



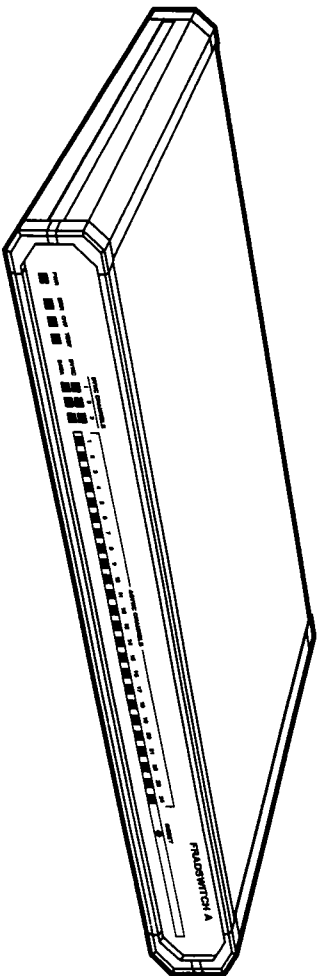
**Black Box Corporation**  
The World's Source for Calling and Network Connectivity™

JULY 1999

MT720A-232T-R2 MT721A-232T-R2 MT722A-232T-R2  
MT720A-35T-R2 MT721A-35T-R2 MT722A-35T-R2  
MT720AE-21T-R2 MT721AE-21T-R2 MT722AE-21T-R2

## Frads switch A

10/21/99 10:29



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# 1. Specifications

<b>Compliance</b> —	CE (EN 55022, EN 50082-1, EN 60950), FCC Part 15 Class A, IC Class / classe A
<b>Interfaces</b> —	<p>Async channels: EIA/TIA RS-232, DCE, proprietary pinned on RJ-45; Main-link ports (all DTE):</p> <p>Models with “232T” in their product codes: EIA/TIA RS-232/ITU-T V.24;</p> <p>Models with “35T” in their product codes: ITU-T V.35; Models with “21T” in their product codes: ITU-T X.21</p>
<b>Protocols</b> —	<p>Async channels (async only) and main-link ports set as async: ITU-T X.28 or IP/SLIP, user-selectable; supports IP encapsulation over X.25 (as per RFC 1356) or Frame Relay (as per RFC 1490); also supports dialup links for X.25 with X.32 protocols;</p> <p>Main-link ports set as sync:</p> <p>Packet switching: ITU-T X.25 or Frame Relay, user-selectable:</p> <p>X.25: Complies with ITU-T X.25 (1988), LAP-B; Frame Relay: Complies with ANSI T1.606, T1.617 Annex D, and T1.618, as well as ITU-T Q.922 Annex A; also supports CLM, LMI, and ANSI PVC management protocols;</p> <p>Data link (optional): HDLC, SDLC, or STM (proprietary), user-selectable; STM: Compatible with Star-4 (our product code MX864A), Star-8 (MX866A), and Star-24 (MX868A) statistical multiplexors;</p> <p>Management: SNMP</p>
<b>Packet Size</b> —	<p>X.25: Up to 4096 bytes (4 KB);</p> <p>Other protocols: Up to 8192 bytes (8 KB)</p>
<b>Data Rate</b> —	<p>Each async channel and each main-link port set as async: 75, 110, 150, 300, or 600 bps, or 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, or 115.2 Kbps, user-selectable;</p> <p>Main-link ports set as sync (aggregate): Any combination of data rates that, when added together, does not exceed 2.15 Mbps (user-selectable)</p>
<b>Clock Source</b> —	Internal or recovered from receive signal (independently user-selectable for receive and transmit paths)
<b>Flow Control</b> —	<p>Async channels only: Hardware (RTS/CTS) or software (X-ON/X-OFF), user-selectable</p> <p>Async channels only: Herald and bulletin (user-definable)</p>
<b>Logon Messages</b> —	Async channels only: Proprietary extensions; ITU-T X.29
<b>Command Modes</b> —	Async channels only: Enhanced, beyond ITU-T X.3 requirements
<b>Terminal Handling</b> —	Standard maximum for each interface
<b>Maximum Distances</b> —	2 MB RAM
<b>Memory</b> —	

