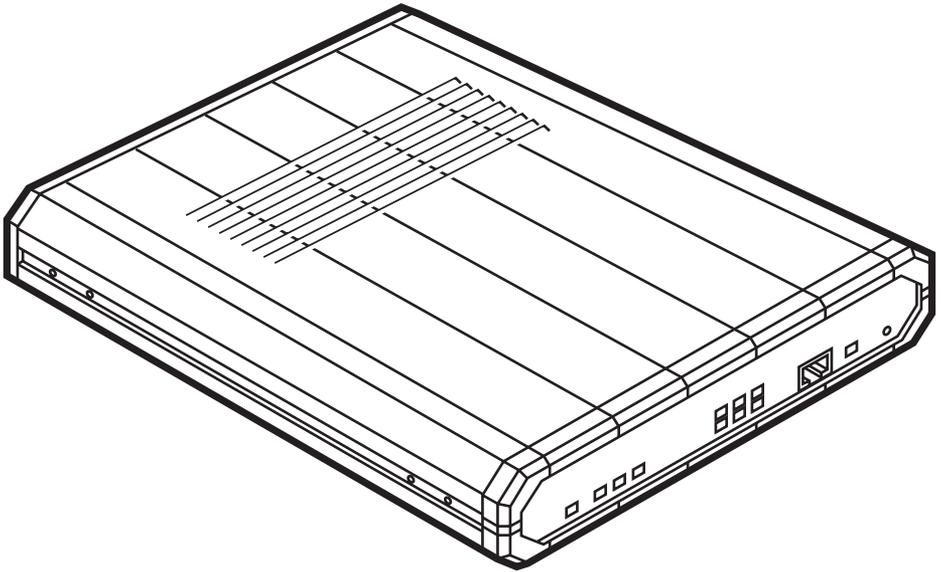




NOVEMBER 1998
MT760A-232/232
MT760A-232/V35
MT760A-V35/V35
MT760A-X21/X21
MT760A-530/530
MT760A-530/232
MT760A-DDS/232
MT760A-DDS/V35

FradSwitch A/S 3 Port



**CUSTOMER
SUPPORT
INFORMATION**

Order toll-free in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)
FREE technical 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 Drive, Lawrence, PA 15055-1018
Web site: www.blackbox.com • E-mail: info@blackbox.com

**FEDERAL COMMUNICATIONS COMMISSION
AND
CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENTS**

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

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

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.

EN 55022 Warning: This is a Class A product. In a domestic environment, this product might cause radio interference, in which case the user might be required to take adequate measures.

TELECOMMUNICATION SAFETY STATEMENTS

Always observe standard safety precautions during installation, operation, and maintenance of this product. Only a qualified and authorized service personnel should carry out adjustment, maintenance, or repairs to this instrument. No adjustment, maintenance, or repairs should be performed by either the operator or the user.

The safety status of each of these ports on the Fradswitch A/S 3 Port is declared according to EN 41003 and is detailed in the table below:

Safety Status	Ports
SELV	RS-232/V.24, RS-530, V.35, X.21, LAN
TNV-1	DDS

SELV = Safety Extra-Low Voltage

TNV-1 = Telecommunications Network Voltage operating within the limits of SELV and subject to overvoltages

DECLARATION OF CONFORMITY (CE)

The manufacturer declares that the Fradswitch A/S 3 Port conforms to the following standards:

- | | |
|-----------------------------------|---|
| EMC: EN 55022 (1994) | Limits and methods of measurement of radio-disturbance characteristics of information-technology equipment. |
| EN 50082-1 (1992) | Electromagnetic compatibility: Generic immunity standards for residential, commercial, and light industry. |
| Safety: EN 60950 (1992/93) | Safety of information-technology equipment, including electrical business equipment. |

The Fradswitch A/S 3 Port herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The Fradswitch was tested in a typical configuration.



