwitch currently supports streaming or continuous mouse data only. It cannot support computers such as the IBM ThinkPad that require bursty mouse data.

*4.3.7.E Command Procedure*

On the *input* side of the ServSwitch, you might need to issue this command twice—once to set the keyboard type and once to set the mouse type. You can enter these global input-side commands at any time.

On the *output* side of the ServSwitch, selecting the Apple or Sun keyboard/mouse combo for the *currently selected CPU port* only requires a single command; selecting an IBM type keyboard mode and mouse interface for a CPU requires two commands—one for the keyboard mode and one for the mouse interface. (These output-side commands only affect one CPU port at a time; enter them only when that port is selected.) On the multiplatform ServSwitch, when you issue a command to change from an Apple or Sun keyboard to an IBM type keyboard, the Switch will automatically set the mouse interface to PS/2; until you make this keyboard change, any attempt to change from an Apple or Sun mouse to an IBM type mouse will be ignored.

To set the shared-keyboard type or shared-mouse type for the *whole ServSwitch system*, or the keyboard mode or mouse interface for the *currently selected port*, take these steps:

- Press and release the left Control key, then type [M];

- Referring to Table 4-5 on the next page, press the numeral key(s) corresponding to the code of the keyboard or mouse type you want; and

- Press [ENTER].

For example, to indicate a 101/102-key shared keyboard and Mouse Systems serial shared mouse, you would type [CTRL] [M] [2] [0] [ENTER] followed by [CTRL] [M] [3] [1] [ENTER]. Or, to choose Mode 2 keyboard with a Microsoft serial mouse for the current CPU port, you would type [CTRL] [M] [2] [ENTER] followed by [CTRL] [M] [7] [ENTER].

After you enter these commands, enter the Keep Settings command to save the mode setting in NVRAM, so that the new setting becomes the default value (preserved during power-down and reloaded at power-up).

Before you can set the keyboard mode or mouse interface of the currently selected port on a submaster unit, you have to isolate it from the rest of the system. (Note that this step might be unnecessary; the submaster should be able to automatically detect the keyboard mode when you turn ON CPUs that use mode 1 or 3, and mode 2—used by most PCs—is the default keyboard mode of the IBM and multiplatform ServSwitches.) First disconnect the submaster from the master, plug a keyboard into the submaster's MONITOR/

KEYBOARD/MOUSE port (this will require an MKM Adapter Cable), and select the port as if the submaster were a single unit. Then issue the Set Keyboard Mode and Keep Settings commands as described in the previous paragraphs. Unplug the keyboard and reconnect the submaster to the master Serv unit. The port's keyboard mode should now be properly configured.

If most or all of the CPUs you'll be connecting to your ServSwitch system use a keyboard mode other than 2 and a mouse type other than PS/2, you might want to change the defaults of the attached CPU ports at installation time. This is because when power outages occur, the CPU ports will return to their default keyboard mode when the power comes back on. (The same thing applies to the shared keyboard and mouse; if they are other than factory-default type, you will probably want to change the defaults at installation time.)

**Table 4-5. Keyboard-Mode and Mouse-Interface Codes**

| Code | Affects | Selects |
| --- | --- | --- |
| 1 | CPU | IBM PC keyboard mode 1 |
| 2 | CPU | IBM PC keyboard mode 2 |
| 3 | CPU | IBM PC keyboard mode 3 |
| 4 | CPU | Apple keyboard and mouse |
| 5 | CPU | Sun keyboard and mouse |
| 6 | CPU | PS/2 mouse |
| 7 | CPU | 2-button Microsoft serial mouse |
| 9 | CPU | 3-button PC Mouse (Mouse Systems) serial mouse |
| 20 | Global | 101/102-key PC shared keyboard |
| 21 | Global | 104/105-key (Win 95/Win 98) PC shared keyboard |
| 30 | Global | PS/2 or PS/2 shared mouse |
| 31 | Global | 2-button Microsoft serial shared mouse |
| 32 | Global | 3-button PC Mouse (Mouse Systems) serial shared mouse |

**4.3.8 SET MAXIMUM PORTS**

Use this command to tell a ServSwitch the total number of ports in its system (on that Switch and all attached submasters) to which devices are or will be connected. This allows the scan function to cycle correctly with CPUs connected to more or fewer ports than the factory default for this option, which (except for the 2-port models) is the total number of ports on the ServSwitch ("4" for a 4-port unit, "8" for an 8-port, etc.). (The factory-default Maximum Ports for 2-port units is "4.") Although this command is used primarily for cascading, it can also be used to enable only some of the ports of a single ServSwitch with 4 or more ports.

To issue the Set Maximum Ports command to a single or master ServSwitch (not to any submasters), press and release the left Control key, type [P] followed by the total number of ports accessible to that Switch (from 1 to 3 digits), and press [ENTER]. To save the new setting, issue the Keep Settings command after you issue this command.

Maximum Ports can be set to any value from 2 to 256. We don't recommend attaching submasters with different numbers of ports to the same ServSwitch; if you do, you might have to count ports that do not actually exist (see **Section 3.3.2**). Also note that if you are sharing Matrix ServSwitch submasters between two ServSwitch masters in your system, the Maximum Ports value might have to be set differently for each master.

### 4.3.9 SET WIDTH OF SUBMASTERS (IBM AND MULTIPLATFORM MODELS ONLY)

Use this command to tell an IBM only or multiplatform ServSwitch master how "wide" your submasters are (that is, how many ports each of them has). If your submasters are all 4-port models, set the Width to 4; if they are all 8-port models, set the Width to 8; and so on.

Because initial configuration and reconfiguration would be complex and time-consuming otherwise, Width is an all-or-nothing proposition for the ServSwitch: One Width value is used for every port. Because this is true, we strongly recommend that all submasters you attach to a master ServSwitch be the same size. If you must attach different-sized submasters, please recognize that you probably either will be unable to use some ports or will have to account for nonexistent ports when you calculate port numbers and when you scan. See **Section 3.3.2**.

Figure 4-1 on the next page is an illustration of why ServSwitches need to know this value. Without a number for Width—even assuming that Units is set correctly to 4—if you were to select CPU 7 on either Switch, they would not know whether CPU 7 was attached to the submaster on port 4, the one on port 2, or (though an example of this isn't shown) the one on port 1. With Width, the ServSwitch knows to switch to port 4 and send the "switch to port 1" command if Width is 2, or to switch to port 2 and send the "switch to port 3" command if Width is 4.

The default setting for Width is 16. To issue the Set Width of Submasters command for a ServSwitch (which you may do at any time), press and release the left Control key, type [W] followed by the number of ports on the attached submasters (from 1 to 3 digits), and press [ENTER]. Enter the Keep Settings command after you enter this command. Width can be set to any value from 2 to 255, but Width values higher than 16 (allowed in order to support future expansion capabilities) might cause the ServSwitch to behave unpredictably.

❶

CPUs

1  2    3  4    5  6    7  8

2-Port Matrix
ServSwitches

Multiplatform
ServSwitch

Multiplatform
ServSwitch

9
Sun
CPU

9
Mac
CPU

WIDTH = 2

❷

CPUs

1  2  3  4   5  6  7  8   9  10  11  12   13  14  15 & 16:

Empty
Slots

4-Port Matrix
ServSwitches

Multiplatform
ServSwitch

Multiplatform
ServSwitch

17
Sun CPU

17
Mac CPU
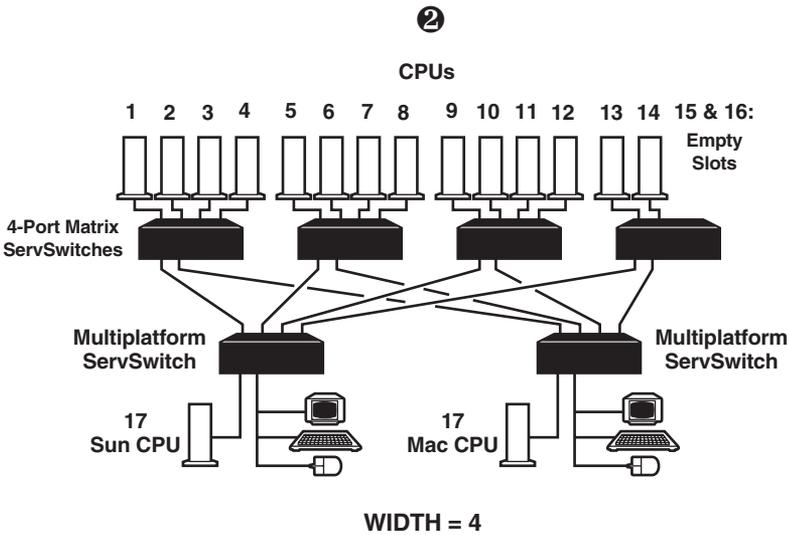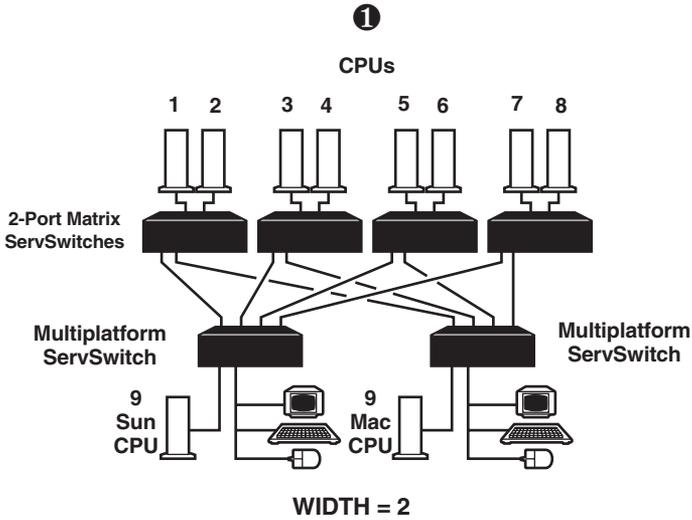
WIDTH = 4

**Figure 4-1. Alternative configurations which the ServSwitch needs Width to resolve.**

### 4.3.10 SET UNITS (IBM AND MULTIPLATFORM MODELS ONLY)

Use this command to tell an IBM only or multiplatform ServSwitch master how many submasters (as opposed to CPUs) are directly attached to it. It doesn't matter what kind of Serv device the submaster is. For example, if you were to take an 8-port ServSwitch and directly attach three other ServSwitches, a Matrix ServSwitch, a ServManager, and two CPUs, the master ServSwitch would have five submasters on it, so you would set Units to 5.