<b>User Controls</b> —	On-screen terminal-based menu system, including SNMP management;
	(1) Front-mounted recessed reset pushbutton;
	(1) Internal jumper on motherboard for power-up configuration loading
<b>Indicators</b> —	(18), (26), or (34) Front-mounted LEDs;
	All models:
	(1) for unit power;
	(1) for hardware error;
	(1) for buffer overflow;
	(1) for test mode;
	(3) for main-link synchronization (one for each main-link port);
	(3) for main-link activity (one for each main-link port);
	MT720 models only: (8) for async-channel activity (one for each async channel);
	MT721 models only: (16) for async-channel activity (one for each async channel);
	MT722 models only: (24) for async-channel activity (one for each async channel)
<b>Connectors</b> —	All rear-mounted:
	MT720 models: (8) RJ-45 female for async channels;
	MT721 models: (16) RJ-45 female for async channels;
	MT722 models: (24) RJ-45 female for async channels;
	Models with “232T” in their product codes: (3) DB25 female for main-link ports;
	Models with “35T” in their product codes: (3) M/34 female for main-link ports;
	Models with “21T” in their product codes: (3) DB15 female for main-link ports
<b>Power</b> —	<p>From utility-power (mains) outlet, through included 2-m (6.5-ft.) power cord and rear-mounted IEC 320 male power inlet, to internal transformer:</p> <p>Input: 100 to 240 VAC, 50 or 60 Hz (auto-sensing);</p> <p>Fuse: Integral 0.5 A, 250 V;</p> <p>Consumption: Up to 20 watts</p>
<b>Temperature Tolerance</b> —	32 to 122°F (0 to 50°C)
<b>Humidity Tolerance</b> —	Up to 90% noncondensing
<b>Size</b> —	1.7”H x 17”W x 9.5”D (4.4 x 43.2 x 24.6 cm)
<b>Weight</b> —	3.9 lb. (1.8 kg)

## 2. Introduction

The Fradswitch A Multiprotocol Packet Switches are high-performance X.25 and Frame Relay switches for routing between asynchronous RS-232 devices and X.25 and Frame Relay devices and services. As such, they provide easy, cost-effective access to packet-switching networks.

The Fradswitch A has three main-link ports on its rear panel for X.25 and Frame Relay connections. These ports can be any of three interfaces: They are EIA/TIA RS-232 on models with "232T" in their product codes, ITU-T V.35 on "35T" models, or ITU-T X.21 on "21T" models.

Once you've installed your Fradswitch A, you can configure it. One configuration setting is controlled through a hardware jumper, but the rest is done through terminal-based menus resident in the Fradswitch's firmware. The main-link channels can be set up for X.25 or Frame Relay packet switching, and they can also be set to operate using any of these protocols: HDLC, SDLC, STM (a proprietary stat-mux protocol), or asynchronous (X.28 or IP/SLLP). (Be aware that a main-link port set to async becomes, for all intents and purposes, an additional async channel.) The Fradswitch supports switching between these ports if the protocol is set to X.25, Frame Relay, SDLC, or one of the encapsulated protocols. In addition, the Fradswitch supports SNMP management. (Most aspects of configuring, operating, and maintaining your Fradswitch A will be covered in the *Packet Switching Guide*.)

Regardless of their interface or sync protocol, the main-link ports support an aggregate synchronous data rate of 2 Mbps. That is, the total of the three ports' data rates can't exceed 2 Mbps.

The 8-port models of the Fradswitch A (our MT720 product codes) have eight fully switchable asynchronous-only ports; the 16- and 24-port models (our MT721 and MT722 product codes) have sixteen and twenty-four of these respectively. These ports are EIA/TIA RS-232 interfaces, proprietary pinned on RJ-45 connectors; each of them has a top speed of 115.2 Kbps.

The Fradswitch A has an autosensing power supply, so it can be attached to either 115-VAC, 60-Hz power or 230-VAC, 50-Hz power. It's built into a compact case that you can place on desktops or shelves, or you can use the included screws and brackets to rackmount it in 1U of space in a 19" rack.

## 3. Installation

### 3.1 The Complete Package

The Fradswitch A ships from the factory with these components:

- The Fradswitch itself.
- A 2-m (6.5-ft.) power cord.
- A 1-ft. (30.5-cm) control cable with an RJ-45 plug on one end and a DB25 female connector on the other.
- A rackmount kit consisting of two brackets and four screws.
- This manual.
- The *Packet Switching Guide*.

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

### 3.2 Site Requirements

The Fradswitch A should be installed within 6 ft. (1.8 m) of an easily accessible, grounded AC outlet. If you rackmount the unit, you should leave 3 ft. (90 cm) of clearance in front of the unit for operator access, plus 4 inches (10 cm) of clearance behind the unit for attaching interface cables. The ambient temperature of the Fradswitch's location should never get colder than 32°F (0°C) or hotter than 122°F (50°C). The humidity at the Fradswitch's location should never exceed 90% noncondensing.

