ServSwitch™
PROFESSOR

SYSTEM CONTROL MODULE

BLACK BOX®
724-746-5500

ServSwitch
PROFESSOR
EDUCATIONAL/TRAINING SYSTEM

KEYBOARD / MONITOR / MOUSE   COMPUTER

POWER STATUS SEND

ServSwitch
PROFESSOR
STUDENT MODULE

BLACK BOX®
724-746-5500

KEYBOARD / MONITOR / MOUSE   COMPUTER

POWER STATUS SEND

**KV780A
KV780AE**

BLACK BOX®
NETWORK SERVICES

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**

BLACK BOX®
NETWORK SERVICES

Welcome to the ServSwitch™ Family!

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

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

With our ServSwitch products, there's no reason why not. We carry a broad line of robust solutions for all these applications. Do you have just two PCs, and need an economical alternative to keeping two monitors, keyboards, and mice on your desk? Or do you need to share dozens of computers, including a mix of IBM® PC, RS/6000®, Apple® Macintosh®, Sun Microsystems®, and SGI® compatibles among multiple users with different access levels? Does your switch have to sit solidly on a worktable and use regular everyday cables? Or does it have to be mounted in an equipment rack and use convenient many-to-one cables? No matter how large or small your setup is, no matter how simple or how complex, we're confident we have a ServSwitch system that's just right for you.

The ServSwitch™ family from Black Box—the one-stop answer for all your KVM-switching needs!

*

This manual will tell you all about your new ServSwitch™ Professor, including how to install, operate, and troubleshoot it. For an introduction to the ServSwitch Professor, see **Chapter 2**. This manual is shipped with the ServSwitch Professor Instructor Kit, whose product codes are:

<div align="center">

KV780A
KV780AE

</div>

This manual also covers the ServSwitch Professor Student Kits, whose product codes are:

<div align="center">

KV781A
KV781AE
KV782A
KV782AE

</div>

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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.

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This equipment complies with the requirements of the European EMC Directive 89/336/EEC.
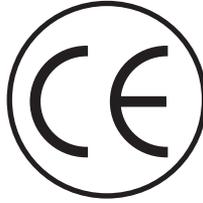
NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

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

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

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

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

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

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

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

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

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

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

18. Servicio por personal calificado deberá ser provisto cuando:

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

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

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

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

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

Contents

Chapter   **Page**

1. Specifications

Compliance —   FCC Part 15 Subpart J Class A, IC Class/classe A;
230-VAC ("-AE" suffix) models: CE

Standards —   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

Interfaces —   All COMPUTER, KEYBOARD/MONITOR/MOUSE, and
BUS ports:
Proprietary composite of IBM PS/2 or PC/AT
keyboard, PS/2 or RS-232 mouse, and VGA/SVGA/
XGA video;
RS-232 port: Proprietary variant of EIA/TIA RS-232 using
RJ-12 ("6-wire RJ-11") connectors, DTE;

Resolution —   With original Serv cabling: Up to 1024 x 768
noninterlaced;
With coaxial cabling: Up to 1280 x 1024 noninterlaced

Maximum
Distance —   To local equipment (depends on the CPUs, monitors,
video resolutions, and the length of bus cable between
CPUs and user equipment—see **Section 4.1.3**):
5 ft. (1.5 m) of total original Serv cable or at least 20 ft.
(6.1 m) of coaxial cable—possibly as much as 100 ft.
(30.5 m), depending on the devices—from any
ServSwitch Professor to any device attached to it;
Between Professor units (depends on the video
resolution):
250 ft. (76.2 m) of total bus cable, end to end

User Controls — Keyboard commands;
Bottom-mounted 8-position unit-address DIP switch;
Rear-mounted power (ON/OFF) pushbutton

Indicators —   All front-mounted LEDs:
(1) Power;
(1) Status;
(1) Send

Connectors —   Front-mounted:
      (1) DB25 female for CPU;
      (1) DB25 female for keyboard, monitor, and mouse;
Rear-mounted:
      (2) 13W3 female: (1) bus in, (1) bus out;
      (1) RJ-12 ("6-wire RJ-11") female for RS-232;
      (1) 5-pin DIN female for power

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

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

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

Enclosure —   Fully shielded steel

Power —   KV780A, KV781A, KV782A:
    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);
KV780AE, KV781AE, KV782AE:
    From desktop 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)

Size —   2.3"H x 8.8"W x 4.9"D (5.8 x 22.4 x 12.5 cm)

Weight —   3 lb. (1.4 kg)

2. Introduction

Thank you for choosing a ServSwitch™ Professor. Designed for plug-and-play operation, your new Professor will simplify your job by helping you organize your applications involving multiple IBM® PC compatible computers. In particular, the ServSwitch Professor is especially designed for classroom applications so the instructor can access students' stations.

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

2.1 The Complete Package

What you get in your ServSwitch Professor Kit depends on which type of Kit you ordered. The Instructor Kit (product code KV780A or KV780AE) comes with:
   • A ServSwitch Professor System Control Module (SCM).
   • (1) 1-ft. (0.3-m) standard PS/2 type User Cable.
   • (1) 1-ft. (0.3-m) standard PC/AT type User Cable.
   • (1) 5-ft. (1.5-m) coaxial PS/2 type CPU Cable with PC/AT adapters.
   • (2) Bus terminators.
   • (1) Power supply.
   • (1) Copy of this manual.
   • (1) Keyboard template.

The Student Kit for PS/2 (product code KV781A or KV781AE) comes with:
   • A ServSwitch Professor Student Module (STM).
   • (1) 1-ft. (0.3-m) standard PS/2 type User Cable.
   • (1) 5-ft. (1.5-m) coaxial PS/2 type CPU Cable.
   • (1) 10-ft. (3-m) coaxial bus cable.
   • (1) Power supply.

The Student Kit for PC/AT (product code KV782A or KV782AE) comes with:
   • A ServSwitch Professor Student Module (STM).
   • (1) 1-ft. (0.3-m) standard PC/AT type User Cable.
   • (1) 5-ft. (1.5-m) coaxial PC/AT type CPU Cable.
   • (1) 10-ft. (3-m) coaxial bus cable.
   • (1) Power supply.

2.2 Features

Some of the useful features of the ServSwitch Professor:

- The instructor can access any student's computer in three modes:

  View mode—see student's station without disturbing student's keyboard or mouse;

  Share mode—see student's station with interactive keyboard and mouse sharing;

  Control mode—see student's station with complete control over their keyboard and mouse.

- The instructor can disable any student's station in two modes:

  Disable—Student's screen is blanked and keyboard and mouse are locked out;

  Freeze—Student's screen remains on, but all keyboard and mouse activity is locked out.

- The instructor can let students interact with each other in two modes:

  XView mode—students see another student's station without disturbing their keyboard or mouse;

  XShare mode—students see another student's station with interactive keyboard and mouse sharing.

- "Show mode" allows instructors to send their screen to any or all students.

- "Scan mode" allows instructor to sequentially view each student's computer.

- The instructor can even allow students to view or share control of each other's CPUs, or allow students to share control of the instructor's own CPU.

- You can connect one instructor station and up to 254 student stations.

- Single cable connection between units simplifies installation.

- The bus cabling between units uses high-quality 13W3 video connectors for crystal-clear video even at long distances.

- Data on the bus is packetized, as if it were network data, for fast and highly reliable delivery of keyboard, mouse, and control information.

- Easily set each unit's network address with the bottom-panel DIP switch.

- Keyboard-timeout feature allows sharing of CPUs.

- Drives video, keyboard, and mouse up to 100 ft. (30.5 m) away.

- Supports up to 1280 x 1024 noninterlaced video resolution.

- LEDs show bus status and video-sending state.

- Screen-blanking function turns off video after 1 to 999 seconds of inactivity.

- Use the previous-channel command for easy back-and-forth access to two CPUs.

- All settings can be saved in nonvolatile memory.

- Available in 117-VAC or 230-VAC models.

- 19," 23," and 24" rackmount kits are also available.

2.3 The ServSwitch Professor Illustrated

2.3.1 THE FRONT PANEL

The ServSwitch Professor's front panel features two local-equipment connectors and three LED indicators. To familiarize yourself with these controls and indicators, refer to Figure 2-1 and the descriptions that follow. (The figure shows a System Control Module, but Student Modules will have the same components in the same places.)
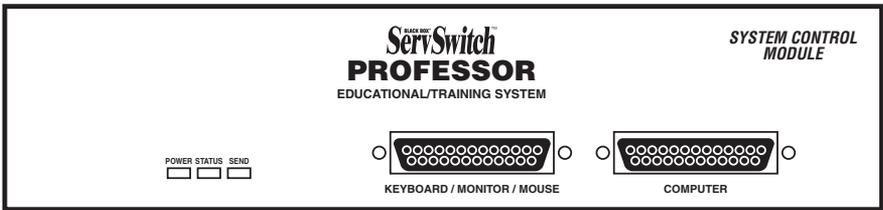
Figure 2-1. The front panel of a ServSwitch Professor.

Panel Label	Description
POWER	This LED lights to indicate that unit is powered ON.
STATUS	This LED flashes once a second to show bus connection. Also flashes in response to keyboard or mouse activity.
SEND	This LED lights to show that the unit is sending video over the coax bus (one or more monitors might be receiving the video).
KEYBOARD/ MONITOR/ MOUSE	Attach the keyboard, mouse, and monitor of a user station to this DB25 female connector using a User Cable ("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 User Cable is needed. See **Section 2.4**.
COMPUTER	Attach the local CPU to this port with a "CPU Cable" ("CPU Adapter Cable"). At the Professor end this cable has a DB25 male connector; at the other ends, it has appropriate connectors to plug into your CPU's video, keyboard, and mouse ports. This cable takes the signals that would normally pass between the CPU's ports and the monitor, keyboard, and mouse, and carries them between the CPU's ports and the Professor station instead.