**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 conectado 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 física 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 líneas de energía.
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 objetos líquidos 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: Objetos 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	10
1.1 The Main-Link Ports (All Numbered Ports Except Port 1 on “-DDS” Models)	10
1.2 The DDS Port (Port 1 on “-DDS” Models Only)	11
1.3 The Control Port	11
1.4 The Unit As a Whole	12
2. Introduction	13
3. Configuration and Installation	14
3.1 The Complete Package	14
3.2 Site Requirements	15
3.3 Hardware Configuration	16
3.3.1 Accessing the PCBs	17
3.3.2 The Jumpers on the Main Circuit Board	17
3.3.3 The Jumper Banks on the Interface Boards	19
3.4 Installing a Switch in a 19" Rack (Optional)	20
3.5 Attaching Cables to the Switch	21
3.5.1 Connecting to the Control Port	21
3.5.2 Connecting to the DDS Port	21
3.5.3 Connecting to the Non-DDS Main-Link Ports	22
3.5.4 Connecting AC Power	23
4. Operation	24
4.1 The Switch's Controls, Indicators, and Connectors	24
4.1.1 Front-Panel Components	24
4.1.2 Rear-Panel Components	26
4.2 Basic Operating Instructions and Indications	27
4.2.1 Power-Up	27
4.2.2 Normal Operation	27
4.2.3 Power-Down	27
4.3 Upgrading the Switch's Firmware	28

Chapter	Page
5. Troubleshooting	31
5.1 Things to Try First	31
5.2 Calling Black Box	31
5.3 Shipping and Packaging	32
Appendix: Connector Pinouts	33
A.1 The RS-232 Interfaces	33
A.2 The RS-530 Interface	34
A.3 The V.35 Interface	35
A.4 The X.21 Interface	36
A.5 The DDS Interface	36

1. Specifications

1.1 The Main-Link Ports (All Numbered Ports Except Port 1 on “-DDS” Models)

Interfaces —	Models with “232” in their product code: EIA/TIA RS-232 (ITU-T V.24/V.28); Models with “530” in their product code: EIA/TIA RS-530; Models with “V35” in their product code: ITU-T V.35; Models with “X21” in their product code: ITU-T X.21; All either DTE or DCE (user-selectable)
Protocols —	X.25, Frame Relay, HDLC, STM (proprietary), IP/SLIP, or async (user-selectable); 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 CLLM, LMI, and ANSI PVC management protocols; STM: Compatible with Stat-4 (our product code MX864A), Stat-8 (MX866A), and Stat-24 (MX868A) statistical multiplexors; IP: Supports encapsulation over X.25 (as per RFC 1356) or Frame Relay (as per RFC 1490), as well as dialup links for X.25 with X.32 protocols
Packet Size —	X.25: Up to 4096 bytes; Other protocols: Up to 8192 bytes
Clock Source —	Internal or recovered (user-selectable)
Data Rate —	Any port configured as synchronous: Any data rate that, when added to the data rates of all other synchronous main-link ports, does not total more than 2 Mbps; Any port configured as asynchronous: 115,200, 57,600, 38,400, 19,200, 9600, 4800, 1200, 600, 300, 150, 110, or 75 bps (user-selectable)
Maximum Distance —	Standard maximum for each interface
Connectors —	On rear panel: (2) DB25 female (“-DDS” models) or (3) DB25 female (all other models);

Connectors

(continued) — On adapter cables:
 For each V.35 port: (1) M/34 female;
 For each X.21 port: (1) DB15 female

1.2 DDS Port (Port 1 on “-DDS” Models Only)

Interface — Digital Data Service (DDS) as per AT&T® Pub. 62310

Clock Source — Either internal (transmit) or recovered from line signal (receive), user-selectable

Data Rate — 4.8, 9.6, 19.2, or 56 kbps, user-selectable

Maximum Distance — Over 24-AWG (0.6-mm) wire:
 6.5 mi. (10.5 km) at 9.6 kbps,
 5 mi. (8 km) at 19.2 kbps, or
 4 mi. (6.5 km) at 56 kbps;