## CAUTION!

**We strongly recommend that you do not attach submasters of different Serv types to a master ServSwitch. If you must do so, make sure that all of the CPUs attached to each such submaster use the same type of keyboard and mouse input.**

ServSwitches use the Units value to find CPU ports. If you select a CPU that is directly attached to the ServSwitch, the Switch can simply switch to that CPU port. However, if you select a CPU attached to a submaster, the ServSwitch has to switch to the submaster's port and issue switching commands to the submaster. The Units setting is the only way it knows where, for example, CPU 18 is, and how to go about accessing that port.

Figure 4-2 on the next page shows a typical pair of alternatives that the ServSwitch can't resolve properly unless Units is set correctly. The ServSwitch in the diagram can't tell merely from its hardware connections how many submasters it is attached to. Without a number for Units—even assuming that Width is set correctly to 4—if you were to select CPU 7 on that Switch, it would not know whether CPU 7 was attached to a submaster on port 2 or directly attached on port 4. With Units, the ServSwitch knows to switch to port 4 if Units is 1 or to switch to port 2 and send the "switch to port 3" command if Units is 2.

The default value for Units is 0. To set Units for a ServSwitch (which you may do at any time), press and release the left Control key, type [U] followed by the number of submasters (from 1 to 3 digits), and press [ENTER]. Enter the Keep Settings command after you enter this command. Units can be set to any value from 0 to 255, but Units values higher than the number of ports on your ServSwitch (allowed in order to support future expansion capabilities) might cause the ServSwitch to behave unpredictably.

Please note that if you are sharing Matrix ServSwitch submasters between two ServSwitch masters in your system, and especially if you have submasters of other types attached to one or both of the masters, the Units value might have to be set differently for each master.

If you are having difficulty switching between ports or scanning, and one or more of your CPUs are receiving spurious data, check the Units setting of the ServSwitch you are using; you are probably seeing misdirected switching commands that the Switch thinks it is sending to submasters.

➊

➋

CPUs

1 2 3 4

**Submaster ServManager**

CPUs

5 6 7

**Master ServSwitch**

UNITS = 1

CPUs

1 2 3 4

CPUs

5 6 7

**Submaster ServSwitches**

**Master ServSwitch**
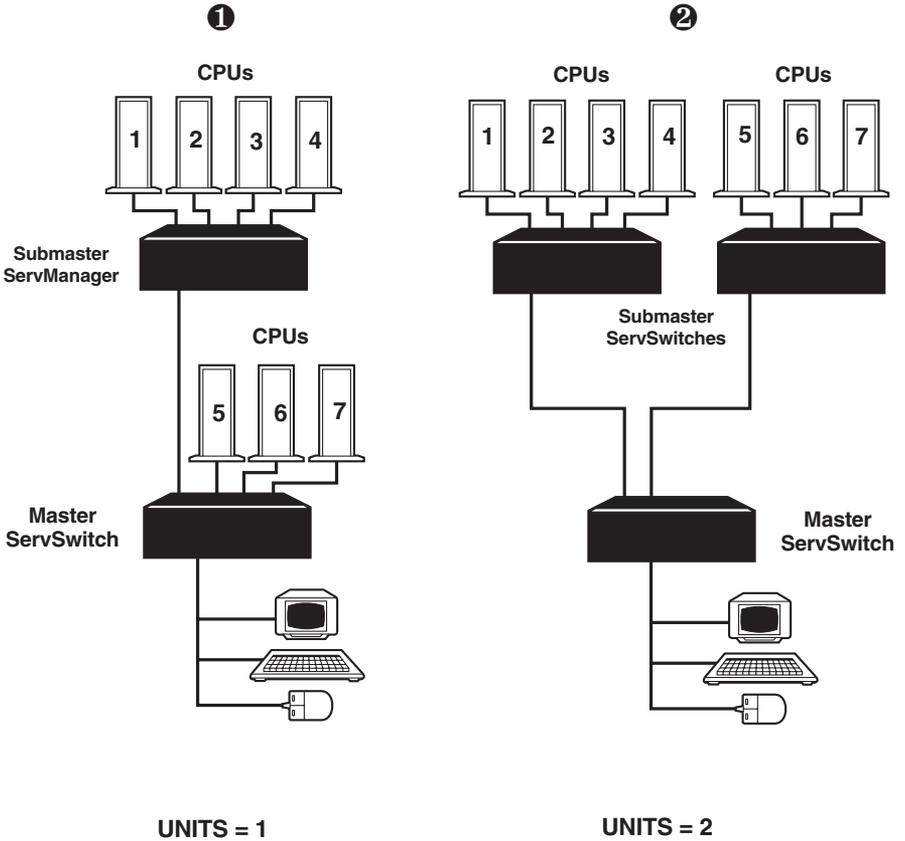
UNITS = 2

**Figure 4-2. Alternative configurations which the ServSwitch needs Units to resolve.**

**4.3.11 SET KEYBOARD TYPEMATIC (IBM AND MULTIPLATFORM MODEL SERVSWITCHES AND IBM COMPATIBLE KEYBOARDS ONLY)**

Most IBM type keyboards have an internal seven-bit "typematic" setting which governs the way the keyboard responds when you hold a key down to force it to repeat. (Apple and Sun keyboards have no typematic features, so Mac only and Sun only ServSwitches do not support this command at all, and multiplatform Switches with Mac or Sun shared keyboards attached will just ignore it.) The five "low" bits of this setting represent the rate at which the key repeats; the two "high" bits represent the delay after you begin holding down the key before it begins to repeat. Sometimes a keyboard's typematic setting isn't suitable for a given operator or for a given application. To change the shared keyboard's typematic setting, issue the Set Keyboard Typematic command: Press and release the left Control key, type [A] followed by the desired "typematic value," and press [ENTER]. The "typematic value" is the decimal equivalent of the binary seven-bit typematic setting: While the typematic setting = delay bits + rate bits, the typematic value = decimal delay value + decimal rate value (see Table 4-6 below and Table 4-7 on the next page). For example, to set the shared keyboard to register a key 16 times per second after the key has been held down for half a second (typematic value = 7 + 32 = 39), enter [CTRL] [A] [3] [9] [ENTER].

**Table 4-6. Typematic Delay**

| Decimal Value | Binary Bit Values | Delay Before Key Repeats |
|---|---|---|
| 0 | 00[*xxxxx*] | 1/4 second (250 ms) |
| 32 | 01[*xxxxx*] | 1/2 second (500 ms) |
| 64 | 10[*xxxxx*] | 3/4 second (750 ms) |
| 96 | 11[*xxxxx*] | 1 second (1000 ms) |

**Table 4-7. Typematic Rate**

| Decimal Value | Binary Bit Values | Repeat Rate in Keys per Second |
|---|---|---|
| 0 | [*xx*]00000 | 30 |
| 1 | [*xx*]00001 | 26.7 |
| 2 | [*xx*]00010 | 24 |
| 3 | [*xx*]00011 | 21.8 |
| 4 | [*xx*]00100 | 20 |
| 5 | [*xx*]00101 | 18.5 |
| 6 | [*xx*]00110 | 17.1 |
| 7 | [*xx*]00111 | 16 |
| 8 | [*xx*]01000 | 15 |
| 9 | [*xx*]01001 | 13.3 |
| 10 | [*xx*]01010 | 12 |
| 11 | [*xx*]01011 | 10.9 |
| 12 | [*xx*]01100 | 10 |
| 13 | [*xx*]01101 | 9.2 |
| 14 | [*xx*]01110 | 8.6 |
| 15 | [*xx*]01111 | 8 |
| 16 | [*xx*]10000 | 7.5 |
| 17 | [*xx*]10001 | 6.7 |
| 18 | [*xx*]10010 | 6 |
| 19 | [*xx*]10011 | 5.5 |
| 20 | [*xx*]10100 | 5 |
| 21 | [*xx*]10101 | 4.6 |
| 22 | [*xx*]10110 | 4.3 |
| 23 | [*xx*]10111 | 4 |
| 24 | [*xx*]11000 | 3.7 |
| 25 | [*xx*]11001 | 3.3 |
| 26 | [*xx*]11010 | 3 |
| 27 | [*xx*]11011 | 2.7 |
| 28 | [*xx*]11100 | 2.5 |
| 29 | [*xx*]11101 | 2.3 |
| 30 | [*xx*]11110 | 2.1 |
| 31 | [*xx*]11111 | 2 |

### 4.3.12 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'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.

### 4.3.13 RESET

This command, along with the two commands described in the next two sections, comes in handy when certain problems arise. It will reset or refresh your shared equipment. Issue it if (a) your shared keyboard or mouse gets stuck or begins behaving oddly, (b) you need to send mouse data to a CPU that hasn't enabled the mouse (this can happen if you boot up the CPU while the ServSwitch is off or disconnected). To issue the Reset command, press and release the left Control key, then type [R].