### 3.3 Setting Jumper JP33 (Optional)

There is one configuration jumper on the Fradswitch A's motherboard that you might need to set differently, although the default "NOR" setting is OK for most applications. This jumper is labeled JP33, as shown in Figure 3-2 on the next page, and it can be set to either of these positions:

- **NOR** (normal operation). The Fradswitch always uses the parameters selected by the user during the most recent configuration session. This is the factory-default setting.
- **INIT** (initialization). Whenever it's started up (plugged in) after being powered down, the Fradswitch loads its factory-default configuration. (Refer to the *Packet Switching Guide* for information about how to do load the default configuration manually through the unit's firmware.)

To change the setting of this jumper, someone will have to open the Fradswitch's enclosure. We recommend that this be done only by someone well acquainted with electronic equipment and how to handle it safely. That person should take these steps:

1. Make sure the Fradswitch A is unplugged from AC power. Taking all available precautions against static electricity—such as standing on an antistatic mat and/or wearing antistatic gloves or a grounding strap—unscrew the single rear-mounted screw securing the unit's cover to its case, then slide the top cover off as shown in Figure 3-1 on the next page.
2. Move jumper JP33 to the desired position.
3. Put the unit's cover back on and secure it to the chassis by screwing its screw back in.

There are other jumpers on the motherboard, but their settings should *not* be changed. (All other configuration of the Fradswitch A is done through the unit's firmware; see the *Packet Switching Guide* for more information.)

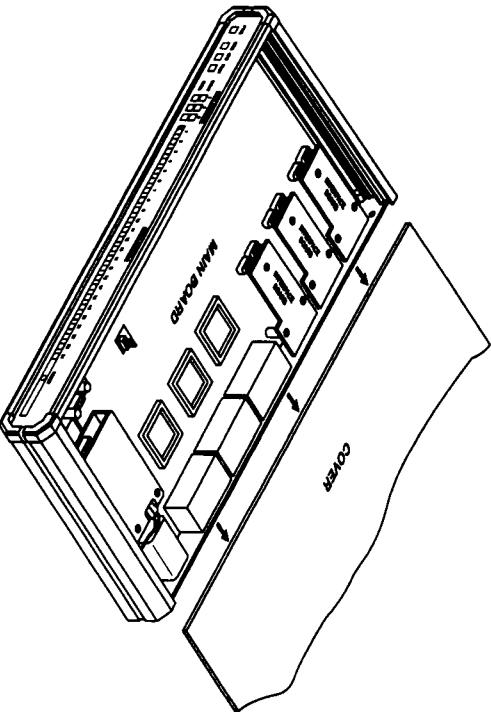


Figure 3-1. The internal layout of a Fradswitch A.

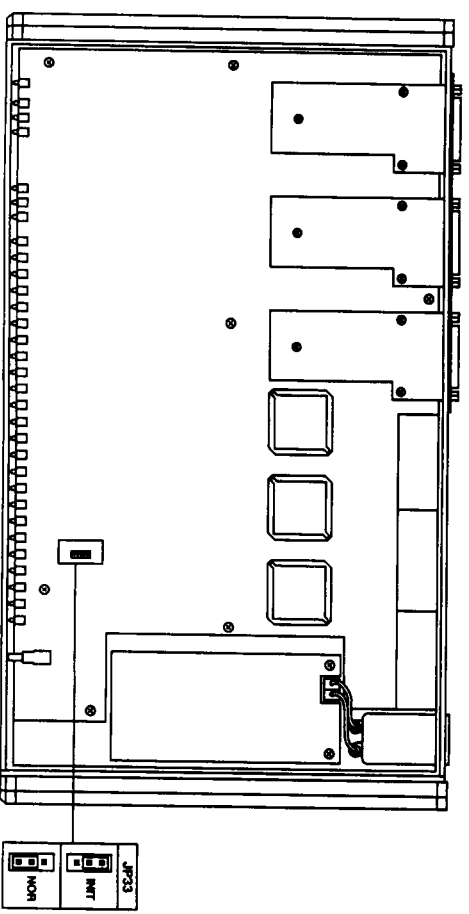


Figure 3-2. The location of the JP33 jumper.

**3.4 Rackmounting the Fradswitch A (Optional)**

Any Fradswitch A can be installed in a 19" rack, where it takes up 1U (1.75" 4.4 cm) of vertical space. The rackmount kit included with the Fradswitch provides the hardware necessary to do this: two short brackets, four 4-40 fastening screws, and four flat washers.