2.3.2 THE REAR PANEL

The ServSwitch Professor's rear panel features two bus connectors, as well as an RS-232 port, power inlet, and power switch, as illustrated in Figure 2-2 and described below.
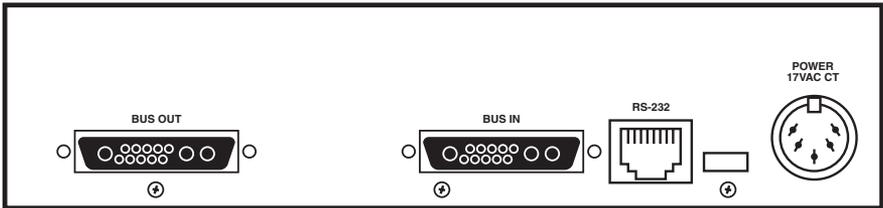
Figure 2-2. The rear panel of a ServSwitch Professor.

Panel Label	Description
BUS IN, BUS OUT	You'll attach bus cable running to other ServSwitch Professors to either or both of these 13W3 female ports. Remember that a cable attached to one unit's BUS IN port must be attached to the BUS OUT port of the unit at the other end, and a cable attached to one unit's BUS OUT port must be attached to another unit's BUS IN port.
	If a unit is the first station on the bus—that is, if there is going to be (at least for now) a cable attached to the BUS OUT port but not the BUS IN port—you'll need to attach a terminator to the BUS IN port. Similarly, if the unit is the last station on the bus—if there is going to be a cable attached to the BUS IN port but not the BUS OUT port—you'll need to attach a terminator to the BUS OUT port.
RS-232	RS-232 port reserved for factory diagnostics only. Do *not* attach any of your equipment to this port.
POWER	You'll attach the output cord from the included power supply to this 5-pin DIN female power inlet. This is *not* a keyboard input. Input voltage is 17 VAC center-tapped.
[None]	There is an unlabeled ON/OFF pushbutton just to the left of the POWER inlet. Pressing it turns the Professor ON and OFF, provided that the Professor's power supply is properly attached to the inlet.

2.3.3 THE BOTTOM PANEL

The ServSwitch Professor's bottom panel features a configuration DIP switch, as illustrated in Figure 2-3 and described below.
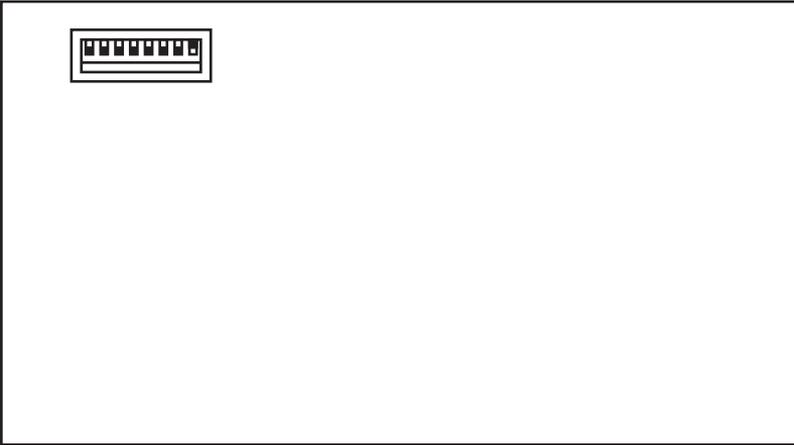
Figure 2-3. The bottom panel of a ServSwitch Professor.

Panel Label	Description
[None]	The setting of this 8-position configuration DIP switch determines the bus address of the ServSwitch Professor and the CPU attached to it. Each of the switch positions corresponds to a binary multiple—from left to right, position values are 128, 64, 32, 16, 8, 4, 2, and 1—so addresses from 0 to 255 are available. Because address 0 is reserved for diagnostics and address 255 is reserved for the instructor's System Control Module and CPU, Student Modules and CPUs can be set to any address from 1 to 254.

2.4 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, a third for each mouse cable, and then there are the user-device cables—and don't even talk about the bus wiring running between the switches! Needless to say, the potential for tangling or mismatching cables is high.

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

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

Lastly, the communication between each pair of Professor units is carried on a single high-quality bus cable. (You will also need to attach terminators to the first and last devices on the bus.)

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 in **Section 3.3.4** for information about maximum cabling distances.

NOTES

SVGA (at higher resolutions) and XGA place special demands on cabling that the regular CPU and User Cables typically cannot meet. For these applications, you should use coaxial cables that can carry video signals not only farther but also at higher resolutions. See Appendix B **and the first Caution notice in** Section 3.3.4**.**

3. Installation

3.1 Quick Setup Guide

Figures 3-1 and 3-2 show a basic example of connecting a CPU, keyboard, monitor, and mouse to the ServSwitch Professor, as well as interconnecting a set of Professors with bus cables. Local-device connectors will vary depending on the types of equipment you are installing.

SERVSWITCH PROFESSOR (FRONT)
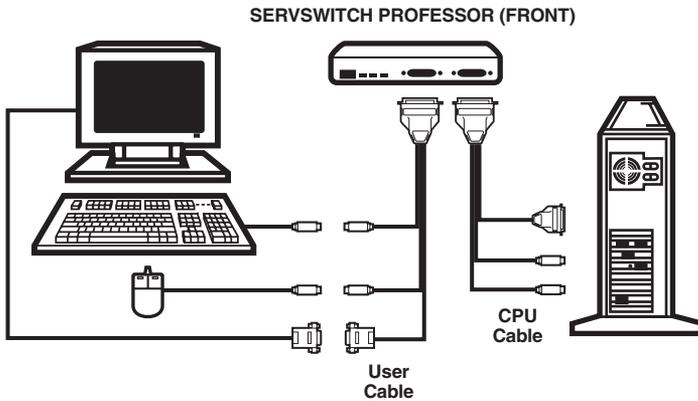
Figure 3-1. Basic system setup (local-equipment side).
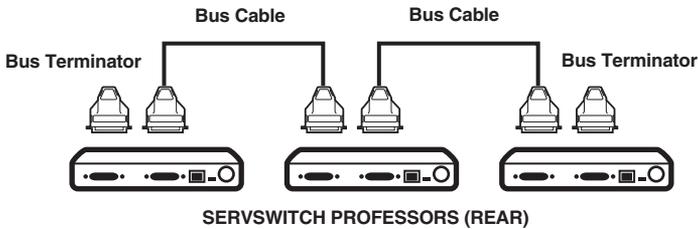
Figure 3-2. Basic system setup (bus side).

3.2 Placement

It's a good idea to put each ServSwitch Professor as close as possible to the CPU and associated keyboard, monitor, and mouse that you want to attach to it. This is because using short CPU and User Cables to run to your local devices is not only neater and less expensive, but will also provide the best video quality to and from those devices.

Typically you should leave the Professor's front panel accessible in order to view the STATUS and SEND LEDs, though once your whole system is installed you probably won't need to see these LEDs. As you place your units, also keep in mind that the total length of bus cable in your system should not exceed 250 feet (76.2 m), especially at high video resolutions.

3.3 The Installation Procedure

This section provides instructions for installing a single ServSwitch Professor system; simply repeat these steps for each ServSwitch Professor, and your system will be ready in no time. For an illustrated example of the elements of a basic setup, see Figure 3-1 on the previous page.

3.3.1 SETTING THE UNIT'S BUS ADDRESS

A ServSwitch Professor determines what its address is by reading the setting of its bottom-mounted configuration DIP switch (show in Figure 3-3) at power-up. The DIP switch represents a binary number: Each switch position corresponds to a power of two that is *added* to the station's address if the position is ON (UP) or *not added* to the address if the position is OFF (DOWN). From left to right, the positions correspond to 128, 64, 32, 16, 8, 4, 2, and 1. So, for example, if the Professor station reads these positions as being set to UP DOWN DOWN UP UP UP DOWN UP, it will add 128 + 16 + 8 + 4 + 1 and arrive at a total of 157, which it will use as its address.
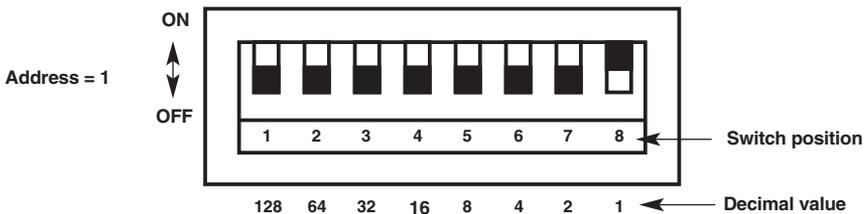
Figure 3-3. The configuration DIP switch.