If you're using a PS/2 type mouse, don't issue this command to a CPU that doesn't have a mouse driver loaded. Many CPUs will crash if you send them unexpected mouse data.

### 4.3.14 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 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 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.

### 4.3.15 IDENTIFY ROM

Unfortunately, as with all complex equipment, problems might arise with your ServSwitch 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 to send the three-character "*x.x*" 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].

**4.3.16 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 34.) If you absolutely have to use a PC or Mac shared keyboard, you can use this command to cause the ServSwitch 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.

**4.3.17 DISPLAY LABEL (SERVSWITCH ULTRA AND SERVSWITCH WITH OVERLAY BOARD ONLY)**

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].

**4.3.18 ACTIVATE ON-SCREEN MENUS (SERVSWITCH ULTRA AND SERVSWITCH WITH OVERLAY BOARD ONLY)**

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.

**4.3.19 ACTIVATE SELECT WINDOW (SERVSWITCH ULTRA AND SERVSWITCH WITH OVERLAY BOARD ONLY)**

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.

## 4.4 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'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 TIA RS-422/423 signal levels rather than RS-232, a special adapter or interface converter is required to connect them to the ServSwitch'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'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'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 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 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 currenty selected port, in ASCII decimal format, back to the remote computer or terminal as keyboard data. (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.)**

**4.4.3 UPGRADING THE FIRMWARE (FLASH MEMORY)**

The ServSwitch 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 Black Box BBS—call (724) 746-7120. For ServSwitches (both regular and ServSwitch Ultra), filenames will follow these formats: "UxxP.HEX" (for PC-only models), "UxxA.HEX" (Apple only models), "UxxS.HEX" (Sun only models), or "UxxE.HEX" (multiplatform models), where "xx" = the $x.x$ firmware-revision level. Please make sure you get the right file; the ServSwitch will not let you load firmware intended for other models.

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 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 is turned OFF, then turn it ON while holding in both the "+" and "−" buttons on the Switch's front panel. Once the Switch has powered up, release the "+" and "−" 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 "+" 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 "−" 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 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 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 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 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: 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 is turned OFF, then turn it ON while holding in both the "+" and "–" buttons on the Switch's front panel. Once the Switch has powered up, release the "+" and "–" buttons, then the power button. The ServSwitch 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 "+" 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 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 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 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 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 (ServSwitch Ultra and ServSwitch with Overlay Board Installed Only)

## 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.

```
ServSwitch Ultra version U52E          Copyright 1990-1998

Main configuration menu
Configure system
Configure computers
Configure overlay
Exit




Use arrow keys to highlight
selection and press enter
or press escape to exit

View/change keyboard, mouse, expansion, and scanning
```
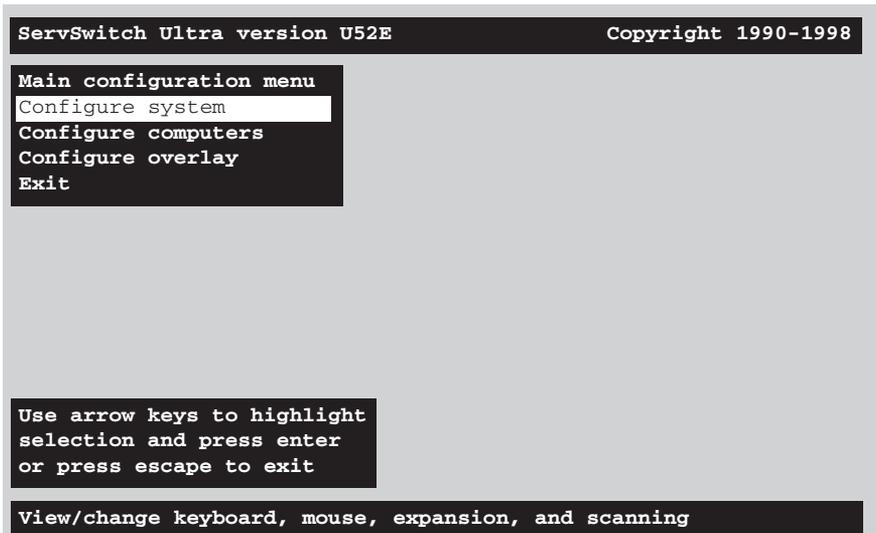
**Figure 5-1. Main configuration menu.**

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
Keyboard     PC 104/105
Mouse             PS/2

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


Detected at power-up from cable, can't be changed here
```
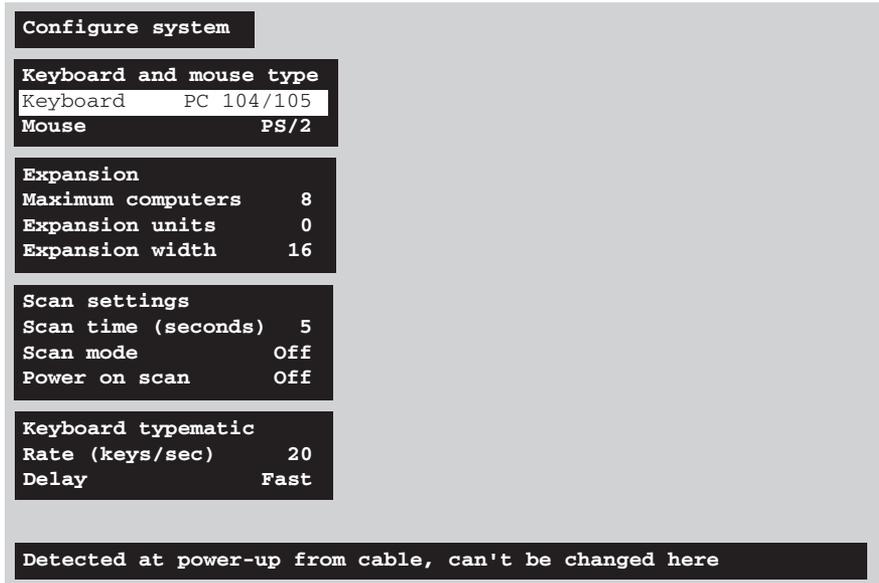
**Figure 5-2. The "Configure system" page.**

### 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, on the PC only and multiplatform Switches, you can switch between "PC 101/102" and "PC 104/105.") Multiplatform ServSwitch Ultras normally autodetect the keyboard type when they are powered up. However, if you power up a multiplatform Switch when no shared keyboard is attached to it, this setting will default to "PC"; 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."

### 5.2.2 CONFIGURE SYSTEM: MOUSE (IBM AND MULTIPLATFORM MODELS ONLY)

For PC-only and multiplatform ServSwitch Ultra models, the factory-default setting for the mouse type is "PS/2." (This option is not available on Apple only and Sun only models, because they *must* use Apple or Sun mice respectively.) 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 only be changed if keyboard is PC type
```
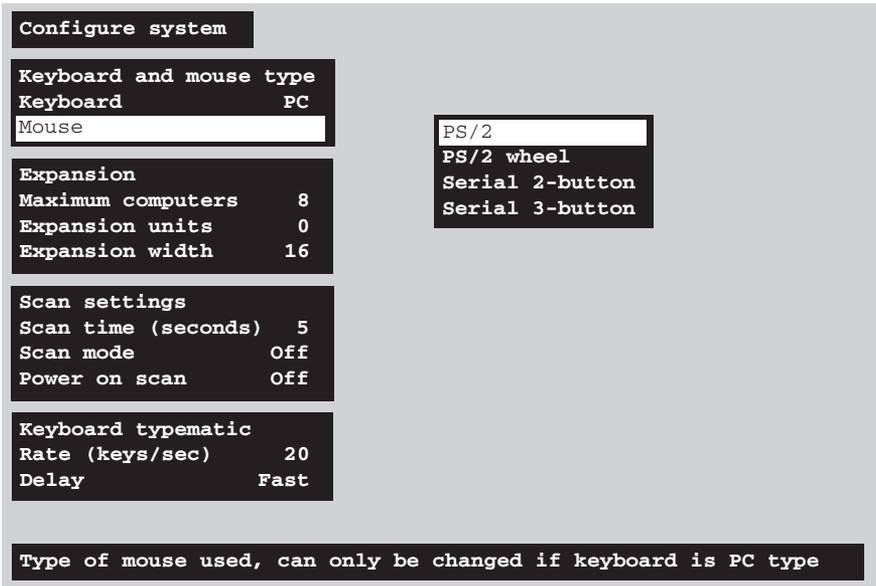
**Figure 5-3. Changing the mouse type.**