To prepare the Fradswitch for rack installation, first make sure that it's unplugged from AC power. Attach the two rackmount-kit brackets to its sides. Each bracket is fastened with two screws and two washers, inserted into the two front holes on the Switch's side, as shown in Figure 3-3 below (nuts are already in place, inside the unit). Now fasten the brackets to the side rails of the rack with four of your own screws (not included), two on each side.

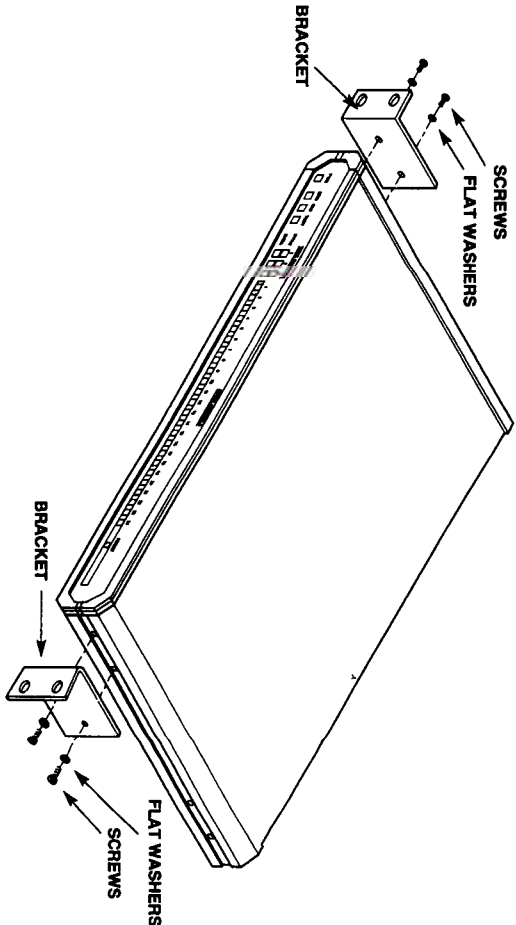


Figure 3-3. Rackmounting the Fradswitch A.

### 3.5 Attaching Cables to the Fradswitch A

#### NOTE

All data cables attached to the Fradswitch should be shielded in order to comply with FCC regulations. The Fradswitch and its data interfaces will work well even if the cables aren't shielded, but some radio interference might occur.

#### 3.5.1 THE ASYNC CHANNELS

Whether you want to pass data to the unit or just want to access the Fradswitch A's firmware, you can run the included RJ-45 male to DB25 female control cable from any of the Fradswitch's rear-mounted RJ-45 female async channels to the RS-232 serial port of a terminal, PC, modem, etc. (For firmware access, we recommend that you use channel 1, because it's the Fradswitch's default control port.) If you should lose this cable, or if you need to hook equipment to both channels at once, you can use straight-through-pinned 8-wire twisted-pair cable with RJ-45 plugs at both ends, plus a modular adapter on the device end:

- If the device is a PC or terminal with DB25 male connectors, use an RJ-45 female to DB25 female adapter such as our product code FA016.
- If the device is a PC with DB9 male connectors, or a modem or mux with DB25 female connectors, you'll need to either order the appropriate adapter kit and pin it out yourself (refer to Section A.1 of the Appendix) or call Black Box Technical Support to get a special quote on an assembled adapter.

Plug the adapter into the device, then run the cable from the Fradswitch to the adapter.

#### 3.5.2 THE MAIN-LINK PORTS

As you run cables from your main-link ports to other devices, keep in mind that unless a port is configured as asynchronous, the cable attached to it *must* be capable of carrying the synchronous clock signals. (Also be aware that, though the ports are physically and electrically DTE, they can be set in their firmware to *behave* as DTE or DCE in terms of how they handle the X.25 protocol in X.25 applications.)

- **"232T" Models:** How you connect an RS-232 device to one of the DB25 female main-link ports of an RS-232 Fradswitch A will depend on what type of device it is (DCE or DTE) and what type of connector it has:
  - If the device is a DCE with a DB25 male or female connector, run a shielded, straight-through-pinned RS-232 cable—such as our EDN25-CMF or EDN25-CMM respectively—between the Fradswitch and the device.
  - If the device is a DTE with a DB25 connector, run a shielded, cross-pinned null-modem cable such as our EYN251-CMF between the Fradswitch and the device.
  - If the device is a DTE with a DB9 connector, you could run a custom cable, a regular null-modem cable with a DB9 adapter, or a straight-pinned cable with an adapter that you can assemble or that we can build for you. Call Black Box Technical Support for help determining the best solution for your application. (Be aware that devices with normal DB9 RS-232 connectors, pinned as TIA-574, *must* communicate asynchronously with the Fradswitch. This is because the standard TIA-574 pinout does not include the sync clocking signals present on the full RS-232 DB25 pinout.)
- **"35T" Models:** To connect a V.35 DCE device to one of the main-link ports of a V.35 Fradswitch A, use a straight-through-pinned V.35 cable with a M/34 male connectors on both ends, such as our EYN450-MM. Plug one end of the cable into the M/34 female connector on the Fradswitch, then plug the other end of the cable into the V.35 port on the device. To connect a V.35 DTE device, call Black Box Tech Support.