ServSwitch Professor System Control Modules (SCMs) should always be set to an address of 255 (all DIP-switch positions up, the factory-default setting for SCMs), and there should only be one SCM in a Professor system. Address 0 (zero, all positions down) is reserved for diagnostic purposes. So Professor Student Modules (STMs) should be set to addresses between 1 and 254. (The factory-default address for STMs is "1.") Here are the DIP-switch settings for the STM addresses up to 10:

- Address 1 = position 8 up;

- Address 2 = position 7 up;

- Address 3 = positions 7 and 8 up;

- Address 4 = position 6 up;

- Address 5 = positions 6 and 8 up;

- Address 6 = positions 6 and 7 up;

- Address 7 = positions 6, 7, and 8 up

- Address 8 = position 5 up;

- Address 9 = positions 5 and 8 up; and

- Address 10 = positions 5 and 7 up.

One note of caution: If you set two units to the same address, their LEDs will blink rapidly when the system is powered up. But if you accidentally set the address of a System Control Module to something other than 255 and set a Student Module to address 255, the SCM will no longer recognize most commands, but the STM will. So be very careful as you set this value.

3.3.2 RACKMOUNTING (OPTIONAL)

If you want to mount the ServSwitch Professor in a 19" rack, you will need a Mini-Size Classic-Chassis ServSwitch Family Rackmount Kit (our product code SW727). If you want to mount the ServSwitch Professor in a 23" or 24" rack, call Black Box Technical Support for a quote on a special Kit. See **Appendix C** for more information.

3.3.3 CONNECTING THE KEYBOARD, MONITOR, AND MOUSE

An included User Cable (also called a Monitor/Keyboard/Mouse ["MKM"] Adapter Cable) connects your monitor, keyboard, and mouse to the ServSwitch Professor. System Control Module Kits include one PS/2 style User Cable with 6-pin mini-DIN keyboard and mouse connectors and one PC/AT style User Cable with a 5-pin DIN mouse connector and a DB9 mouse connector; you can use the cable you need. The Student Module Kits for PS/2 include just the PS/2 style cable. The Student Module Kits for PC/AT include just the PC/AT style cable. If you lose this cable or ever need another one or a longer one, it is also available separately; see **Appendix B**.

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 Professor doesn't support most keyboard-line dongles.**

If you order a longer replacement cable, be careful where and how you run it; see the other Caution notice below.

Take these steps:

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

2. Plug the cables from your shared monitor, keyboard, and mouse into the corresponding connectors on the other ends of the User Cable.

3.3.4 CONNECTING THE CPU

An included CPU Cable runs from the ServSwitch Professor to the keyboard port, mouse port, and video-output port of the CPU you want to directly attach to it. System Control Module Kits include a PS/2 style CPU Cable with 6-pin mini-DIN keyboard and mouse connectors, plus PC/AT keyboard (5-pin DIN) and mouse (DB9) adapters. Student Module Kits for PS/2 include a PS/2 style CPU Cable but not adapters. Student Module Kits for PC/AT include a dedicated PC/AT style CPU Cable. If you lose this cable or an adapter, or ever need another one or a longer one, they are also available separately; see **Appendix B**.

CAUTION!

Avoid routing longer replacement CPU or User Cables near fluorescent lights, air-conditioning compressors, or machines that may create electrical noise. Total length of original Serv cable (not including bus cable) from any keyboard, monitor, and mouse to any given CPU should not exceed 15 ft. (4.6 m). For typical equipment and video resolutions, length of coaxial cable should not exceed 20 ft. (6.1 m) from a Professor to any attached device (keyboard, monitor, mouse, or CPU). 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. See Appendix B**.**

Take these steps:

1. After you verify that the Professor is turned off and unplugged, plug the DB25 male connector of the CPU's CPU Cable into the DB25 female COMPUTER port on the Professor's front panel.

2. Plug the CPU Cable's video-, keyboard-, and 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 4.3.19** to make sure the Professor is set for the proper keyboard mode.

CAUTION!

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

3.3.5 CONNECTING THE BUS

To interconnect ServSwitch Professors, you'll use high-quality coaxial bus cables with robust 13W3 male connectors. One such cable, 5 ft. (1.5 m) long, is included with each Student Module Kit; if you ever need a replacement cable, or a longer one, our product code is EHN275—specify your desired length. Also see **Appendix B**.

You'll also need two terminators, one for each of the unoccupied BUS ports that mark the start and end of the bus. These terminators are included with your System Control Module Kit; if you ever need a replacement, the product code is SW991.

How you hook up the bus to a given station depends on where along the bus the station is:

- To connect the bus to the *first* station—most often the instructor's System Control Module, although that doesn't have to be the case—attach a bus cable to the first station's BUS OUT port and run it to the second station's BUS IN port, then attach a bus terminator to the first station's BUS IN port.

- To connect the bus to one of the *middle* stations, take the bus cable running from the previous station's BUS OUT port and attach it to this station's BUS IN port. Then run a cable from *this* station's BUS OUT port to the *next* station's BUS IN port.

- To connect the bus to the *last* station, take the bus cable running from the previous station's BUS OUT port and attach it to this station's BUS IN port, then attach a bus terminator to the last station's BUS OUT port.

Remember that cables must run from BUS OUT ports to BUS IN ports; never connect cables from BUS IN to BUS IN or BUS OUT to BUS OUT. Also, do *not* run bus cable in such a way that a ring is formed; your system will not work if you do.

3.3.6 POWERING THE PROFESSOR

Once you've installed all of the equipment in your system, take these steps to power up the system:

1. Making sure that all of the CPUs attached to the system are OFF (powered down), take the output cord of each Professor's power supply and plug its 5-pin DIN male connector into the 5-pin DIN female power inlet on the rear panel of the Professor. Plug each power supply's transformer (115 VAC) or input cord (230 VAC) into a nearby AC-power outlet.

2. Push in the ON/OFF button on each Professor's rear panel to power it up.

3. When you power up each Professor, its yellow status LED will light briefly and go out. After a few seconds the status LED will flash irregularly as it talks to the keyboard and mouse attached to the Professor. Then, if other ServSwitch Professors are on the bus, the LED will flash at a steady one-second interval. If it flashes at a faster rate, about three times per second, this indicates either a hardware error or a duplicate address. See **Chapter 5** for more information.

4. Power up the connected CPUs one by one, giving each one time to boot completely before turning ON the next one. When the CPUs are powered up after the Professors, the Professors will autodetect each CPU's keyboard mode and emulate all keyboard and mouse functions for automatic boot-up. (You might want to issue a Keep Settings command after initial bootup, so that the Professor saves the mode settings it has autodetected to nonvolatile memory.)

3.3.7 TESTING THE PROFESSOR

Your ServSwitch Professor is now ready for operation using its default settings. To take full advantage of the Professor's features, refer to **Chapter 4**, which gives detailed information about each of the Professor's commands, describing its application and giving the keyboard command sequence. For your convenience, this information is summarized in **Section 4.2**. But here's how to begin switching immediately:

Find the keyboard template that you should have received with your unit, shown in Figure 3-4. Put it over the upper function keys of your keyboard. The template has commands listed at the top and station numbers at the bottom. Commands are carried out by pressing and releasing the left [Ctrl] (control) key, pressing the function key corresponding to the desired command, and pressing another function key corresponding to the station(s) to which the command will apply. For example:

- To *view* the screen of student #2: Press and release the left [Ctrl] key, then press [F1] (view) and [F2] (CPU 2).

- To *share* the CPU of student #1: Press and release the left [Ctrl] key, then press [F2] (share), and [F1] (CPU 1).

- To *disable* all students' screens: Press and release the left [Ctrl] key, then press [F6] (disable) and [F12] (all stations).

- To *show* the instructor's screen to student #3: Press and release the left [Ctrl] key, then press [F4] (show) and [F3] (station 3).

NOTES

The left [Ctrl] key starts *all* ServSwitch Professor commands—it cues the Professor to look for commands from the keyboard. You then have two seconds in which to start entering a valid command.

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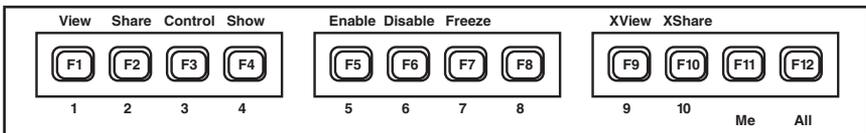

Figure 3-4. The Professor's keyboard template.

4. Operation

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

   Section 4.2 summarizes the Professor's keyboard commands, and **Section 4.3** describes these commands in detail. Keep in mind that only the instructor's System Control Module (SCM, our product code KV780A) responds to commands; Student Modules (STMs, our product codes KV781A and KV782A) ignore commands.

NOTES

To start any ServSwitch Professor keyboard command, you must press and release the left Control Key ([Ctrl]). Pressing and releasing [Ctrl] cues the Professor 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 Professor 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.

   Commands are not case-sensitive.

   You *must* press the [Enter] key to complete any command that requires a numeric operand.

4.1 Guidelines for Using the ServSwitch Professor with Your Equipment

4.1.1 CPUs

Use only IBM PC/AT or PS/2 or 100% compatible machines. The ServSwitch Professor does not support IBM PC/XT™ or compatible machines. It does not support machines that output CGA or EGA video.

4.1.2 MOUSE AND KEYBOARD

When you power up your ServSwitch Professor system, make sure that your CPUs, mice, and keyboards are properly cabled to each Professor. When you boot up your CPUs, the Professors to which they are connected should already be ON. (You should be able to freely disconnect and reconnect a mouse or keyboard from a ServSwitch Professor while the Professor is ON, but if you experience problems when you do this, issue the Reset command [CTRL] R—see **Section 4.3.24**).

The ServSwitch Professor 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. Do *not* try to use the Professor with any keyboard that uses nonstandard keys, connectors, or keyboard-scan modes.