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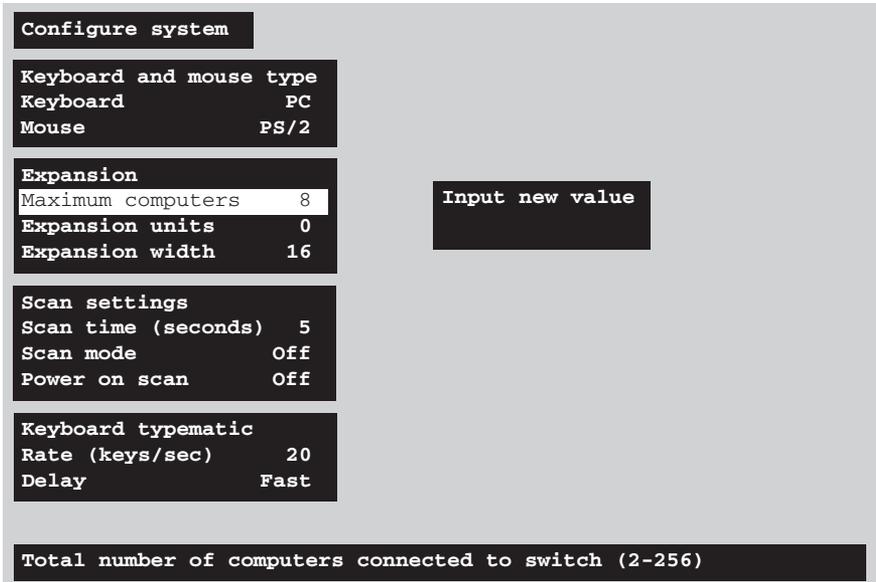


**Figure 5-4. Changing the maximum number of computers.**

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 (IBM AND MULTIPLATFORM MODELS ONLY)**

This setting corresponds to the number of "submaster" (expansion) Serv units that are connected to the main master IBM only or multiplatform ServSwitch Ultra. (This option will appear and can be set for Sun only and Mac only models, but has no purpose, because those models cannot currently be cascaded.) 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.

**5.2.5 CONFIGURE SYSTEM: EXPANSION WIDTH (IBM AND MULTIPLATFORM MODELS ONLY)**

This setting correpsonds to the number of CPU ports that each submaster attached to an IBM only or multiplatform ServSwitch Ultra master has. (This option will appear and can be set for Sun only and Mac only models, but has no purpose, because those models cannot currently be cascaded.) 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.

**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 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]. 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. 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.)

**5.2.9 CONFIGURE SYSTEM: TYPEMATIC RATE (IBM AND MULTIPLATFORM MODELS ONLY)**

This item determines how quickly repeated keystrokes are sent to the attached IBM PC compatible CPUs when a key on the shared keyboard is held down. 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.

The ServSwitch Ultra does not support the typematic function for Apple and Sun CPUs, so this option is not available on Apple only and Sun only models.

**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 AND MULTIPLATFORM MODELS ONLY)**

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

The ServSwitch Ultra does not support the typematic function for Apple and Sun CPUs, so this option is not available on Apple only and Sun only models.