- **"21T" Models:** To connect an X.21 DCE device to one of the main-link ports of an X.21 Fradswitch A, use an X.21 cable with DB15 male connectors on both ends, such as our EVNX21-MM. Plug one end of the cable into the DB15 female connector on the Fradswitch, then plug the other end of the cable into the DB15 port on the device. To connect an X.21 DTE device, call Black Box Tech Support.

### 3.6 Attaching Power

AC power should be supplied to the Fradswitch A through a power cord terminated with a standard 3-prong plug, such as the 2-m (6.5-ft.) cord provided with the unit. Connect the cord's outlet to the Fradswitch's rear-panel power inlet, then attach the cord's plug to a standard grounded AC outlet. The Fradswitch should begin operating immediately, as described in Section 4.2.1.

#### CAUTION!

When you apply power to the Fradswitch A, make sure that it is properly connected to the site's grounding (earth) system. Make sure to always use a power cord with a ground lead running from the ground terminal of the Fradswitch's power inlet to the ground contact of a utility-power (mains) outlet. Do not leave the unit ungrounded by using a power cord, power strip, extension cord, BPS/UPS, or outlet without a ground conductor.

In the course of normal operation under normal conditions, your Fradswitch A's fuse (located in the unit's rear panel above the power inlet) should never blow. But if it ever does, make sure that you replace it only with a new fuse rated for the same required current (see the rear-panel labeling). Do not use repaired fuses or short-circuit the unit's fuse holders. If you ever suspect that the Fradswitch's fuse might have blown or been damaged, unplug the unit and make sure it is not powered up again until the problem can be checked and fixed.

Operating the Fradswitch when it's not properly grounded or does not have proper fuse protection could damage the unit and any attached equipment, and could also pose a potentially fatal shock hazard.

## 4. Operation

The Fradswitch A can be used in a wide variety of applications, including:

- Creating redundant links to the public network.
- Running asynchronous data in X.25 packets over Frame Relay.
- Using the SLIP protocol to run async data directly over Frame relay.
- Working with statistical muxes such as the Stat-4, Stat-8, and Stat-24 (our product codes MX864A, MX866A, and MX868A respectively) to carry a large number of asynchronous channels across synchronous links.
- Routing between several Frame Relay devices or networks (performing Frame Relay to Frame Relay switching).
- Connecting HDLC devices to an X.25 or Frame Relay network.

For detailed information about configuring the Fradswitch A for these and other applications, refer to the *Packet Switching Guide*.

### 4.1 The Fradswitch's Controls, Indicators, and Connectors

#### 4.1.1 FRONT-PANEL COMPONENTS

The Fradswitch A's front panel is shown in Figure 4-1 below. Its numbered components are described in Table 4-1 on the next page.

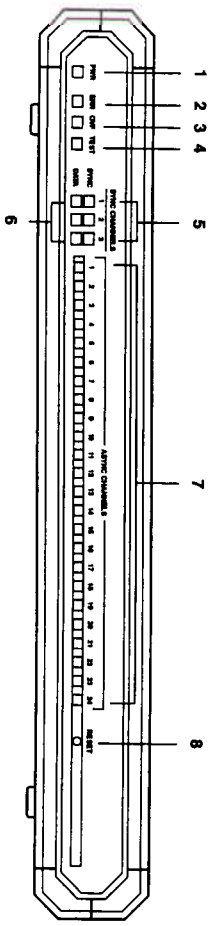


Figure 4-1. The Fradswitch's front panel (12-port model shown).