Although the ServSwitch Professor 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 Professor, wait at least three seconds after powering down the Professor before powering it up again, or the keyboard might not reset correctly.

The ServSwitch Professor supports several types of IBM PC type mice, including PS/2 mice and RS-232 serial mice. The Professor does *not* support "wheel" mice such as the Microsoft IntelliMouse®.

Because the ServSwitch Professor currently only supports "stream mode" (continuous) mouse data but older IBM ThinkPad models have to handle mouse data in "prompt mode" (burst-on-request), don't try to attach any older ThinkPad computers to the Professor, either directly or through docking stations. Some newer models should work with the Professor, but there's no good way to tell other than by trial and error. (You can't damage your equipment by trying—if you have the wrong kind of ThinkPad, it just won't work.)

Make sure that the CPUs attached to the system use only the generic Microsoft mouse driver `MOUSE.COM`, version 4.0 at least and preferably version 9.01 or higher. If you're running Windows® 3.x, this driver must be loaded in Windows as well as in DOS. Do not, on any of your switched 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, you might notice some variation in mouse sensitivity (how far or fast the mouse moves) from CPU to CPU. This is normal. To optimize mouse movement, adjust the sensitivity on each CPU according to your individual preference. (This is usually handled through some kind of software "control panel," but the specifics vary depending on the operating system and on the mouse driver.)

4.1.3 MONITOR

NOTE

At resolutions up to 1024 x 768, video quality will be excellent for most Professor applications. At higher resolutions, however, it might not be possible to avoid seeing some fuzziness on your monitors.

The ServSwitch Professor is designed to support standard VGA video, including VGA monochrome ("page white"). It doesn't support PCs that use CGA, EGA, or proprietary VGA variants. If your PC's manual doesn't tell you whether or not the PC uses standard VGA, consult with the PC's or the video card's manufacturer.

The Professor is also designed to support SVGA (Super VGA) video, although it doesn't handle higher resolutions very well without coaxial CPU and User Cables. With coaxial cables, it will also support XGA.

Table 4-1 shows the marked decline in SVGA quality that can result if you try to use original Serv type cables with higher resolutions or across longer distances. The distances listed are total lengths of original Serv cable between a CPU and monitor; they do *not* include any bus-cable length, because the bus cable can carry even high-resolution video as far as 250 ft. (76.2 m) without significant degradation.

Table 4-1. 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; small reflections around text lettering depending on the color; screen defects 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 CPU and User Cables (required for XGA applications, and recommended for most other applications) do much better at maintaining video quality, as shown in Table 4-2. (For the meaning of quality numbers **3**, **2**, and **1**, see the bottom of the previous page.) The distances in the table are total lengths of coaxial CPU and User Cable between the CPU and the monitor; as before, these measurements do *not* include any bus-cable length.

Table 4-2. 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 Professor-to-CPU or Professor-to-monitor runs over 100 feet (30.5 m), Station Extenders or CAT5 KVM Extenders might be required. Call Black Box for technical support to discuss this option.

4.2 Keyboard-Command Summary

Table 4-3 below and on the next three pages summarizes the commands that can be sent to the ServSwitch Professor. To enter any command at the shared keyboard, first press and release the left Control Key, represented by "[CTRL]." (This cues the Professor to look for commands from that keyboard.) Then enter the command followed by any arguments you wish to specify (the station 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 Professor from getting stuck waiting for you to finish the command.

The [CTRL] character is always passed through to the CPU, but cues the Professor to accept commands. 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 Professor becomes badly misconfigured; see **Section 5.1**.

Table 4-3. The ServSwitch's keyboard commands.

Command	Keystroke Sequence	Description
View Station	**[CTRL][F1]** *st* ***[ENTE**	View CPU display and activity at station.
Share Station	**[CTRL][F2]** *st* ***[ENTE**	Share control of the CPU at station.
Control Station	**[CTRL][F3]** *st* ***[ENTE**	Take sole control of the CPU at station.
Show to Station	**[CTRL][F4]** *st* ***[ENTE**	Show instructor's video to station.
Enable Station	**[CTRL][F5]** *st* ***[ENTE**	Enable keyboard, mouse, and monitor at station.
Disable Station	**[CTRL][F6]** *st* ***[ENTE**	Disable keyboard, mouse, and monitor at station.
Freeze Station	**[CTRL][F7]** *st* ***[ENTE**	Disable keyboard and mouse at station.

*st = Station: Either any station number, [F1] through [F10] for student station 1 through 10, [F11] for the instructor's station, or [F12] for all students' stations.

Table 4-3 (continued). The ServSwitch's keyboard commands.

Command	Keystroke Sequence	Description
XView Station at Station	`[CTRL] [F9] st1*` `[ENTER] st2*`	Allow the student(s) at station1 to view the CPU display and activity at station2.
XShare Station with Station	`[CTRL] [F10] st1*` `[ENTER] st2*`	Allow the student(s) at station1 to share control of the CPU at station2.
Select Station	`[CTRL] xxx [ENTER]` (*xxx* = a 1- to 3-digit station number)	View CPU display and activity at station *xxx*.
Switch to the Next Station in Numeric Order	`[CTRL] +`	Switches to the next station in sequence (view-only access).
Switch to the Previous Station in Numeric Order	`[CTRL] –`	Switches to the previous station in sequence (view-only access).
Switch to the Previously Selected Station	`[CTRL] [BACKSPACE]`	Switches back to the station you were connected to before you selected the current one (view-only access). (Issuing this command repeatedly will cause the Professor to switch back and forth between two stations.)
Scan ON	`[CTRL] S`	Turns Scan mode ON, causing the ServSwitch to start scanning sequentially from the current station through the remaining stations until the Maximum Scan Station is reached, and then begin again at the Minimum Scan Station. If scan is ON when you issue the Keep Settings command, the unit will power up in scan mode.
Scan OFF	`[CTRL] X`	Turns Scan mode OFF, giving the instructor view-only access to the station being scanned at the time the command is entered. Issuing the Keep Settings command after you issue this command will also turn power-on scanning OFF. Note: Scan can also be stopped by entering a station-selection command.

st1, st2 = Stations 1 and 2: Either any station number, [F1] through [F10] for student station 1 through 10, [F11] for the instructor's station, or [F12] for all students' stations.

Table 4-3 (continued). The ServSwitch's keyboard commands.

Command	Keystroke Sequence	Description
Keep Settings	`[CTRL] K`	Enter this command after you enter any of the following ten commands (it saves new settings to nonvolatile memory):
Set Scan-Delay Time	`[CTRL] Txx [ENTER]` (*xx* = delay in seconds from 1 to 15)	Sets the time, in seconds, that the ServSwitch will pause at each station when scanning.
Set Minimum Scan Station	`[CTRL] <xxx [ENTER]` (*xxx* = station address)	Sets the lowest-numbered station that will be scanned and sequentially switched to.
Set Maximum Scan Station	`[CTRL] >xxx [ENTER]` (*xxx* = station address)	Sets the highest-numbered station that will be scanned and sequentially switched to.
Set Screen Saver's Delay Time	`[CTRL] Vxxx [ENTER]` (*xxx* = delay in seconds from 0 to 999)	Sets the time of inactivity, in seconds, after which the Professor will blank the screen of the monitor attached to the selected station. (The monitor is reactivated when the mouse is moved or any key on the shared keyboard is pressed.)
Set Keyboard Timeout	`[CTRL] Hxxx [ENTER]` (*xxx* = delay in seconds from 0 to 255)	Sets the time of keyboard inactivity, in seconds, that must elapse before another keyboard can take control of the CPU attached to the selected station. (Zero is an instant timeout; 255 disables the timeout.)
Set Keyboard Mode	`[CTRL] Mx [ENTER]` (*x* = 1, 2, or 3)	Tells the Professor the keyboard mode expected by the CPU attached to the selected station.
Set Keyboard Typematic	`[CTRL] Axxx [ENTER]` (*xxx* = a decimal value from 0 to 127)	Sets the keyboard typematic (automatic key-repeat) function of the CPU attached to the currently selected station.
Set Mouse Translation	`[CTRL] Qx [ENTER]` (*x* = 0, 1, or 2)	Q1 turns on PS/2 to RS-232 mouse translation for all user stations. Q2 turns on RS-232 to PS/2 translation for all stations. Q0 turns off mouse translation for all stations (mouse type is autodetected).
Set Power-On Station	`[CTRL] J` (with station selected)	Designates the current station as the one that should be selected when the unit is powered up.
Set Access Level	`[CTRL] Lx [ENTER]` (*x* = 1 or 4)	L4 gives a student station command-level (instructor) access. L1 turns this off.

Table 4-3 (continued). The ServSwitch's keyboard commands.

Command	Keystroke Sequence	Description
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 4.3.25**).
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.

4.3 The Commands in Detail

IMPORTANT NOTE ABOUT ADDRESSES IN COMMANDS

Sections 4.3.1 **through** 4.3.9 **discuss the commands that manipulate station controls and displays. These commands share the common format, "[Ctrl] [function key] station_address [Enter] (station_address_2 [Enter])," where each "station_address" is the address of the station or CPU for which the command is intended. The station address can be designated with any of several different keystrokes or sets of keystrokes:**

- **A one- to three-digit number (required for any station with an address greater than 10)—as always, use the numeral keys from the top of the keyboard, not from the numeric keypad;**
- **[F1] through [F10] for stations 1 through 10 respectively;**
- **[F11] for the instructor's station ("Me"); or**
- **[F12] for all students' stations ("All").**

4.3.1 VIEW STATION

The View Station command is used to observe a student's screen. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F1] key, designating a station address (CPU number; see the Note above), and pressing [Enter]. While you are in View mode, the System Control Module will discard all non-command data coming from your keyboard and mouse.