## 5.3 The "Configure Computers" Page

Use this page to set the name, keyboard type, and mouse type for each CPU port. 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.

```
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 (IBM AND MULTIPLATFORM MODELS ONLY)**

Use this field to tell the IBM PC compatible and multiplatform ServSwitch Ultra what type of keyboard mode (PC mode 1, 2, or 3) 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), or mode 3 (PC3). Most regular PCs are mode 2 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. (The PC-only ServSwitch does not support these settings; they will not even appear here. Conversely, only the "Apple"

setting will appear for the Apple only Switch, and only the "Sun" setting will appear for the Sun only Switch.)

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 (IBM AND MULTIPLATFORM MODELS ONLY)

Use this field to tell PC-only and multiplatform models of the ServSwitch Ultra what type of mouse a given CPU uses. (This option is not available on Apple only and Sun only models, because attached CPUs *must* use Apple or Sun mice respectively. 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**.

## 5.4 The "Configure Overlay" Page

Use this page to set the color of the configuration menus, the resolution of ServSwitch-Ultra-generated video, 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), "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. For PC-only Switches, the possible choices—all IBM PC type, using 640 x 480 resolution—are "PC1" (60-Hz refresh rate), "PC2" (72 Hz), and "PC3" (75 Hz). The possible choices for Apple only models are "MAC1" (640 x 480 at 67 Hz) and "MAC2" (832 x 624 at 75 Hz). The possible choices for Sun only models are "SUN1" (1152 x 900 at 66 Hz) and "SUN2" (1152 x 900 at 76 Hz). All of these choices are available on multiplatform models.

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," "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 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.

### 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. 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.

*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.

### 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.

*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.

*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.

### 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 4.3.17**). 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.

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 or ServManager displays the computer label. The choices are: 8x16 modern, 8x16 classic, 16x24 modern, 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 "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 5-10 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 5-10. 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 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 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!

**We strongly recommend that you avoid opening the ServSwitch's cover. If for some reason you need to do this, be very careful to replace each screw in the same hole you took it from, because there are three different lengths of screws involved.**

## 6.1 Restoring Factory-Default Settings

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

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

2. Press and hold in the "**–**" (minus) button on the front of the Switch. While holding in the minus button, push the ON/OFF button on the front of the ServSwitch to power up the Switch.

3. Wait until Port 2's red LED 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. 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 OR A SUBMASTER DOESN'T BOOT, AND YOU GET A KEYBOARD OR MOUSE ERROR

**A.** First make sure your ServSwitch 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. 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 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 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.** For IBM and multiplatform models, the keyboard mode that the currently selected CPU port is set for might not match the mode that the CPU on that port expects. Issue the Set Keyboard/Mouse command to change the port's mode (see **Section 4.3.7**). 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.

**D.** 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.

**E.** 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 (IBM AND MULTIPLATFORM MODELS ONLY)**

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 Ports setting is too low. (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 4.3.8**).

**B.** The Width and/or Units 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 4.3.9** and **4.3.10**).

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

**A.** The Maximum Ports 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 4.3.8**.

**B.** The Width and/or Units 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 4.3.9** and **4.3.10**).

### 6.2.6 YOUR MOUSE DRIVER DOESN'T LOAD (IBM AND MULTIPLATFORM MODELS 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 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 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 AND MULTIPLATFORM MODELS ONLY)

**A.** What type of mouse is it? If it is any other type than those listed as being supported in item A under **Section 6.2.6**, chances are that the ServSwitch 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 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 4.3.13**) 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 doesn't support it.

**B.** The mouse might not be configured properly.

**C.** Your mouse must be connected to a powered ServSwitch 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 4.3.13**).

**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. With IBM type equipment, maximum distance of original Serv cable from any CPU to the shared monitor, keyboard, and mouse is 25 ft. (7.6 m). With Apple or Sun equipment, maximum distance of standard coaxial cable from any ServSwitch to any attached device is 100 ft. (30.5 m). The distance you can run will be less than the maximum if you are using SVGA video on original Serv cables or if you are cascading submasters. If you're running IBM video, you might need to upgrade from original Serv cables to coaxial cables that carry the video signal better. If you are already using coax cables for IBM video, you might need to add Station Extenders (our product codes AC253 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.

**E.** The CPU is sending video with sync on green, which the ServSwitch 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 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 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 ONE OR MORE OF YOUR CPUS HAS PROBLEMS EXITING WINDOWS 3.X

If a CPU running Windows 3.x locks up or (if it's also running EMM386®) displays "EMM386 EXCEPTION ERROR #06" when you try to exit Windows, this is probably what causes it: Windows tries to unload its mouse drivers and reinstate any DOS drivers specified in AUTOEXEC.BAT and CONFIG.SYS. The ServSwitch sees this as a reboot and sends a [CTRL] [M] to the CPU to set the mouse driver for Microsoft mouse compatibility. If the CPU doesn't actually load a mouse driver in DOS, it will crash or at least display the EMM386 error when it receives the [CTRL] [M]. Make sure all of your CPUs load mouse drivers in *both* operating-system environments, even if you don't use a mouse in DOS.

### 6.2.16 THE SERVSWITCH DOESN'T WORK WITH YOUR DOCKING STATION

At the time of this writing, the ServSwitch does not support docking stations for portable computers.

### 6.2.17 THE SERVSWITCH DOESN'T WORK WITH YOUR DONGLE-PROTECTED SOFTWARE

At the time of this writing, the ServSwitch does not support dongles (the devices required to be inserted into the keyboard line by some software for copy protection).

### 6.2.18 THE SERVSWITCH DOESN'T WORK WITH YOUR IBM THINKPAD

At the time of this writing, the ServSwitch 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 6.2.16**).

## 6.3 Calling Black Box

If you determine that your ServSwitch is malfunctioning, *do not attempt to alter or repair the unit*. It contains no user-serviceable parts (and see the Caution notice on page 85). 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:

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

- If you are shipping the ServSwitch 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

The table below and on the next page shows, for the ServSwitch's saveable options, the default values stored in nonvolatile memory (NVRAM) when the ServSwitch is shipped from the factory. It also shows what commands or actions can change these settings for the ServSwitch's current operating period, as well as what commands or actions 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 [CTRL] X  (to turn OFF) | Can't be saved |
| Scan-Delay Time | 5 seconds | Type [CTRL] T*xx* [ENTER] (*xx* = any 1- or 2-digit number, time in seconds) | [CTRL] K |
| *IBM, multi models only:* Shared Keyboard and Mouse Types | PS/2 | Type [CTRL] M*xx* [ENTER] (*xx* = 20 or 21 for the keyboard, 30 to 32 for the mouse) | [CTRL] K |
| *IBM, multi models only:* CPU Key-board Mode and Mouse Interface | Mode 2, PS/2 | Select port, then type [CTRL] M*xx* [ENTER]  (*xx* = 1 to 7, 9, or 10) | [CTRL] K |
| Maximum Ports | 2-port models: 4; Other models: Number of   CPU ports on unit | Type [CTRL] P*xxx* [ENTER] (*xxx* = any 1- to 3-digit number up to 256) | [CTRL] K |
| *IBM, multi models only:* Width of Submasters | Mini models: 4; Other models: 16 | Type [CTRL] W*xxx* [ENTER] (*xxx* = 2 to 255) | [CTRL] K |
| *IBM, multi models only:* Units | 0 (no submasters) | Type [CTRL] U*xxx* [ENTER] (*xxx* = 0 to 255) | [CTRL] K |

| Option | Factory-Default Setting | To Change | To Save Changes |
|---|---|---|---|
| Keyboard Typematic | 43 (delay of 1/2 second, rate of 10.9 characters per second) | Type [CTRL] A*xxx* [ENTER] (*xxx* = 0 to 127; see **Section 4.3.11**) | [CTRL] K |
| Transpose Command and Alt Keys | Pressing the key produces the same scan code | Type [CTRL] B | [CTRL] K |

# Appendix B: Cable Product Codes

The table below and on the next page lists the product codes for all the types of cables we currently offer for use with the ServSwitch. 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 table also lists the product codes for the Mac Adapter, Station Extenders, etc. Depending on your equipment—which must be IBM type—and the video resolution you're using, you might be able to use the Extenders to connect the ServSwitch 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 Monitor/Keyboard/Mouse Adapter 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 |

**Coaxial Monitor/Keyboard/Mouse Adapter 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) | EHN273-0xxx |
| Mac (DB15 female) | Mac (4-pin mini-DIN female) | N/A | EHN202-0xxx |
| Sun (13W3 female) | Sun (8-pin mini-DIN female) | N/A | EHN200-0xxx |
| Multisync (HD15 female) | Sun (8-pin mini-DIN female) | N/A | EHN059-0xxx |

**Standard CPU Adapter 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 |

**Coaxial CPU Adapter Cables:**

| Video Type (Connector on Cable) | Keyboard Type (Connector on Cable) | Mouse Type (Connector on Cable) | Product Code |
|---|---|---|---|
| VGA (HD15 male) | IBM AT (5-pin DIN male) | Serial RS-232 (DB9 female) | EHN271-0xxx |
| VGA (HD15 male) | IBM PS/2 (6-pin mini-DIN male) | PS/2 (6-pin mini-DIN male) | EHN272-0xxx |
| Mac (DB15 male) | Mac (4-pin mini-DIN male) | N/A | EHN207-0xxx |
| Sun (13W3 male) | Sun (8-pin mini-DIN male) | N/A | EHN205-0xxx |

**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

# Appendix C: Pinout of RS-232 Port

The table below shows the pinout of the ServSwitch'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 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 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: Installing the ServSwitch Overlay Option Board (SW720C-R3)

## E.1 Introduction

The ServSwitch Overlay Option Board, our product code SW720C-R3, is an extra circuit board that can be installed in the current generation of regular ServSwitches and ServManagers to add on-screen menus to the Serv unit's functions. Once the Board is installed, you can bring these menus up on the shared monitor's screen by pressing the hotkey combination left-[Ctrl] [F12]; the Board simply inserts these menus into the monitor's video feed, and does not interfere with your CPUs' software or hardware at all. When a regular ServSwitch is converted this way, it becomes functionally identical to a ServSwitch Ultra.

Refer to **Chapter 5** for descriptions of all the Board's operating features and how to access them once the Board has been installed.

## E.2 The Installation Procedure

# CAUTION!

**Installing the ServSwitch Overlay Option Board requires almost completely disassembling the ServSwitch or ServManager. This can be complicated and time-consuming, and it is possible to damage the Serv unit. We recommend that you let us install the Board for you at our factory—call Black Box to arrange this.**

**If you do install the ServSwitch Overlay Option Board yourself, take every reasonable caution against static electricity. At the very least, discharge yourself on a metallic surface before touching the Board; if possible, stand on an anti-static mat and wear a grounding strap or anti-static gloves.**

**Also, you will be removing many screws during the course of the installation. These screws are different lengths and sizes, so note carefully which type of screw goes in which screwhole.**

To install the ServSwitch Overlay Option Board in a ServSwitch or ServManager, take these steps:

1. Make sure the Serv unit is turned OFF, unplugged, and disconnected from all other devices.

2. Unscrew and remove the screws that fasten the wraparound top-and-side cover to the Serv unit. On the mini ServSwitch models, there are two of these screws, one on each side. On the other ServSwitch models, there are six of these screws: four on top and one on each side. On the ServManagers, there are eleven of these screws: two on top, three on each side, and three self-tapping screws at the top of the back plate.

3. Remove the Serv unit's top cover.

4. Unscrew and remove the three screws that fasten the back panel to the bottom panel. On the ServManager and on mini ServSwitch models, these protrude from the back panel. On the other ServSwitch models, they are countersunk and are on the bottom panel. See Figure E-1 on the next page.

5. Unscrew and remove the screws on the Serv unit's bottom panel that fasten the unit's PCB(s) to the panel. On the ServManager and mini ServSwitch models, there are two of these; on the other ServSwitch models, there are three. See Figure E-1 on the next page.

**Mini ServSwitch models**

Step 13: Overlay-Board standoffs

Step 4: Back-plate screws

Step 14: Overlay-Board screws

Step 5: Bottom screws

**Slimline ServSwitch models**

Step 7: Jack screws

Step 10: J3

Step 4: Back-plate screws

Step 5: Bottom screws

Step 9: PCB standoffs

**Full-size ServSwitch models and all ServManagers (not all models will have all slave PCBs)**

Step 7: Jack screws

Step 10: J3

Step 4: Back-plate screws (will be here on ServManagers)

Step 5: Bottom screws
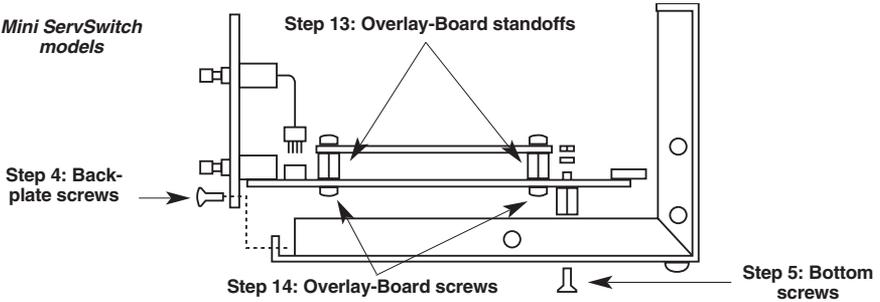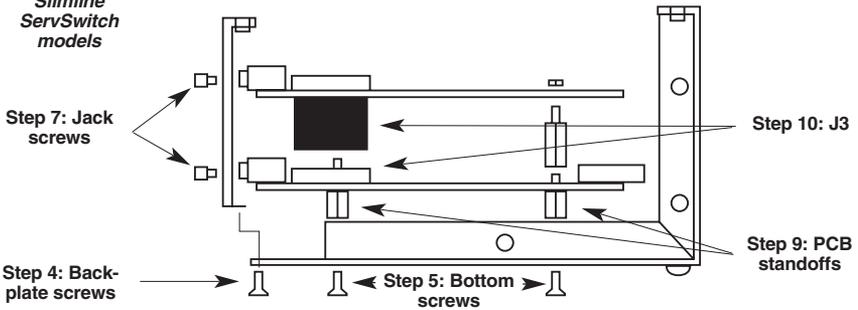
Step 9: PCB standoffs
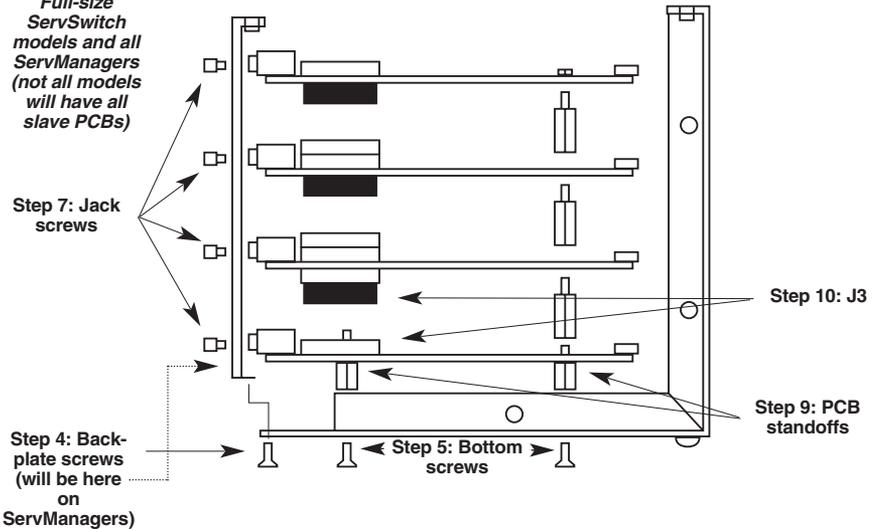
**Figure E-1. Exploded left-side view.**

6. Separate the Serv unit's PCB(s) and back panel from the bottom panel, being very careful not to bend the LEDs. With the ServManager, you will have to carefully unplug the ribbon cables of the display panel (pry gently upward) and keypad (pry gently outward) from the J12 and J13 connectors respectively on the ServManager's master PCB (printed circuit board). See Figure E-5 on page 108.

(If your Serv unit is a 2- or 4-port model, go to step 11—you don't have to do steps 7 through 10.)

7. Unscrew and remove the jack screws on the back panel that fasten the Serv unit's DB25 connectors to the panel. On 8-port units, there are 18 of these; on 12-port units, there are 26; on 16-port units, there are 34. See Figure E-1 on the previous page.

8. Separate the PCBs from the back panel.

9. Unscrew and remove the PCB standoffs that attach the bottom ("master") PCB to the rest of the PCB stack. There will definitely be two of these at the front of the master PCB; there might also be one on the narrow right-hand end. See Figure E-1 on the previous page, Figure E-2 on the next page, and Figure E-3 on page 105.