Attenuation — Up to 43 dB

Transmit BPV Sequence — Zero suppression

Received BPV Sequence — Out of service (OOS), out of frame (OOF), DSU loopback

Connector — (1) Rear-mounted RJ-48 female

1.3 The Control Port

Flow Control — Hardware (RTS/CTS) or software (X-ON/X-OFF), user-selectable

Data Rate — 38,400, 19,200, 9600, 4800, 1200, 600, 300, 150, 110, or 75 bps (user-selectable)

Maximum Distance — 50 ft. (15.2 m)

Command Modes — X.28, extended

Terminal Handling — Enhanced asynchronous (exceeds X.3 requirements)

Connector — (1) Front-mounted RJ-45 female

1.4 The Unit As a Whole

Compliance — FCC Part 15 Subpart J Class A, DOC Class/MDC classe A

User Controls — (1) Front-mounted recessed reset pushbutton;
(1) Internal jumper for power-up configuration loading;
(3) Internal jumper banks for DTE vs. DCE;
“-X21” models only: (3) additional jumpers for DTE vs. DCE;
Firmware-resident terminal-based configuration menus

Indicators — (11) Front-mounted LEDs:
PWR (unit power); ERR (error); OVF (buffer overflow); TEST; SYNC 1, 2, and 3 (main-link synchronization); ACTIV 1, 2, and 3 (main-link data activity); ACT (control-port data activity)

Power — From AC outlet, through detachable 5-ft. (1.5-m) power cord and internal transformer:
Nominal Input: 100 to 230 VAC, 47 to 63 Hz;
Input-Voltage Tolerance: 90 to 253 VAC;
Consumption: 30 watts

Temperature Tolerance — 32 to 122° F (0 to 50° C)

Humidity Tolerance — Up to 90% noncondensing

Size — 1.7"H x 8.5"W x 9.4"D (4.2 x 21.5 x 24 cm)

Weight — 2.6 lb. (1.2 kg)

2. Introduction

The FradSwitch A/S 3 Port provides easy, cost-effective access to a packet-switching network. It also provides packet-switching capability for both X.25 and Frame Relay.

The FradSwitch has three ports which support aggregate data rates up to 2 Mbps. Each port can be configured—through a firmware-resident set of configuration menus that you can access with an attached terminal—to use any of the following protocols: X.25, Frame Relay, HDLC, STM, asynchronous, or IP/SLIP. Switching between ports is provided for X.25, Frame Relay, and encapsulated protocols.

Depending on the model you ordered, the FradSwitch's ports can be any of several combinations of EIA/TIA RS-232 (ITU-T V.24) or RS-530 or ITU-T V.35 or X.21. These physical interfaces can be DCE or DTE (user-configurable). The “-DDS” models have a DDS interface on port 1 which is always DTE.

The FradSwitch A/S 3 Port supports a wide range of applications. For information on configuring the FradSwitch's firmware, refer to the *Packet Switching Guide* (call Black Box for a copy if you did not receive one with your FradSwitch).

3. Configuration and Installation

The FradSwitch A/S 3 Port is delivered completely assembled. It is designed to be installed as a desktop unit or mounted in a 19" rack.

After installing the unit, refer to the *Packet Switching Guide* for system-configuration information and procedures, as well as for troubleshooting information (including testing and diagnostics instructions) if you have any difficulties.

3.1 The Complete Package

The complete FradSwitch A/S 3 Port package includes:

- A FradSwitch A/S 3 Port,
- Its power cord,
- This manual,
- An RJ-45 to DB25 adapter cable for the control port (see **Section 3.5.1**), and
- *V.35 and X.21 models only*: An adapter cable for each V.35 or X.21 port to patch the FradSwitch's DB25 connector to a V.35-native M/34 connector or an X.21-native DB15 connector.

If anything is missing or damaged, contact Black Box right away.

NOTE

We suggest that you save the packing material and carton in case it becomes necessary to store, ship, or return the FradSwitch.