Issuing the View Station command with a station address of All ([F12]) will turn scan mode ON. Issuing the View Station command with a station address of Me ([F11]) will restore you (the instructor) to a normal connection with your own CPU.

4.3.2 SHARE STATION

The Share Station command is used to interact with a student. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F2] key, designating a station address (CPU number; see the Note on the previous page), and pressing [Enter]. All keyboard and mouse data is shared according to the keyboard-timeout setting (see **Section 4.3.18**). If the student is using the keyboard and mouse when you issue this command, the student will retain control until they stop using the keyboard and mouse; once they do so, after the keyboard and mouse have remained idle for the length of the student station's keyboard timeout, you (the instructor) can take control. You will retain control until *you* stop using the keyboard and mouse for the duration of *your* station's keyboard-timeout setting.

Issuing the Share Station command with a station address of All ([F12]) will turn scan mode ON. Issuing the Share Station command with a station address of Me ([F11]) will restore you to a normal connection with your own CPU.

ServSwitch Professors that are sharing the same CPU will synchronize their keyboard Lock states: Any of Num Lock, Caps Lock, or Scroll Lock that are ON at the shared station's keyboard when sharing begins will be turned ON at all sharing keyboards; any that are OFF will be turned OFF. If anyone at any of the sharing keyboards turns one of these Locks ON or OFF later, it will be turned ON or OFF at all of the sharing keyboards.

4.3.3 CONTROL STATION

The Control Station command is used to gain full control of a student's computer. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F3] key, designating a station address (CPU number; see the Note on the previous page), and pressing [Enter]. The student's keyboard will be locked out and you (the instructor) will have exclusive use of the student's CPU.

Issuing the Control Station command with a station address of All ([F12]) will turn scan mode ON. Issuing the Control Station command with a station address of Me ([F11]) will restore you to a normal connection with your own CPU.

4.3.4 SHOW TO STATION

The Show to Station command is used to show the instructor's screen to any or all students. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F4] key, designating a station address (CPU number; see the Note on the previous page), and pressing [Enter]. You (the instructor) will retain control of your own CPU; the student(s) will not be able to access it.

Issuing the Show to Station command with a station address of All ([F12]) will send your screen to all students. Issuing the Show to Station command with a station address of Me ([F11]) will stop sending your screen to other stations.

4.3.5 ENABLE STATION

The Enable Station command restores any or all students' keyboards, mice, and monitors to normal connections with their own CPUs after you (the instructor) have restricted their access with the Disable Station or Freeze Station command (see **Section 4.3.6** or **4.3.7** respectively). Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F5] key, designating a station address (CPU number; see the Note at the start of **Section 4.3**), and pressing [Enter].

Issuing the Enable Station command with a station address of All ([F12]) will restore all students' CPUs. Issuing the Enable Station command with a station address of Me ([F11]) will restore you to a normal connection with your own CPU.

4.3.6 DISABLE STATION

The Disable Station command blanks any or all students' screens and locks their keyboards and mice. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F6] key, designating a station address (CPU number; see the Note at the start of **Section 4.3**), and pressing [Enter].

Issuing the Disable Station command with a station address of All ([F12]) will disable all students' CPUs. Issuing the Disable Station command with a station address of Me ([F11]) will have no effect.

4.3.7 FREEZE STATION

The Freeze Station command keeps any or all students' screens active but locks their keyboards and mice. Issue the command by pressing and releasing the left [Ctrl] key, pressing the [F7] key, designating a station address (CPU number; see the Note at the start of **Section 4.3**), and pressing [Enter].

Issuing the Freeze Station command with a station address of All ([F12]) will freeze all students' CPUs. Issuing the Freeze Station command with a station address of Me ([F11]) will have no effect.

4.3.8 XView Station at Another Station

The XView Station at Another Station command is used to allow one or more students to observe a fellow student's screen. Issue the command by:

- pressing and releasing the left [Ctrl] key,
- pressing the [F9] key,
- designating the *viewing* station address (the address of the station[s] that will be watching),
- pressing [Enter],
- designating the *viewed* address (the address of the station whose CPU activity will be watched), and
- pressing [Enter] again.

Refer to the Note at the start of **Section 4.3**.

Issuing the XView Station at Another Station command with a viewing station address of All ([F12]) will broadcast the viewed station's screen to all students and to you. Alternatively, you can issue several XView commands in succession to designate only a subset of students to view the other student's screen. For example, [Ctrl][F9][F2][Enter][F3][Enter] followed by [Ctrl][F9][F4][Enter][F3][Enter] shows station 3's video to both station 2 and station 4. (However, the ServSwitch Professor's bus will only handle video data from a single source at any given time, so although multiple students can view a single student's video at the same time, student A can't view student B's video while student C looks at student D's video or while you, the instructor, share control of student E's CPU.)

While student stations are in XView mode, their Student Modules will discard all of their keyboard and mouse data.

Issuing the XView Station at Another Station command with a *viewing* station address of Me ([F11]) will cause the Professor system to behave just as if you had entered the View Station command (see **Section 4.3.1**). Issuing the XView command with a *viewed* station address of Me ([F11]) will cause the Professor system to behave just as if you had entered the Show to Station command (see **Section 4.3.4**). The Professor will ignore any XView command with a *viewed* station address of All [F12].

To dissolve all XView relationships and return the Professor system to normal operation (each student viewing and controlling his or her own CPU), send the Enable All Stations ([Ctrl][F5][F12][Enter]) command (see **Section 4.3.5**).

4.3.9 XSHARE STATION WITH ANOTHER STATION

The XShare Station with Another Station command is used to allow one or more students to share control of a CPU with one of their fellow students. Issue the command by:

- pressing and releasing the left [Ctrl] key,
- pressing the [F10] key,
- designating the *sharing* station address (the address of the station[s] that will be sharing a CPU that isn't theirs),
- pressing [Enter],
- designating the *shared* address (the address of the station whose CPU will be shared), and
- pressing [Enter] again.

Refer to the note at the start of **Section 4.3**.

When you issue the XShare command, the two or more stations involved share keyboard and mouse control according to the keyboard-timeout setting (see **Section 4.3.18**). (Note that the ServSwitch Professor system will not apply the keyboard timeout of the shared station to all of the sharing students; rather, it will use the different timeouts that you've individually set for each of those students' stations.) If the student at the shared station is using the keyboard and mouse when you issue this command, that student will retain control, but any of the other sharing students can take control as soon as the student at the shared station stops using the keyboard and mouse for the duration of their keyboard-timeout setting. The student that then takes control will retain that control until *they* stop using the keyboard and mouse for the duration of *their* keyboard-timeout setting.

Issuing the XShare Station with Another Station command with a viewing station address of All ([F12]) will divide control of the shared station's CPU among all students and yourself. Alternatively, you can issue several XShare commands in succession to designate only a subset of students to share control of the shared station. For example, [Ctrl][F10][F6][Enter][F8][Enter] followed by [Ctrl][F9][F7][Enter][F8][Enter] will cause stations 6, 7, and 8 to share control of student 8's CPU. (However, the ServSwitch Professor's bus will only handle video data from a single source at any given time, so although multiple students can share a single student's CPU at the same time, student A can't share student B's CPU while student C shares student D's CPU or while you, the instructor, view student E's video.)

Issuing the XShare Station with Another Station command with a *sharing* station address of Me ([F11]) will cause the Professor system to behave just as if you had entered the Share Station command (see **Section 4.3.2**). Issuing the XShare command with a *shared* station address of Me ([F11]) will actually allow students to share control of your CPU. (Remember that even though students might be in control of your CPU, your ServSwitch Professor System Control Module will always respond instantly to your keyboard commands.)

The Professor will ignore any XShare command with a *shared* station address of All ([F12]).

ServSwitch Professors that are sharing the same CPU will synchronize their keyboard Lock states: Any of Num Lock, Caps Lock, or Scroll Lock that are ON at the shared station's keyboard when sharing begins will be turned ON at all sharing keyboards; any that are OFF will be turned OFF. If anyone at any of the sharing keyboards turns one of these Locks ON or OFF later, it will be turned ON or OFF at all of the sharing keyboards.

To dissolve all XShare relationships and return the Professor system to normal operation (each student viewing and controlling his or her own CPU), send the Enable All Stations ([Ctrl][F5][F12][Enter]) command (see **Section 4.3.5**).

4.3.10 SELECT STATION

Instead of using the View, Share, or Control Station command to switch to a student's station, you can use this command to select any station directly. To do so, press and release your keyboard's left [Ctrl] key, type in the station address, and press [Enter]. Do *not* try to use the function keys as a shortcut for stations 1 through 10—the Professor will interpret this as a different command instead. Also remember to use the numbers located at the top of your keyboard; do *not* use the numeric keypad.

   This command will give you view-only access, as if you had entered a View Station command (see **Section 4.3.1**). To gain shared or sole keyboard and mouse control, you'll need to issue a Share Station or Control Station command (see **Section 4.3.2** or **4.3.3** respectively).