Table 4-1. The Fradswitch's Front-Panel Controls, Indicators, and Connectors

No. In Fig. 4-1	Component	Function
1	PWR LED	Lights when the Fradswitch A is powered ON.
2	ERR LED	Lights when a hardware malfunction is detected during the power-up self-test or after you press the RESET pushbutton.
3	OVF LED	Lights when Fradswitch A's buffers are full. In a properly designed system, this condition usually indicates that one of the devices connected to the Fradswitch is not responding to the flow-control commands the Fradswitch is sending it, which can happen if the unit is configured incorrectly.
4	TEST LED	Lights when the Fradswitch A is in diagnostics mode (one of its test loops is active), or when someone is accessing the Fradswitch's on-screen menus. In either case, data traffic is interrupted.
5	SYNC LEDES	Indicate the synchronization status of the corresponding main-link port on the Fradswitch A:  <b>Condition:</b> <b>Indication:</b> <b>Off</b> Switch not powered. <b>On</b> Switch powered and synchronized with the peer at the other end of the main link. <b>Continuous flashing</b> Fradswitch A is powered but not synchronized with the corresponding peer.
6	DATA LEDES	Light to show activity (reception or transmission of frames) on the corresponding main-link port.
7	ASYNC CHANNEL (Numbered) LEDES	Light to show activity (reception or transmission of data) on the corresponding async channel.
8	RESET Button	Press to reinitialize the Fradswitch A's internal circuitry (including its data buffers) and initiate its power-up self-test.

## 4.1.2 REAR-PANEL COMPONENTS

The Fradswitch A's rear panel is shown in Figure 4-2 below. Its numbered components are described in Table 4-2 below.

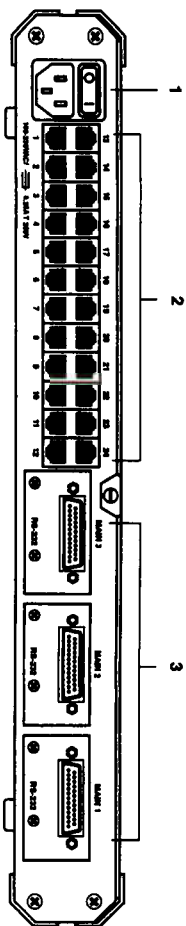


Figure 4-1. The Fradswitch's rear panel (12-port RS-232 model shown).

Table 4-2. The Switch's Rear-Panel Controls, Indicators, and Connectors

No. in Fig. 4-2	Component	Function
1	Power Inlet	AC-power connector with integral fuse.
2	Async Channels	Connect async RS-232 devices to the Fradswitch system through these ports.
3	Main-Link Connectors	Connection points for X.25 or Frame Relay links.

## 4.2 Basic Operating Instructions and Indications

Once you install and configure the Fradswitch A, it normally operates unattended. After initial setup, operator intervention is only required when the Fradswitch has to be reconfigured or if something goes wrong. Note that the Fradswitch stores its configuration in nonvolatile RAM (NVRAM), so it won't lose its configuration if it loses power.

## 4.2.1 Power-Up

The Fradswitch A will begin operating as soon as you attach its power cord to its rear-panel power inlet and plug the cord into AC power; the unit has no ON/OFF switch. The Fradswitch's PWR LED should light. The SYNC LEDs of any of the main links that are (a) attached to other devices and (b) configured as synchronous will flash until the link becomes operational; make sure that, for all installed sync links, the SYNC LEDs eventually stop flashing and become continuously lit. The ERR, OVF, and TEST LEDs should also light; make sure that after a short interval (during which the Fradswitch performs its power-up self-test) these LEDs go dark again.

## 4.2.2 NORMAL OPERATION

During normal operation, the PWR and SYNC LEDs should be continuously lit and the TEST, OVF, and ERR indicators should remain dark. Channel- and link-activity LEDs should flash according to the traffic load, and should be dark when the corresponding port is idle.

## 4.2.3 POWER-DOWN

To turn off the Fradswitch A, unplug its power cord from AC power; the unit has no ON/OFF switch.

## 4.3 Upgrading the Fradswitch's Firmware

Because the Fradswitch A has flash memory, you can upgrade its firmware without replacing its EPROMs. To do so, take these steps:

1. Use the control cable that came with the Fradswitch A to connect a PC running terminal emulation to async channel 1 on the Fradswitch. Configure the terminal emulator to transmit and receive at 9600 bps using no parity, 8 data bits, and 1 stop bit ("9600,N,8,1").
2. Press a key on the terminal keyboard. The Fradswitch will send back a prompt consisting of a single asterisk character ("\*\*"). To access the unit's firmware, type in "c 0" (c, then space, then zero) and press [Enter]. The Main Menu will appear:

```

MAIN MENU
-----
1) CONFIGURE
2) SYSTEM CONTROL
3) DIAGNOSTICS
4) STARTUP and STATISTICS
5) LOGOUT

```

Select:

3. Select option 2. The System Control Menu will appear:

```

SYSTEM CONTROL MENU
-----
1) Link down
2) Link up
3) Clear Channel
4) Clear LCN
5) Update date
6) Update time
7) Reset statistics
8) Rearrange NOVRAM
9) Reset
10) Set default configuration
11) Disconnect dial link
12) Enable software upgrade
CR) Exit