3.2 Site Requirements

Power: The FradSwitch A/S 3 Port unit should be installed within 5 ft. (1.5 m) of an easily accessible, grounded AC outlet capable of furnishing power at the voltage it needs (100 to 230 VAC).

Control-Port Connections: The FradSwitch A/S 3 Port has an RJ-45 connector for its asynchronous supervisory-control port (see the **Appendix** for this port's pinout).

Main-Link Connections: The FradSwitch A/S 3 Port has three main-link connectors. What type of connectors these are depends on which interface(s) you ordered for your Switch:

RS-232: DB25 female

X.21: DB25 female patched to DB15 female with included adapter cable

V.35: DB25 female patched to M/34 female with included adapter cable

RS-530: DB25 female

DDS: RJ-48 female

The pinouts for these interfaces are listed in the **Appendix**.

Front and Rear Clearance: When the FradSwitch A/S 3 Port is installed in a 19" rack, allow at least 36" (90 cm) of clearance in front of it for operator access and 4" (10 cm) of clearance behind it for interface-cable connections.

Environment: The ambient temperature in which the FradSwitch A/S 3 Port operates should be 32 to 122° F (0 to 50° C), at a relative noncondensing humidity of not more than 90%.

3.3 Hardware Configuration

The FradSwitch A/S 3 Port contains two different types of printed circuit boards, as shown in Figure 3-1 below. The main board contains most of the FradSwitch's circuits, and has two jumpers. Three main-link interface boards carry interface-specific logic. The following subsections provide information on the functions and default settings of the internal jumpers, as well as step-by-step instructions for setting them. (Note that the default settings of the FradSwitch's jumpers are usually suitable for most applications.)

All other configuration of the FradSwitch A/S 3 Port is done after you install it, through its firmware-based "command facility" (menu system). For detailed instructions, refer to the *Packet Switching Guide*.

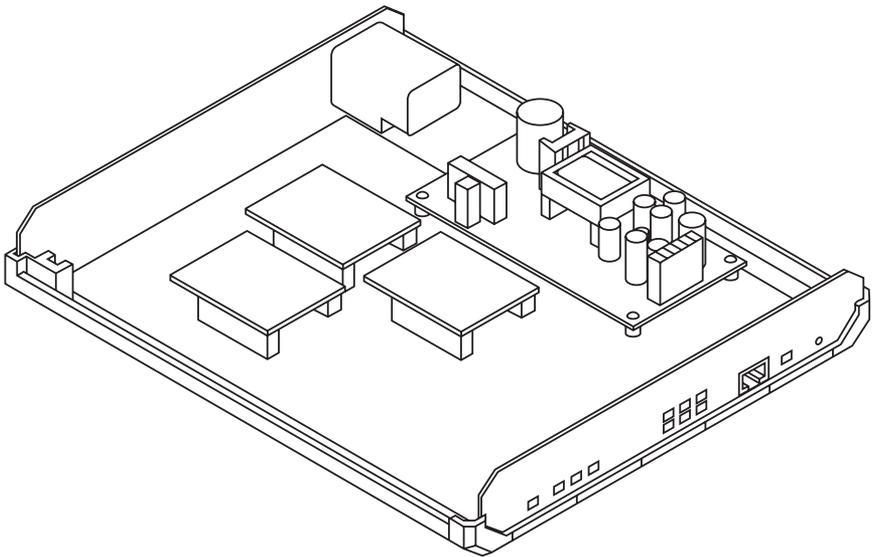


Figure 3-1. The FradSwitch A/S 3 Port's general component layout.

3.3.1 ACCESSING THE PCBs

CAUTION!

In order to avoid the possibility of electrical shock, always unplug the FradSwitch A/S 3 Port before opening it.

To access the printed circuit boards of the FradSwitch A/S 3 Port, loosen the screws on the bottom of the Switch and remove the unit's top cover. Refer to **Sections 3.3.2** and **3.3.3** and change jumper settings as required. When you're finished, replace the Switch's cover: Gently push it down until it clips into place, then refasten the screws.