4.3.11 SWITCH TO THE NEXT OR PREVIOUS STATION IN NUMERIC ORDER

From the keyboard you can go forward or backward through the ServSwitch Professor's stations by selecting either the next or the previous station respectively. To switch to the next station, press and release the left [Ctrl] key, then press the plus key (the key at the top of the keyboard marked with [=] and [+]). To switch to the previous station, 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 Professor doesn't recognize these.

   These commands will give you view-only access, as if you had entered a View Station command (see **Section 4.3.1**); to gain shared or sole keyboard and mouse control, you'll need to issue a Share Station or Control Station command (see **Section 4.3.2** or **4.3.3** respectively).

   You can use these commands to switch only to those stations within the range defined by the current Minimum Scan Station and Maximum Scan Station settings (see **Section 4.3.16**.) If you issue a Next Numeric Station command when you're connected to the Maximum Scan Station (or to a higher-numbered station that you've switched to by other means), the command will cause the Professor to "wrap around" and switch to the Minimum Scan Station. Similarly, if you issue a Previous Numeric Station command when you're connected to the Minimum Scan Station (or to a lower-numbered station that you've switched to by other means), the command will cause the Professor to wrap in the opposite direction and switch to the Maximum Scan Station. Lastly, the Professor will switch to the Minimum Scan Station if you enter a Next Numeric Station command from any lower-numbered station, and it will switch to the Maximum Scan Station if you enter a Previous Numeric Station from any higher-numbered station.

4.3.12 SWITCH TO THE PREVIOUSLY SELECTED STATION

You can use this command—which causes the Professor to switch back to the station you had previously selected before selecting the station you're currently connected to—as a convenient method of switching back and forth between two stations/CPUs. (This is especially useful when you have many CPUs, so that you can avoid entering the multi-digit station numbers.) To switch to the previously selected station, press and release the left [Ctrl] key, then press the [Backspace] key. This will give you view-only access, as if you had entered a View Station command (see **Section 4.3.1**); to gain shared or sole keyboard and mouse control, you'll need to issue a Share Station or Control Station command (see **Section 4.3.2** or **4.3.3** respectively).

4.3.13 TURN SCAN MODE ON OR OFF

To start scanning (switching from station to station in a continuous rotation) from the keyboard, press and release the left [Ctrl] key, then press [S]. The ServSwitch Professor will begin scanning sequentially from your currently selected station. If the currently selected station is within the range defined by the current Minimum Scan Station and Maximum Scan Station settings (see **Section 4.3.16**.), the Professor will scan through the higher-numbered stations until it reaches the Maximum Scan Station, then begin again at the Minimum Scan Station. If the currently selected station is outside that range, the Professor will switch to the Minimum Scan Station first, *then* begin scanning.

   As it scans, the Professor delays 1 to 15 seconds at each station. (This "Scan-Delay Time" is user-selectable; see **Section 4.3.15**.) To stop scanning, press and release [Ctrl], then press [X]; you can also stop a scan by entering a station-selection command. (Remember that ServSwitch Professor letter commands are not case-sensitive: You can enter upper- or lower-case letters.)

   If you want the Professor to begin scanning immediately at power-up, issue the Keep Settings ([Ctrl][K]) command (see the next section) while the unit is scanning. In order to maintain this setting, however, you'll need to be very careful, because power-up scanning is just as easily turned off by ending a scan with [Ctrl][X] and then issuing a Keep Settings command. This means that if you end a scan with [Ctrl][X], then change a configuration setting and issue Keep Settings *at any time afterward before you scan again*, power-on scanning will be turned off. To maintain power-on-scanning as the ServSwitch Professor's default state, you need to do one of two things:

- *Always* end your scans by selecting a specific station with commands such as View Station or Select Station.

- *Never* issue a Keep Settings command except while the Professor is scanning.

4.3.14 KEEP SETTINGS

The Keep Settings command causes *all* of the ServSwitch Professors in your system to save their keyboard-selectable settings to their nonvolatile memory (NVRAM), after which they become the new default (loaded at power-up) settings. To enter the command, press and release the left [Ctrl] key, then type [K]. The ten keyboard-selectable settings are described in the next nine sections.

4.3.15 SET SCAN-DELAY TIME

Issue the Set Scan-Delay Time command to set the time, in seconds, that the ServSwitch Professor will pause at each of the stations when it's scanning them. The factory-default setting is 5 seconds. To set a different delay time, press and release the left [Ctrl] 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.

4.3.16 SET MINIMUM AND MAXIMUM SCAN STATIONS

The Minimum and Maximum Scan Stations commands set the range of stations for which scanning and numeric-order switching occurs. The default Minimum Station is 1, the default Maximum Station is 16. To set the Minimum Station, press and release the left [Ctrl] Key, type [<], enter the address of the new Minimum Scan Station and press [Enter]. To set the Maximum Station, press and release the left [Ctrl] Key, type [>], enter the address of the new Maximum Scan Station and press [Enter]. Issue the Keep Settings command after you enter these commands to save the settings.

   Be careful not to accidentally set the Minimum Scan Station to an address higher than the Maximum Scan Station; if you do, scanning will not work.

IMPORTANT NOTE FOR THE FOLLOWING SEVEN COMMANDS

Each of the seven commands described in the next seven sections involves configuring stations. In order to configure any station, you *must* first select that station with one of the station-selection commands described in Sections 4.3.1 **through** 4.3.3 **(View Station, Share Station, or Control Station) or** Sections 4.3.10 **through** 4.3.12 **(Select Station, Switch to Next Station, Switch to Previous Station, or Switch to Previously Selected Station).**

4.3.17 SET SCREEN-SAVER INTERVAL

This feature reduces the wear on your monitor screens and provides security for your system by blanking the screens when there has been no keyboard activity for a specified length of time. (The ServSwitch Professor will also shut off all of its LEDs when this "screen-saver mode" is active.) To set the screen-saver interval for a station, first select that station (see the Note above), then press and release the left [Ctrl] 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).

4.3.18 SET KEYBOARD TIMEOUT

This is a very powerful feature that controls access when two or more keyboards are sharing a CPU. The setting of this time-interval value determines after what amount of time a CPU becomes available for use by another keyboard.

Each ServSwitch Professor loads this timeout value (individually configurable for each station) when it powers up, then reinitializes the value every time it detects any activity on the keyboard or mouse that is currently controlling it. This process is repeated any time you connect to a student's CPU with the Share Station command, or when you connect one or more students to your CPU or to another student's CPU with the XShare command: Your keyboard's timeout or that of any sharing student's keyboard is loaded and is reinitialized every time any keyboard or mouse activity occurs. If there is no keyboard or mouse activity for the length of this time interval, the CPU becomes available for control by another station.

Each ServSwitch Professor can have a different timeout value set for its attached keyboard, from 0 to 254 seconds (or 255 to disable the timeout—see the next page). If a station's CPU is being controlled by a user at another station, it is the keyboard timeout of the *user's* station that will be used to determine when the CPU becomes available.

If you set a station's timeout for zero, the timeout becomes "instant": The keyboards of two stations each set for a zero timeout and connected to the same CPU will appear to be sending data to the CPU simultaneously, because keystrokes from either one will be accepted at any time. If you set a station's timeout to 255, the timeout becomes "infinite" (that is, the timeout is disabled): Any CPU controlled by the keyboard on that station will not be released until either (a) the user on that keyboard switches or is switched to another CPU, or (b) you change the keyboard timeout of the *user's* station.

The factory-default keyboard-timeout setting for each station is two seconds. To set a different interval for a given station, first select that station (see the Note on the previous page), then press and release the left Control Key, type [H], type in the new keyboard-timeout interval in seconds, and press [Enter]. Then issue the Keep Settings command to save the setting.

For example, to change the keyboard timeout on your instructor station (the System Control Module) to 30 seconds, make sure you have your own station selected, then type in [Ctrl][H][3][0][Enter], then type in [Ctrl][K][Enter]. Or, to change the keyboard timeout on station 4 to 15 seconds, connect to station 4 with any of the station-selection commands—for example, View Station 4 ([Ctrl][F1][F4])—then type in [Ctrl][H][1][5][Enter], then type in [Ctrl][K][Enter].

4.3.19 SET KEYBOARD MODE

Keyboard "modes" are electrical signaling protocols that determine how a powered CPU and keyboard interact. A CPU and keyboard must use the same mode in order to work with each other. Of the three standard 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-key and PS/2 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 Professor supports all three of these modes: As it receives signals from any of the station keyboards, it sends them to the corresponding CPU by emulating a keyboard of the appropriate mode for that CPU; as it receives signals for one of the keyboards from the CPU, it sends them to that 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. If your CPU is a mode 1 or mode 3 type, the Professor can use these commands to automatically detect the CPU's keyboard mode when you turn on the CPU *after* it has been cabled to the Professor. However, the Professor doesn't automatically save this value; unless you send it a Keep Settings command, it will forget the mode it has detected when it is turned off or loses power, then default to the most recently saved setting when it's powered up again. (For this reason, if you're using mode 1 or mode 3 CPUs at any of your Professor stations, you will probably want to change the default keyboard mode of those stations at installation time.)

The ServSwitch Professor's factory-default keyboard-mode setting is mode 2. Send the Set Keyboard Mode command to change the keyboard mode if:

• the CPU uses mode 2, but the Professor's default keyboard-mode setting was changed previously, or

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

To set the keyboard mode at a particular station, first select that station (see the Note above **Section 4.3.17**), then press and release the left [Ctrl] key, type [M], and press the numeral key of the mode number ([1], [2], or [3]). After you enter this command, 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).