```

SELECT:



4A. *Current firmware is version 4.3 or earlier:* Select option 12. This screen will appear (skip ahead to step 6):

```
*****
*
*                                     WARNING !!!
*
* THIS ACTION WILL ENABLE YOU TO DOWNLOAD
* A NEW SOFTWARE VERSION AFTER RESET.
* * * *
*
* Type:
* LINK1 for download through link 1.
* CHAN1 for download through channel 1.
*
* You should connect a terminal configured:
* 9600, N, 8, 1 to the desired port.
*
*****
```

4B. *Current firmware is version 5.0 or later:* Select option 12. The Enable Upgrade Menu will appear:

```
-----
Enable software upgrade
-----
1) Async direct connection
2) TFTP
CR) Exit
Select:
```

5. *Current firmware is version 5.0 or later:* If you select 1, the screen shown under step 4A will appear; go on to step 6. If you select 2, the TFTP Setup Menu appears:

```
TFTP Setup
-----
1) TFTP server IP..... [0.0.0.0]
2) File name..... [ ]
3) Command..... [No Option]
4) Retry timeout..... [15 ]
5) Total timeout..... [75 ]
S) Start download file to Device.
R) Terminate file Transfer.
CR) Exit
Select:
```

Enter the IP address of the server where the firmware file is, the name of the file, and your other desired options, then proceed to download the file. If the download is successful, reset the Fradswitch; this completes your firmware upgrade.

6. Type "CHAN1" and press [Enter] if the PC is attached to async channel 1, or type "LINK1" and press [Enter] if the PC is attached to main-link port 1. (If you select the main-link port, make sure that that port is an RS-232 type and is configured for async operation. If you try to select a non-RS-232 main-link port, the download channel will automatically default to CHAN1, async channel 1.) After you make your selection, this text appears:

```
Done.
Press <RETURN> to continue
```

When you press [Enter], you will be returned to the System Control Menu if the Fradswitch's current firmware is version 4.3 or earlier or to the Enable Upgrade Menu if the Fradswitch's current firmware is version 5.0 or later.

7. Reset the Fradswitch A by either (a) selecting option 9 at the System Control Menu (the preferred method), (b) pressing the RESET button on the Fradswitch's front panel, or (c) unplugging the Fradswitch and plugging it back in again. This screen appears:

```
*****
* Software Upgrade System
*
* Please select one of the following:
*
* 1) 9600 bit/s
* 2) 19200 bit/s
* 3) 38400 bit/s
* 4) 57600 bit/s
* 5) 115200 bit/s
* 6) Run the existing software (NO download)
*
*****
```

8. If you want to abort the upgrade process, select option 6. Otherwise, select your desired firmware-transfer data rate. (Regardless which option you choose, the number whose key you press will not appear on screen.) If you were to choose option 3, this message would appear:

```
*****
* Software Upgrade System
*
* Please change terminal setting
* To:
* 38400,N,8,1
*
* and start to download new software.
*****
```

9. Reconfigure the emulator to communicate at your desired data rate (38,400 bps in this example), then have it send the new firmware file to the Fradswitch A as "ASCII" or (preferably) "raw ASCII" data. When the firmware is downloaded successfully, the following message will appear:

```
Successful download
```

10. Reset the Fradswitch A again; you will be returned to the System Control Menu. Press [Enter] to exit the menu; the Fradswitch returns to normal operation.

## 5. Troubleshooting

### 5.1 Things to Try First

If a problem occurs with your 6- or 12-Port Fradswitch A, try these things first:

- Make sure that the Fradswitch A is actually powered ON (the PWR indicator should be lit).
- Make sure all cables are properly connected.
- Make sure that all equipment connected to the unit is powered ON and operating normally.
- Check the unit's indicators.
- Make sure that the configurations of the local Fradswitch A and the remote packet-switching device correspond to the requirements of the equipment connected to their channels.

In case these preliminary checks do not correct the problem, either press RESET or turn the Fradswitch OFF and then ON again. If the problem persists, refer to the *Packet Switching Guide* for additional things to try. If this still doesn't help, see the next section.

### 5.2 Calling Black Box

If you determine that your Fradswitch A 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.
- any particular application that, when used, appears to create the problem or make it worse.
- the results of any testing you've already done.