10. Ease the master PCB apart from the rest of the PCB stack, being very careful not to bend the pins on the PCB-to-PCB connector J3. See Figure 3-1 on the previous page and Figure E-3 on page 105.

11. Remove and discard the five jumpers on connector J4 in the middle of the PCB—you won't be needing them anymore. See Figure E-3 on page 105.

12. Two screws and two washers should have been included with your Overlay Option Board. These might be screwed into the bottom of the Board's two mounting standoffs (the bottom is the end that is not attached to the Board). If they are, unscrew and remove them.

13. Carefully plug the Overlay Option Board into J4, aligning the Board's mounting standoffs over the two mounting holes in the PCB. See Figure E-2 on the next page and Figure E-3 on page 105. For mini ServSwitch models, see also Figure E-1 on the previous page; for other ServSwitch models and ServManagers, see also Figure E-4 on page 107.

*Mini ServSwitch models*

**Step 13: Overlay-Board standoffs**
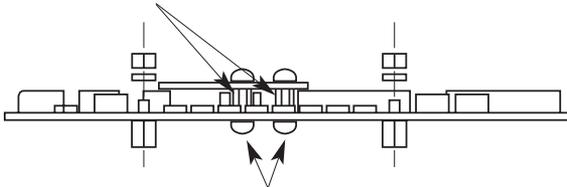
**Step 14: Overlay-Board screws**

*Slimline ServSwitch models*

**Step 13: Overlay-Board standoffs**
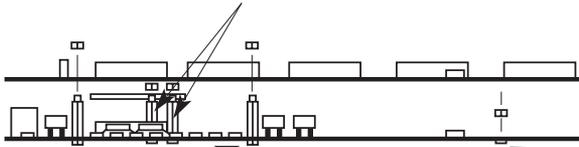
**Step 9: PCB standoffs**

**Step 14: Overlay-Board screws**

**Step 9: PCB standoff might also be here**

*Full-size ServSwitch models and all ServManagers (not all models will have all slave PCBs)*

**Step 13: Overlay-Board standoffs**
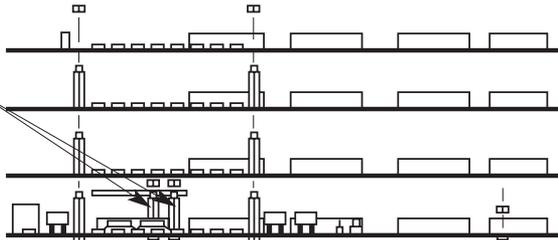
**Step 9: PCB standoffs**

**Step 14: Overlay-Board screws**

**Step 9: PCB standoff might also be here**

**Figure E-2. Exploded front view of the PCB stack.**

14. Mount the two washers included with the Overlay Option Board on the two screws that are also included. (You might have removed these from the Board's mounting standoffs in Step 12.) Screw the screws through the bottom of the PCB's mounting holes into the Overlay Board's standoffs. See Figure E-2 on the previous page. For mini ServSwitch models, see also Figure E-1 on page 101; for other ServSwitch models and ServManagers, see also Figure E-4 on page 107.

(If your Serv unit is a 2- or 4-port model, go to step 20—you don't have to do steps 15 through 19.)

15. Plug the master PCB back into the bottom of the PCB stack, being extremely careful not to bend the pins on the PCB-to-PCB connector J3.

16. Check the clearance between the top of the Overlay Option Board and the slave PCB above it. If any component pins (that is, the pins by which components such as chips and resistors are attached to a circuit board) are hanging down far enough from the bottom of the slave PCB to make contact with the Overlay Option Board, either bend them away from the Board (and not into each other) or snip them off.

17. Refasten the master PCB by screwing the PCB standoffs you removed in step 9 back in.

18. Put the back panel back on the PCB stack.

19. Refasten the back panel to the PCB stack by screwing the jack screws that you removed in step 7 back in.

20. Put the PCB(s)-plus-back-panel assembly back together with the Serv unit's bottom and front panels. (This can be very tricky. Hold the assembly at a 45˚ angle relative to the front panel—this will make it much easier to realign the LEDs with the corresponding holes in the front panel.)

21. Refasten the PCB stack to the bottom panel by screwing the screws that you removed in step 5 back in.

22. Refasten the back panel to the bottom panel by screwing the screws that you removed in step 4 back in.

**Mini ServSwitch models**

Steps 11, 13: J4

J4
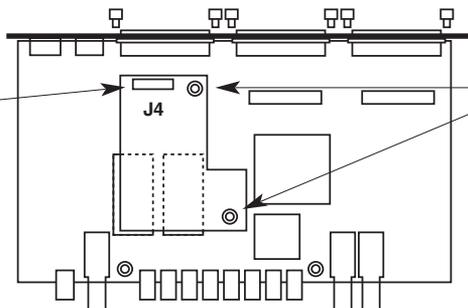
Step 13: Overlay-Board standoffs

**Slimline and full-size ServSwitch models**

Step 13: Overlay-Board standoffs

Steps 11, 13: J4

J4

J3
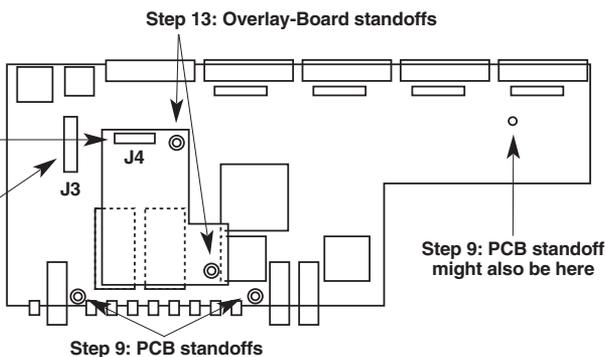
Step 10: J3

Step 9: PCB standoff might also be here

Step 9: PCB standoffs

**All ServManager models**

Step 13: Overlay-Board standoffs

Step 10: J3

Steps 11, 13: J4

J3

J4

J13

J12
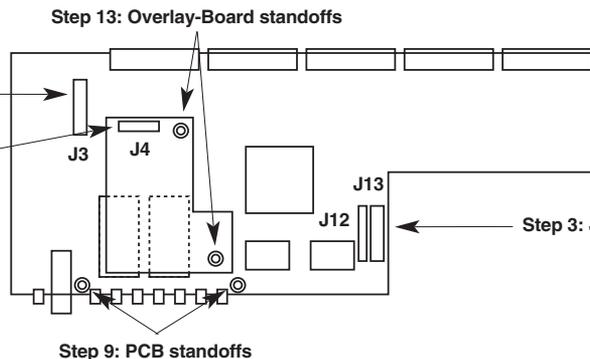
Step 3: J12 and J13

Step 9: PCB standoffs

**Figure E-3. Exploded top views of the master PCB.**

Before putting the Serv unit's top cover back on, test the unit as directed in steps 23 through 28.

23. Temporarily connect the Serv unit to a monitor, keyboard, and mouse, along with at least one CPU for every PCB in the Switch. (On a twelve-port unit, for example, one CPU should be attached to port 1, one CPU to port 5, and one CPU to port 9.)

24. Plug the Serv unit back in and turn it ON. (If, using the configuration currently stored in its NVRAM, the unit won't be able to switch to all of the test CPUs, you might have to change the ServSwitch's or ServManager's Maximum Ports, Width, and Units values, or just perform a factory reset. Refer to the appropriate sections of your Serv unit's manual.)

25. Turn ON the attached monitor and CPUs.

26. Make sure that the Serv unit's front-panel controls and keyboard commands will still scan and switch between all of the CPUs from the front panel as before. If the Serv unit does not respond properly, call Black Box for technical support.

27. Press and release the shared keyboard's left [Ctrl] key, then its [F12] key. The Overlay Option Board's main menu should appear. If it repeatedly fails to appear, call Black Box for technical support.

28. Press the up- and down-arrow keys to move the cursor among the menu selections. Press [Enter] to choose a selection and bring up a submenu. Press [Esc] to return to the main menu. Press [Esc] again to quit the overlay menus and return to normal operation. If any of these functions fails to work, call Black Box for technical support.

29. If the Serv unit seems to be working properly, turn OFF the unit and all attached test equipment. Unplug the unit from utility power and disconnect it from the test equipment.

30. Replace the Serv unit's top cover.

31. Refasten the top cover by screwing the screws that you removed in step 2 back in.

Once you reconnect it to its normal system (and, if necessary, rebuild its normal configuration), the ServSwitch or ServManager, including its new Overlay Option Board, should be ready for continuous operation.

*Slimline models*

**Step 13: Overlay-Board standoffs**

**Step 14: Overlay-Board screws**

*All full-size
ServSwitch
models and all
ServManagers
(not all models
will have all slave
PCBs)*

**Step 13: Overlay-Board standoffs**
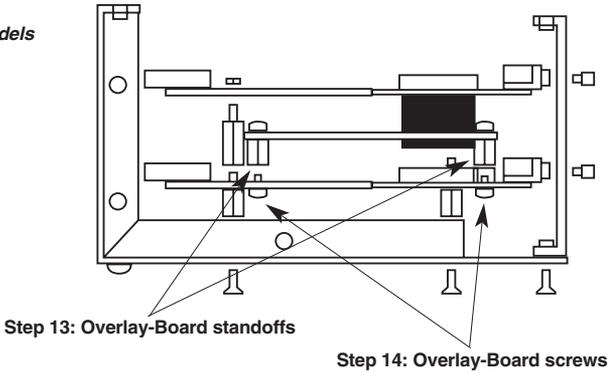
**Step 14: Overlay-Board screws**
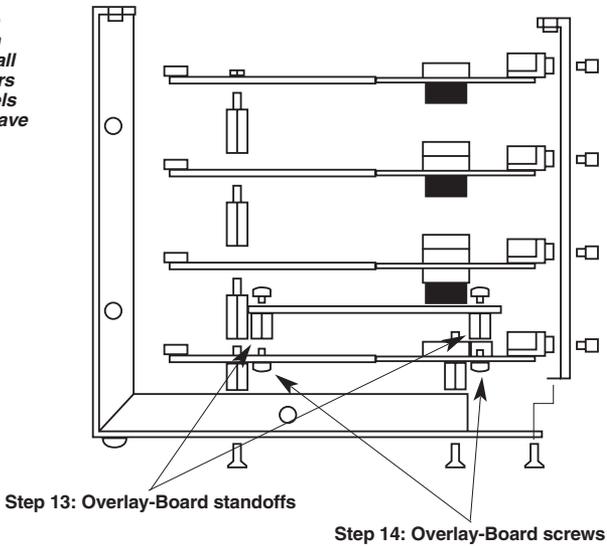
**Figure E-4. Exploded right-side view.**
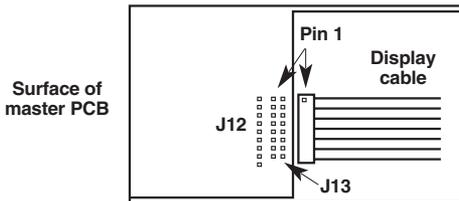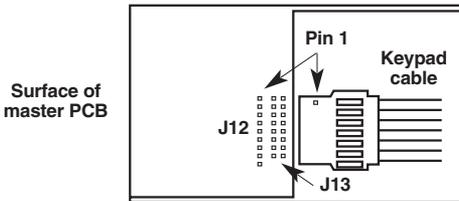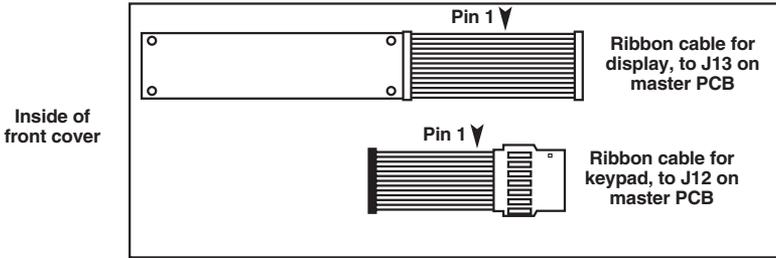
**Figure E-5. The ServManager's display and keypad cables.**

# Appendix F: Installing the 4-Port Expansion Board (KV5x00C) (Full-Size Models Only)

## F.1 Introduction

The 4-Port Expansion Boards for ServSwitch and ServSwitch Ultra, our KV5x00C series of product codes, are extra circuit boards that can be installed in full-size ServSwitches or ServSwitches Ultra to add four additional CPU ports. For example, if you had a full-size regular ServSwitch with four CPU ports (KV3104FA[E]), you could upgrade to eight CPUs ports by installing a single PC-only 4-Port Expansion Board (KV5100C); upgrade to twelve CPU ports by installing two of these Boards; or upgrade to sixteen CPU ports by installing three of these Boards.

Install the multiplatform version of the Expansion Board (KV5000C) in a full-size multiplatform ServSwitch (KV30xxFA[E] model) or ServSwitch Ultra (KV50xxFA[E] model) only.

Install the PC version of the Board (KV5100C) in a full-size IBM PC compatible ServSwitch (KV31xxFA[E] or SW723-5A[E]-R3 model) or ServSwitch Ultra (KV51xxFA[E] model) only.

Install the Sun version of the Board (KV5200C) in a full-size Sun compatible ServSwitch (KV32xxFA[E] model) or ServSwitch Ultra (KV52xxFA[E] model) only.

Install the Apple Macintosh version of the Board (KV5300C) in a full-size Mac compatible ServSwitch (KV33xxFA[E] model) or ServSwitch Ultra (KV53xxFA[E] model) only.