4.3.20 SET KEYBOARD TYPEMATIC

Most 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. 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 user or for a given application.

To change the keyboard's typematic setting at a particular station, first select that station (see the Note above **Section 4.3.17**), then 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 4-4 below and Table 4-5 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), type in [Ctrl][A][3][9][ENTER].

Issue the Keep Settings command after you enter this command.

Table 4-4. Typematic delay.

Decimal Value	Binary Bit Values	Delay Before Key Repeats
0	00[*xxxxx*]	¼ second (250 ms)
32	01[*xxxxx*]	½ second (500 ms)
64	10[*xxxxx*]	¾ second (750 ms)
96	11[*xxxxx*]	1 second (1000 ms)

Table 4-5. 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

4.3.21 SET MOUSE TRANSLATION

If the mice at all of your user stations are the same type (PS/2 or RS-232 serial) as the mouse port of all of your CPUs, you can control the CPU from any station without having to reconfigure the system at all. But if some of your mice are not the same type as the CPU's mouse port, you might need to turn mouse translation on.

If your CPU is connected to the ServSwitch Professor through a serial mouse port, but one or more of your stations have PS/2 mice, turn on PS/2 to RS-232 translation at those stations: First select one of the affected stations (see the Note above **Section 4.3.17**), then press and release the left [Ctrl] key, type [Q][1], and press [Enter].

If instead your CPU's mouse port is PS/2 type but there are serial mice at any of your stations, turn on RS-232 to PS/2 translation at those stations: First select one of the affected stations (again, see the Note above **Section 4.3.17**), then press and release the left [Ctrl] key, type [Q][2], and press [Enter].

To turn off mouse translation at a station, select that station (yet again, see the Note above **Section 4.3.17**), press and release the left [Ctrl] key, type [Q][0], and press [Enter]. (This is the default setting for mouse translation.)

After you change the mouse-translation setting, issue the Keep Settings command.

4.3.22 SET POWER-ON STATION

Sometimes you might want to set the ServSwitch Professor system to automatically connect you to a station/CPU other than your own when the system is powered up. If you do, you will be given view-only access to that station, as if you had entered the View Station command.

To designate your Power-On Station, select that station (see the Note above **Section 4.3.17**), press and release the left [Ctrl] key, then type [J]. Issue the Keep Settings command after you enter this command.

4.3.23 SET ACCESS LEVEL

We urge you to be very careful when using this command, because its main purpose is to allow commands to be entered from a student station. Normally the access level for student stations is "4" (commands ignored), while the access level for the instructor station (the System Control Module) is "1" (commands accepted). If a situation arises, however, in which you need the ServSwitch Professor system to accept commands from a student station—for example, if you need to go to a student station to troubleshoot a problem a student is having, or if you have a responsible teaching assistant that you want to be able to issue commands—use this command to change a student station's access level to "1."

To change a station's access level to "1," select that station (see the Note above **Section 4.3.17**), press and release the left [Ctrl] key, then type [L][1][Enter]. To change a station's access level to "4," select that station (see the Note above **Section 4.3.17**), press and release the left [Ctrl] key, then type [L][4][Enter]. After you change the access level, issue the Keep Settings command if you want this setting to remain in effect until you change it.

Note that if you should accidentally set your instructor station to access level "4," you will not be able to enter commands from your station. This is easily solved, however, even if you've since issued the Keep Settings command. Simply power down your System Control Module, then power it back on; once it reads the "255" address on its DIP switch, it will know it is an instructor station and will resume accepting commands.

CAUTION!

Do *not* issue this command with any argument other than "1" or "4." This command's other arguments are reserved for factory testing. If you issue this command with some other argument, your ServSwitch Professor system could—in fact, probably *will*—behave unpredictably.

4.3.24 RESET

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

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

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

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

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

Regular 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, an active CPU in a ServSwitch Professor system can lose one or two bytes of this control information and get "out of sync" with the mouse that's controlling it. 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 Professor 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 [Ctrl] 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 Professor 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 are running DOS or any variety of Windows and would like to upgrade your Microsoft mouse driver.

4.3.26 IDENTIFY ROM

Unfortunately, as with all complex equipment, problems might arise with your ServSwitch Professor 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 the ROM in each of your ServSwitch Professors. This command causes the currently selected Professor station to send the four-character "CVxy" ROM level—where "CV" is our factory reference to the Professor, x is the major-revision number, and y is the minor-revision number—to the attached 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 Professor's response.) For example, if a station responds with "CV35," its ROM is programmed with version 3.5 of the ServSwitch Professor firmware.

To issue the Identify ROM command, first select the station as described in the Note above **Section 4.3.17** (although with this command you're getting information about the unit rather than configuring it), then press and release the left [Ctrl] key, then type [I].

5. Troubleshooting

The first two sections of this chapter discuss things to try when problems arise in a ServSwitch Professor system. If the trouble you're having with the Professor is something you haven't seen before, or if the trouble seems minor, try the procedures detailed in **Section 5.1** before doing anything else. If the trouble is chronic, see **Section 5.2**, which suggests possible causes and solutions to frequently encountered problems. If those suggestions don't help, **Sections 5.3** and **5.4** discuss what's involved in calling Black Box and shipping your Professor.

5.1 Restoring Factory-Default Settings

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

1. Turn OFF (but do not unplug) the Professor and the CPU attached to it. Disconnect that Professor from the bus cable and thus from the rest of your ServSwitch Professor system.

2. Look at the configuration (address) DIP switch on the bottom of the Professor. Set the Professor's address to 0 (all DIP-switch positions DOWN).

3. Turn the Professor back ON. After it powers up, change its address to 1 (the rightmost DIP-switch position UP, all other positions DOWN).

4. Wait two seconds, then turn the Professor back OFF again.

5. Set the Professor back to its normal address.

6. Reattach the bus cable and turn the Professor back ON. Turn the attached CPU back on.

The unit should be restored to its factory-default settings. See **Appendix A** for a list of these.

   Now reconfigure the unit to your desired settings. If you're still having difficulty, refer to **Section 5.2**. If it doesn't help you to solve your problem, call Black Box for technical support.

5.2 Common Problems

A ServSwitch Professor's STATUS LED continuously flashes three times per second, and the Professor does not respond.

A. This Professor unit might be set to the same address as another unit in your system. Check all of your units; if you find another one that also seems to be disabled and whose STATUS LED is flashing the same way, change the address of one of the units so that the addresses no longer match. See **Section 3.3.1**.

B. If this Professor unit is the only one in your system with this problem, the unit has failed its self-test because one of its components is defective or has gone bad. Call Black Box Technical Support to arrange to have it repaired (see **Section 5.3**).

A CPU connected to a ServSwitch Professor doesn't boot, and you get a keyboard or mouse error.

A. First make sure the ServSwitch Professor is plugged in and powered up.

B. If the Professor is ON, the keyboard and mouse settings for the attached CPU might not be correct. Make sure which type of keyboard and mouse input the CPU is expecting, then send an appropriate pair of Set Keyboard or Mouse commands (see **Section 4.3.19**) to make sure those settings are correct.

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

D. If you don't find a cable error, swap in different keyboards/mice one at a time. If the problem goes away when you substitute a device, the old one might be bad.

E. If swapping input devices doesn't help, swap 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 connecting the CPU to either (a) a known-good ServSwitch Professor or (b) a known-good keyboard and mouse. If the CPU boots when it's connected to a different unit, or directly to a keyboard and mouse, the Professor it was connected to is probably defective.

G. 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 doesn't boot with its original equipment, something in the CPU is defective; call the CPU's manufacturer. If the CPU *does* boot, there's some unusual mismatch between that CPU and the shared monitor, keyboard, or mouse; call Black Box Tech Support.

You can't select stations from the keyboard.

A. Can you do *anything* from the keyboard? If not, the keyboard segment of your User Cable has probably come loose. Reconnect it.

B. The CPU on that station is probably busy (being used by someone else). Wait a while and try again, or issue a Control Station command (see **Section 4.3.3**) to attempt to take control of the CPU immediately.

C. The station you're trying to switch to might be powered off, or the bus cable might be disconnected at some point. Check the STATUS LED on your Professor unit (the System Control Module): If it is not flashing at one-second intervals, either there is something wrong with the bus cabling (disconnected, not terminated properly, etc.) or there are currently no other powered units on the bus.

D. The ServSwitch Professor 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.

E. The keyboard mode that the currently selected station is set to output might not match the mode that the CPU on that station expects. Issue the Set Keyboard Mode command to change the station's output keyboard mode (see **Section 4.3.19**). 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.

F. For PS/2 type equipment, if the keyboard and mouse strands of either your User Cable or the CPU Cable at the station you're trying to switch to have been reversed, plug them into the proper ports.

G. Check the station you're trying to switch to and make sure that it is powered on and that its CPU Cable is securely attached to it and to the computer.

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

Characters that you type come up wrong or missing.
The keyboard mode that the currently selected station is set for might not match the mode that the CPU on that station expects. See item E under the "You can't select stations from the keyboard" problem above.

You can't seem to scan or switch to certain stations at all.

Minimum Scan Station is set too high or Maximum Scan Station is set too low. Set these parameters to *exactly* match the lowest- and highest-numbered stations, respectively, that you want to be able to scan and switch to (see **Section 4.3.16**).

The Professor scans or switches to empty or nonexistent stations.

Minimum Scan Station is set too low or Maximum Scan Station is set too high. Set these parameters to *exactly* match the lowest- and highest-numbered stations, respectively, that you want to be able to scan and switch to (see **Section 4.3.16**).