### 5.3 Shipping and Packaging

If you need to transport or ship your Fradswitch A:

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

## Appendix: Connector Pinouts

### A.1 The RS-232 Interfaces

Here are the EIA/TIA RS-232 pinouts for the Fradswitch A's async-channel interface and (for "232T" models only) its main-link-port interface. Note that the async-channel ports are proprietary **pinned** RJ-45 female connectors, while the main-link ports of RS-232 models are DB25 female connectors with standard pinning. Identical to the serial ports on terminals and older PCs. (For comparison and cable/adaptor-pinning purposes, we've also included the RS-232 on DB9 [TIA-574] pinout of the COM ports on newer PCs.)

ITU-T V.24 Crc. (DB25) Ref.	Main-Link (RJ-45) Pin	Async-Channel (DB9) Pin	PC COM (DB9) Pin	Port Ref.	RS-232 Signal/Circuit Name/Abbrev.
101	1	1	—	—	SHD Shield [Chassis Ground]
102	7	7	5	AB	SGND Signal Ground
103	2	5	3	BA	TD Transmitted Data
104	3	3	2	BB	RD Received Data
105	4	2	7	CA	RTS Request to Send
106	5	8	8	CB	CTS Clear to Send
107	6	—	6	CC	DSR Data Set Ready
108.2	20	6	4	CD	DTR Data Terminal Ready
109	8	4	1	CF	RLSD Received Line Signal Detector [CD]
113	24	—	—	DA	TSETT Transmitter Signal Element Timing (DTE) [EXTC] [External Clock]
114	15	—	—	DB	TSETC Transmitter Signal Element Timing (DCE) [TC] [Transmit Clock]
115	17	—	—	DD	RSETC Receiver Signal Element Timing (DCE) [RC] [Receive Clock]
125	22	—	9	CE	RI Ring Indicator
140	21	—	—	RL	Remote Loopback
141	18	—	—	LL	Local Loopback
142	25	—	—	TM	Test Mode

**A.2 The V.35 Interface ("35T" Models Only)**

Here is the ITU-T V.35 pinout for the main-link ports of the Fradswitch A, pinned out on standard M/34 connectors.

ITU-T V.24 Circ. Ref.	V.35 (M/34) Pin	Signal Abbreviation	Signal/Lead Name
101	A	FGND	Frame Ground
102	B	SGND	Signal Ground
103	P	SD A	Send Data A
	S	SD B	Send Data B
104	R	RD A	Receive Data A
	T	RD B	Receive Data B
105	C	RTS	Request to Send
106	D	CTS	Clear to Send
107	E	DSR	Data Set Ready
108.2	H	DTR	Data Terminal Ready
109	F	RLSD [CD]	Rcvd. Line Signal Detector [Carrier Detect]
113	U	TSETT [EXTC] A	Transmitter Signal Element Timing [DTE] A [External Clock A]
	W	TSETT [EXTC] B	Transmitter Signal Element Timing [DTE] B [External Clock B]
114	Y	TSETC [TC] A	Transmitter Signal Element Timing [DCE] A [Transmit Clock A]
	AA	TSETC [TC] B	Transmitter Signal Element Timing [DCE] B [Transmit Clock B]
115	V	RSETC [RC] A	Receiver Signal Element Timing [DCE] A [Receive Clock A]
	X	RSETC [RC] B	Receiver Signal Element Timing [DCE] B [Receive Clock B]
140	HH	RL	Remote Loopback*
141	JJ	LL	Local Loopback*
142	LL	TM	Test Mode*

\*The Remote Loopback, Local Loopback, and Test Mode signals are pinned proprietarily on the Fradswitch; in the original V.35 spec, they are assigned to Pins N, L, and NN respectively.

**A.3 The X.21 Interface**

Here is the ITU-T X.21 pinout for the main-link ports of the Fradswitch A, pinned out on standard DB15 connectors.

ITU-T V.24 Circ. Ref.	X.21 (DB15) Pin	Signal Abbrev.	Signal/Lead Name
101	1	—	Frame Ground
102	8	G	Signal Ground
103	2	TA	Transmit A
	9	TB	Transmit B
104	4	RA	Receive A
	11	RB	Receive B
105	3	CA	Control [Request to Send] A
	10	CB	Control [Request to Send] B
109	5	IA	Indication [Carrier Detect] A
	12	IB	Indication [Carrier Detect] B
113	7	EA	External Signal Element Timing [External Clock] A*
	14	EB	External Signal Element Timing [External Clock] B*
114	6	SA	Signal Element Timing [Transmit Clock] A
	13	SB	Signal Element Timing [Transmit Clock] B

\*The E A and E B signals are not included in the standard X.21 interface. On the Fradswitch, these signals (which provide the external clocking option that X.21 otherwise lacks) are substituted for the Byte Timing (B A and B B) signals, which are rarely if ever used.

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