3.3.2 THE JUMPERS ON THE MAIN CIRCUIT BOARD

There are several jumpers mounted on the FradSwitch A/S 3 Port's main circuit board. On non-X.21 models, only one of these jumpers—JP25—is user-settable; on X.21 models, so are jumpers JP4, JP5, and JP6. Refer to the descriptions of these jumpers below, and to Figure 3-2 on the next page. (All other jumpers on the main circuit board are either for factory functions or are reserved for future use. Do *not* change them from their factory-default settings.)

JP25, the INIT/NOR Jumper

Use this jumper to select which set of stored firmware-configuration parameters the FradSwitch A/S 3 Port will load at power-up and use as its default. The jumper has two positions:

- NOR** Normal operation (the factory-default setting). The FradSwitch A/S 3 Port loads and uses the set of parameters mostly recently selected and saved to NVRAM by a user.
- INIT** Initialization. The FradSwitch A/S 3 Port loads and uses its original factory-default configuration. For more information about configuring the Switch, including the unit's factory-default settings, refer to the *Packet Switching Guide*.

X.21 Models Only: JP3 (BRG3), JP4 (BRG2), and JP5 (BRG1), the X.21 DCE Jumpers:

In their factory-default settings, which are appropriate for operating the FradSwitch A/S 3 Port's X.21 ports as DTE interfaces, these jumpers are not connected. If you want any of the Switch's X.21 ports to function as a DCE, you'll have to connect its jumper here, as well as move its jumper bank to "DCE" on the interface board (see the next section).

For Link 1 to be DCE, connect the JP5 (BRG1) jumper. For Link 2 to be DCE, connect the JP4 (BRG2) jumper. For Link 3 to be DCE, connect the JP3 (BRG3) jumper.