## F.2 The Installation Procedure

# CAUTION!

**Installing the 4-Port Expansion Board requires almost completely disassembling the ServSwitch or ServSwitch Ultra. This can be complicated and time-consuming, and it is possible to damage the Switch. We recommend that you let us install the Board for you at our factory—call Black Box to arrange this.**

**If you do install the 4-Port Expansion Board yourself, take every reasonable caution against static electricity. At the very least, discharge yourself on a metallic surface before touching the Board; if possible, stand on an anti-static mat and wear a grounding strap or anti-static gloves.**

**Also, you will be removing many screws during the course of the installation. These screws are different lengths and sizes, so note carefully which type of screw goes in which screwhole.**

To install the 4-Port Expansion Board in a ServSwitch or ServSwitch Ultra, take these steps:

1. Make sure the Switch is turned OFF, unplugged, and disconnected from all other devices.

2. Unscrew and remove the six screws (four on top and one on each side) that fasten the wraparound top-and-side cover to the Switch. See Figure F-1 on the next page.

3. Remove the Switch's top cover.

4. Unscrew and remove the three countersunk screws on the bottom panel that fasten the back panel to the bottom panel. See Figure F-2 on the next page.

5. Unscrew and remove the three countersunk screws on the Switch's bottom panel that fasten the Switch's PCB(s) (printed circuit board[s]) to the panel. See Figure 2-2 on the next page.

6. Separate the Switch's PCB(s) and back panel from the bottom panel, being very careful not to bend the LEDs.

7. Depending on how many Expansion Boards you are installing, you will need to remove two or more of the CPU-port blanks (covering plates) that are attached to the Switch's back panel and cover the CPU-port slots—see Figure F-3 on page 113. Unscrew and remove the screws that fasten these blanks to the back panel, then remove the blanks themselves.
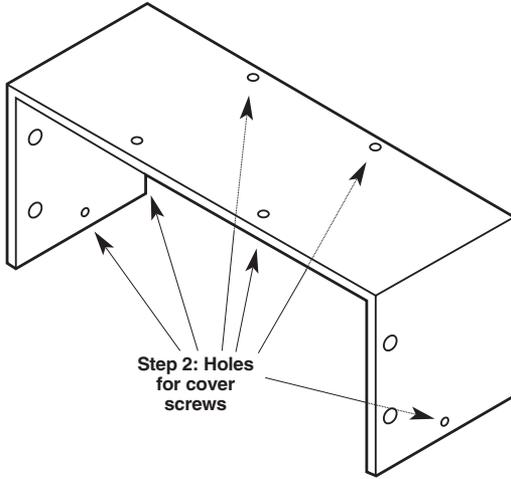
**Figure F-1. The Switch's cover.**
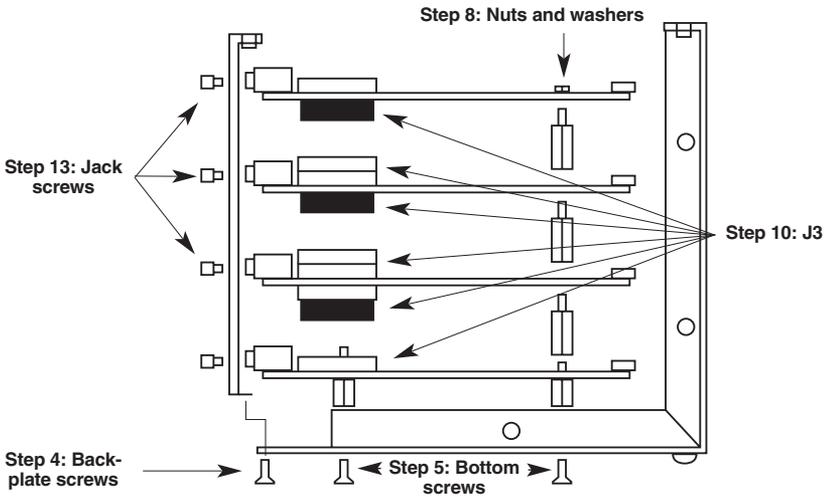


**Figure F-2. Exploded left-side view of a ServSwitch or ServSwitch Ultra with the maximum number of ports installed.**

8. Unscrew and remove the nuts and washers from the screw-ends of the standoffs that poke through the topmost PCB. There will definitely be two of these standoffs at the front of the PCB; there might also be one on the narrow right-hand end. See Figure F-2 on the previous page, Figure F-4 on the next page, and Figure F-5 on page 115.

   4-port models (single PCB): These standoffs will be the short, jack-screw-like affairs that serve to separate the board from the bottom panel. Also, do not remove the screws or standoffs that attach the overlay board to the PCB.

9. Unscrew and remove the eight jack screws attached. to the Expansion Board, one on either side of the Board's four DB25 connectors. (These will secure the connectors to the backplate; you will be screwing them back on soon.)

10. You should have received two or three new standoffs with your Expansion Board. Screw these into the screw-ends of the existing standoffs that you exposed in step 8. You should also have received an extender (spacer) for the J3 connector on the PCB that will be below the Expansion Board (see Figure F-2 on the previous page, Figure F-4 on the next page, and Figure F-5 on page 115); plug this extender into the J3 connector, being careful not to bend the extender's pins.

11. Plug the 4-Port Expansion Board into the J3 extender you just attached, being extremely careful not to bend the Board's pins (see Figure F-2 on the previous page and Figure F-5 on page 115). The new standoffs' screw-ends should poke through the appropriate holes on the Board, and the Board's DB25 connectors should fit in the CPU-port slots you exposed in step 7.

12. Fasten the Board to the other PCB(s) by screwing the nuts and washers you removed in step 8 onto the screw-ends of the new standoffs.

13. Fasten the Board to the back panel by screwing the jack screws you removed in step 9 back in. (See Figure F-2 on the previous page.)

14. Make sure that port-numbering jumper J14 (see Figure F-4 on the next page and Figure F-5 on page 115) is set correctly on all of your unit's "slave boards" (all the boards in the PCB stack except the bottommost main board). On the second board from the bottom, J14 should be *removed* to identify that board as the location of ports 5 through 8. On the third board from the bottom (if you've installed one), J14 should be set to the *left* to identify that board as the location of ports 9 through 12. On the fourth board (again, if you've installed one), J14 should be set to the *right* to identify that board as the location of ports 13 through 16. If these jumpers aren't set correctly, the Switch will either access the wrong ports, access multiple ports simultaneously, or light LED 3 ("slave-communication error") at power-up.

**Step 7: Blanks**

Slots for CPU ports 5 through 8

Slots for CPU ports 9 through 12

Slots for CPU ports 13 through 16 (hidden)
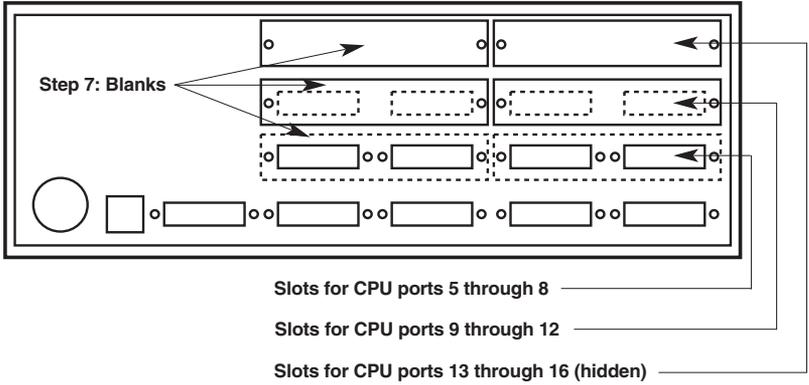
**Figure F-3. The Switch's back panel\*.**



**Step 8: Nuts and washers**

**Step 8: Might also be a nut and washer here**

**Step 14: Jumper J14 (on right)**

**Step 14: Jumper J14 (on left)**

**Step 10: J3 extenders**

**Step 14: Jumper J14 (removed)**
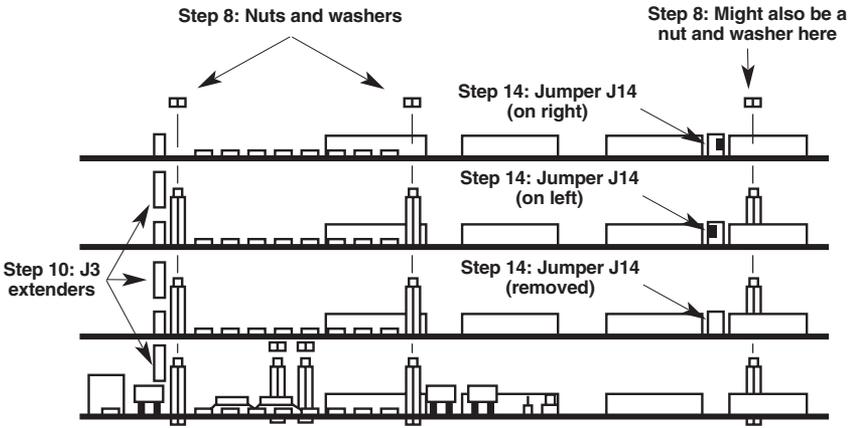
**Figure F-4. Exploded front view of a ServSwitch's or ServSwitch Ultra's PCB stack (16-port unit shown).**

\*Solid lines show actual appearance of 8-port Switch prior to Board installation; dotted lines show differences for 4-port or 12-port units.

15. Put the PCB-stack-plus-back-panel assembly back together with the Switch's bottom and front panels. (This can be very tricky. Hold the assembly at a 45° angle relative to the front panel—this will make it much easier to realign the LEDs with the corresponding holes in the front panel.)

16. Refasten the PCB stack to the bottom panel by screwing the screws that you removed in step 5 back in.

17. Refasten the back panel to the bottom panel by screwing the screws that you removed in step 4 back in.

Before putting the Switch's top cover back on, test the unit as directed in steps 18 through 22.

18. Temporarily connect the Switch to a monitor, keyboard, and mouse, along with at least one CPU for every PCB in the Switch. (On a Switch you have just expanded to twelve ports, for example, one CPU should be attached to port 1, one CPU to port 5, and one CPU to port 9.)

19. Plug the Switch back in and turn it ON. (If, using the configuration currently stored in its NVRAM, the Switch won't be able to switch to all of the test CPUs, you might have to change the Switch's Maximum Ports, Width, and Units values, or just perform a factory reset. Refer to **Sections 4.3.8** through **4.3.10** or **Section 6.1**.)

20. Turn ON the attached monitor and CPUs.

21. Make sure that the Switch's front-panel pushbuttons, keyboard commands, and overlay menus will still scan and switch between all of the CPUs from the front panel as before. If the Switch does not respond properly, call Black Box for technical support.

22. If the Switch seems to be working properly, turn OFF the Switch and all attached test equipment. Unplug the Switch from utility power and disconnect it from the test equipment.

23. Replace the Switch's top cover.

24. Refasten the top cover by screwing the screws that you removed in step 2 back in.

Once you reconnect the Switch to its normal system (rebuilding, if necessary, its normal configuration), you can attach additional computers to the Switch's new CPU ports if all lower-numbered ports are occupied. Power up the system and issue a Maximum Ports command (left-[CTRL] P*xxx*, where *xxx* is the total number of occupied CPU ports) that reflects the new ports/computers you've just added. Once you've done so, the ServSwitch, including its new CPU ports, should be ready for continuous operation.
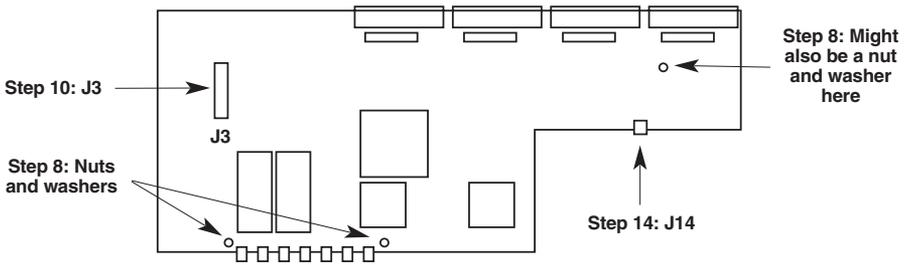
**Figure F-5. Top view of the 4-Port Expansion Board (and previously installed PCBs).**

# Appendix G: Rackmounting the ServSwitch

If you want to mount your ServSwitch 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 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).
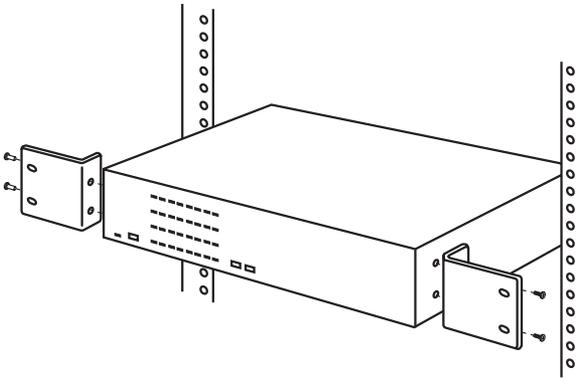


**Figure G-1. Rackmount assembly.**