Your mouse driver doesn't load.

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 mouse, see steps C and D. If it's a Microsoft BallPoint mouse, see step D. The ServSwitch Professor does not support other types of mice.

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

C. PS/2 mouse: To recognize the mouse, the CPU must be directly connected to it, or indirectly connected to it through the ServSwitch Professor, at boot-up time. Make sure that all cables are properly seated and that the Professor is 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.

You can't access all the functions of your mouse.

A. What type of mouse is it? If it is any other type than those listed as being supported in item A under the "Your mouse driver doesn't load" problem, chances are that the ServSwitch Professor 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 Professor supports the two-button models but not the three-button models. (The Professor *does* support most other regular three-button PS/2 mice, not including "wheel" mice.)

Your PS/2 mouse gets out of sync.

Cabling might have been disturbed during mouse movement. Issue the Send Null Byte command (see **Section 4.3.25**) 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.

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 the "Your mouse driver doesn't load" problem, chances are that the ServSwitch Professor doesn't support it.

B. The mouse might not be configured properly.

C. Your mouse must be connected to a powered ServSwitch Professor when the attached CPU is booted and when applications that use the mouse are run. Try exiting and re-entering your application; if this doesn't work, issue the Reset command (see **Section 4.3.24**).

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. Total length of bus cable in your system should not be more than 250 ft. (76.2 m); total length of original CPU and User Cables between any station and a CPU or monitor should not be more than 5 ft. (1.5 m); total length of coaxial CPU and User Cables should not be more than 20 ft. (6.1 m) unless your CPUs can drive keyboard and mouse signals strongly enough. If you are already using coax CPU and User Cables, you might need to add Station Extenders or CAT5 KVM Extenders; call Black Box for technical support. See **Section 4.1.3** and **Appendix B**.

Your video is not synchronized or is the wrong color.

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

B. 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.

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

D. 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.

E. If swapping cables doesn't solve the problem, try plugging the CPU into a different ServSwitch Professor. If the problem goes away when the CPU is connected to a different Professor, the unit you were using is probably defective.

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.

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.

The ServSwitch Professor doesn't work with your IBM ThinkPad.

The ServSwitch Professor supports only "stream mode" (continuous) mouse data. It doesn't support the "prompt mode" (burst-on-request) method for handling mouse data that some older IBM ThinkPad models use, regardless of whether the ThinkPad is connected to the Professor directly or through a docking station (and see the next paragraph.

The ServSwitch Professor doesn't work with your docking station.

The ServSwitch Professor does not support most docking stations for portable computers.

The ServSwitch Professor doesn't work with your dongle-protected software.

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

5.3 Calling Black Box

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

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

- the nature and duration of the problem.

- when the problem occurs.

- the components involved in the problem.

- any particular application that, when used, appears to create the problem or make it worse.

- the results of any testing you've already done.

5.4 Shipping and Packaging

If you need to transport or ship your ServSwitch Professor:

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

- If you are shipping the Professor for repair, make sure you include its power supply and the CPU and User Cables you're using with it. If you are returning the Professor, 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 Professor's saveable options, the default values stored in nonvolatile memory (NVRAM) when the Professor is shipped from the factory. It also shows what commands or actions can change these settings for the Professor'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 station, 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); see **Section 4.3.13**	Can't be saved
Power-On Scan	OFF	**[CTRL] K** while scanning to turn on, **[CTRL] K** after ending scan with **[CTRL] X** to turn OFF; see **Section 4.3.13**	Changes saved auto-matically
Scan-Delay Time	5 seconds	Type **[CTRL] T*xx* [ENTER]** (*xx* = any 1- or 2-digit number from 1 to 15, time in seconds; see **Section 4.3.15**)	**[CTRL] K**
Minimum Scan Station	Station 1	Type **[CTRL] <*xxx* [ENTER]** (*xxx* = any 1- to 3-digit number up to 255; see **Section 4.3.16**)	**[CTRL] K**
Maximum Scan Station	Station 16	Type **[CTRL] >*xxx* [ENTER]** (*xxx* = any 1- to 3-digit number up to 255; see **Section 4.3.16**)	**[CTRL] K**
Screen Saver's Delay Time	0 (screen saver disabled)	Select station, then type **[CTRL] V*xxx* [ENTER]** (*xxx* = any 1- to 3-digit number; see **Section 4.3.17**)	**[CTRL] K**
Keyboard Timeout	2 seconds	Select station, then type **[CTRL] H*xxx* [ENTER]** (*xxx* = any 1- to 3-digit number up to 255; see **Section 4.3.18**)	**[CTRL] K**

Option		Factory-Default Setting	To Change	To Save Changes
Keyboard Mode		Mode 2	Select station, then type **[CTRL] M*x* [ENTER]** (*x* = 1, 2, or 3; see **Section 4.3.19**)	**[CTRL] K**
Keyboard Typematic		43 (delay of ½ second, rate of 10.9 characters per second)	Select station, then type **[CTRL] A*xxx* [ENTER]** (*xxx* = 0 to 127; see **Section 4.3.20**)	**[CTRL] K**
Mouse Translation		OFF (mouse type autodetected)	Select station, then type **[CTRL] Q*x* [ENTER]** (*x* = 0, 1, or 2; see **Section 4.3.21**)	**[CTRL] K**
Power-On Station		Each station connected to its own CPU at power-up	Select station, then type **[CTRL] J** (see **Section 4.3.22**)	**[CTRL] K**
Access Level		1 for instructor (System Control Module), 4 for students (Student Modules)	Select station, then type **[CTRL] L*x* [ENTER]** (*x* = 1 or 4; see **Section 4.3.23**)	**[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 Professor. 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 User Cables, these last three digits can be "001" (User 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 bus cables, Station Extenders, CAT5 KVM Extenders, etc. Depending on your equipment and the video resolution you're using, you might be able to use the Extenders to connect the Professor to a CPU or user station as much as 1000 ft. (300 m) away.

If your ServSwitch Professor system has cabling requirements that can't be met by what you see here, call Black Box for a possible quote on custom cables or adapters.

Standard User Cables:

Monitor Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 female)	IBM PC/AT (5-pin DIN female)	Serial RS-232 (DB9 male)	EHN052-0xxx
VGA (HD15 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN054-0xxx

Coaxial User Cables:

Monitor Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 female)	IBM PC/AT (5-pin DIN female)	Serial RS-232 (DB9 male)	EHN270-0xxx
VGA (HD15 female)	IBM PS/2 (6-pin mini-DIN female)	PS/2 (6-pin mini-DIN female)	EHN283-0xxx

Standard CPU Cables:

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

Coaxial CPU Cable:

Video Type (Connector on Cable)	Keyboard Type (Connector on Cable)	Mouse Type (Connector on Cable)	Product Code
VGA (HD15 male)	IBM PS/2 and PC/AT	PS/2 and serial RS-232	EHN282-0xxx

Coaxial Bus Cable: EHN275-0yyy, where "yyy" = 005, 025, 050, or 100

Station Extenders:

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

ServSwitch Professor to Monitor, Keyboard, and Mouse (RS-232 Mouse): AC255A

CPU to ServSwitch Professor (PS/2 Style Mouse): AC258A

ServSwitch Professor to Monitor, Keyboard, and Mouse (PS/2 Style Mouse): AC259A

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

CAT5 KVM Extenders (Kits include local and remote Extender modules and extension cables to CPU):

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

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

(Other CAT5 KVM Extender types are available. Call for more information.)

4-wire solid-core Category 5 UTP bulk cable, 1000-ft. (304.8-m) spool: EYN737A-1000

**AT→PS/2 Mouse Ghost (for PC/AT connections to the Extender):** AC244A

Keyboard Adapter (for PC/AT connections to the Extender): FA212

Appendix C: Rackmounting the ServSwitch Professor

If you'd like to mount any of your ServSwitch Professor units in a 19" rack, you'll need a 19" Rackmount Kit for Mini-Size Classic-Chassis ServSwitches (our product code SW727). Each of these Kits consists of one rackmounting shelf and four screws. To use one of these Kits to mount a ServSwitch Professor, take these steps, referring to Figure C-1:

1. Remove the adhesive-backed rubber feet from the bottom of the Professor.

2. Place the Professor on the rackmount shelf.

3. The Professor and the shelf are pre-drilled for mounting. Using the outermost pair of holes on either end of the shelf, screw the four self-threading screws included with the Kit through the bottom of the shelf and into the bottom of the Professor.

4. Mount the entire assembly in your rack using your own screws, bolts, or cage nuts (not included).

If you need a Kit like this for a 23" or 24" rack, call Black Box Technical Support for a special quote.
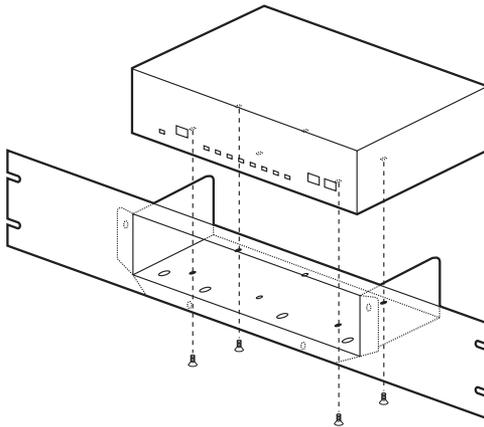
Figure C-1. Rackmounting the Professor.