FRADSWITCH A/S 3 PORT

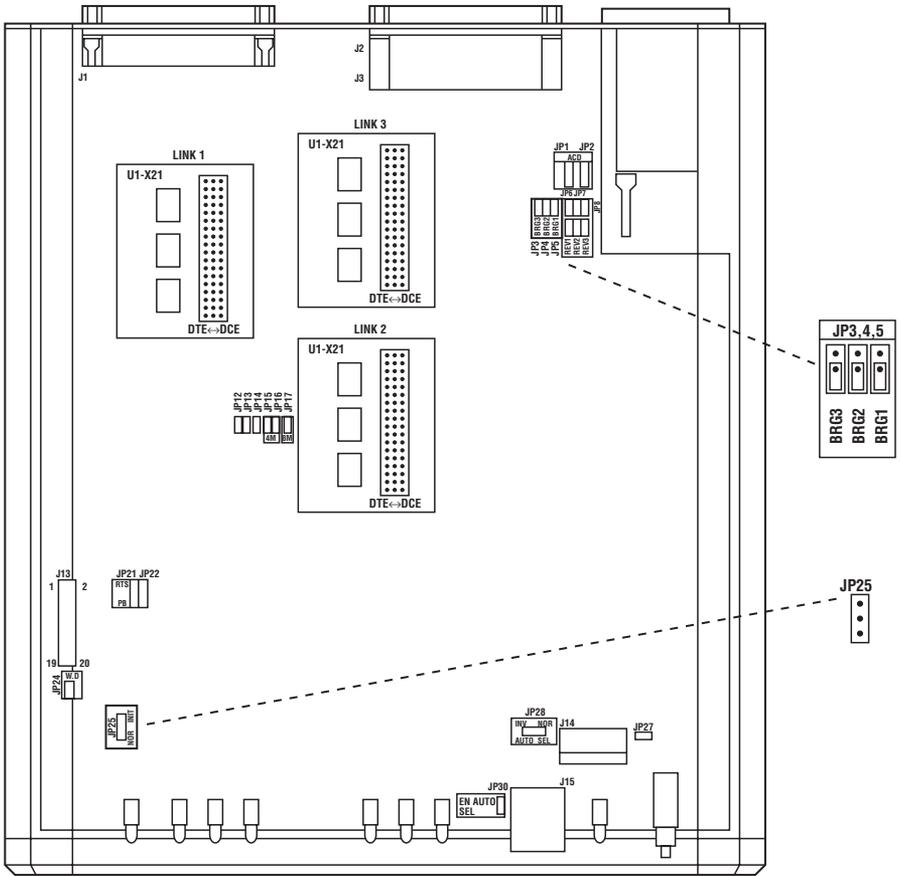


Figure 3-2. The jumpers on the FradSwitch A/S 3 Port's main circuit board (MT760A-X21/X21 model shown).

3.3.3 THE JUMPER BANKS ON THE INTERFACE BOARDS

The FradSwitch A/S 3 Port's main-link ports can be any of these interfaces, each of which is controlled by an interface-specific "interface board" (daughterboard) mounted on the main circuit board:

- EIA/TIA RS-232 (ITU-T V.24)
- EIA/TIA RS-530
- ITU-T V.35
- ITU-T X.21
- DDS CSU/DSU (Port 1 only)

Each interface board can be configured as DCE or DTE by moving the jumper bank on that board. The jumper bank, marked "DCE ↔ DTE," consists of interlinked multiple jumpers that must be moved together, as shown in Figure 3-3 below.

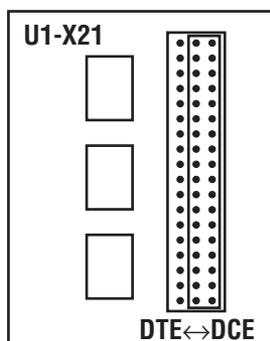


Figure 3-3. A DTE/DCE jumper bank (interface board for an X.21 port shown).

When a board is set as DTE, the port receives its clock from outside and so must be firmware-configured for "external clock." By contrast, when a board is set as DCE, the port uses the Switch's own clock and so must be configured for "internal clock." (Refer to the *Packet Switching Guide* for more information.)

3.4 Installing a Switch in a 19" Rack (Optional)

The FradSwitch A/S 3 Port can be installed in a 19" rack, where it takes up 1U (1.75", 4.4 cm) of vertical space. A rackmount kit (our product code LRRACK) provides the hardware necessary to do this: two long-arm brackets, four screws, and four washers.

To prepare the Switch for rack installation, 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 3-4 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.

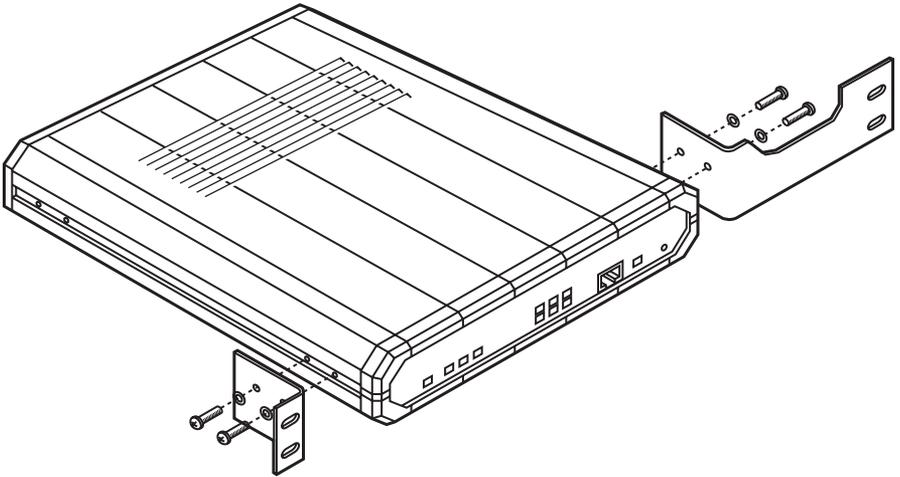


Figure 3-4. Attaching the brackets of the FradSwitch A/S 3 Port's rackmount kit.

3.5 Attaching Cables to the Switch

The FradSwitch A/S 3 Port has three numbered connectors on its rear panel for its main device/WAN links (of which, on “-DDS” models, Port 1 will be the dedicated DDS port), plus an RJ-45 connector on its front panel that serves as the supervisory-control port. See the **Appendix** for the pinouts of these ports.

3.5.1 CONNECTING TO THE CONTROL PORT

The FradSwitch A/S 3 Port comes with a 6-ft. (1.8-m) RJ-45 male to DB25 female adapter cable. You can attach the cable’s RJ-45 plug to the Switch’s control port and plug its DB25 female connector directly into the DB25 male serial port of most RS-232 ASCII terminals, older IBM PC compatible computers, and other terminal-type equipment. Alternatively, with a standard DB25 male to DB9 female adapter, you can run this cable from the Switch’s control port to the DB9 male serial port of a newer IBM PC/AT or PS/2 compatible computer.

If you want to attach the control port to a terminal-type device at a greater distance, you can do one of two things. You can either run high-quality straight-through-pinned RS-232 or AT cable from the DB end of the adapter cable to your device, or you can put aside the adapter cable, attach a specially pinned modular adapter to your device, and run straight-through-pinned RJ-45 male to RJ-45 male 8-wire twisted-pair cable from the control port to the adapter. (Call Black Box Technical Support to discuss either application. In neither case should you exceed the normal RS-232 maximum distance of 50 ft./15.2-m.)

3.5.2 CONNECTING TO THE DDS PORT (“-DDS” MODELS ONLY)

Run twisted-pair cable with four or more wires, terminated with RJ-48 plugs, from your DDS port to your WAN-access device’s input port or your WAN direct-connection point.

3.5.3 CONNECTING TO THE NON-DDS MAIN-LINK PORTS

You can always use straight-through cables for these connections if you set the FradSwitch A/S 3 Port's interface-board DTE/DCE jumpers correctly (see **Section 3.3.3**). (On X.21 models, the X.21 DCE jumpers also need to be set correctly—see **Section 3.3.2**.) Beyond this, the type of cable you connect depends on the link-port's interface:

- How you connect an *RS-232* device to a Switch's RS-232 main-link port will depend on what type of connector the device has. If it's a DB25 male or female, run a shielded straight-through-pinned RS-232 cable—such as our EDN25C-MF or EDN25C-MM respectively—between the Switch port and the device. If the device's connector is a DB9 male—as will be the case if you are attaching a terminal-emulating PC to upgrade the Switch's software (see **Section 4.3**)—run a PC/AT modem cable such as our EVMBMC between the Switch port and the device. (Be aware that devices with normal DB9 RS-232 connectors, pinned as TIA-574, must communicate asynchronously with the Switch. This is because the standard TIA-574 pinout does not include the sync clocking signals present on the full RS-232 DB25 pinout.)
- To connect an *RS-530* device to a Switch's RS-530 main-link port, run a shielded straight-through-pinned RS-530 cable—such as our EVN530-MM—between the Switch port and the device.
- To connect a *V.35* device to a Switch's V.35 port, attach the included DB25 male to M/34 female adapter cable to the port. Then run a shielded straight-through-pinned V.35 cable—such as our EYN450-MM—between the M/34 end of the adapter cable and the device.
- To connect an *X.21* device to a Switch's X.21 main-link port, attach the included DB25 male to DB15 female adapter cable to the port. Then run a shielded straight-through-pinned X.21 cable—such as our EGM16E-MM—between the DB15 end of the adapter cable and the device.

NOTE

The cables you attach to the FradSwitch A/S 3 Port should be shielded, in order to comply with FCC rules. The Switch and its data interfaces will work well even if the cables are not shielded, but some radio interference may occur.

3.5.4 CONNECTING AC POWER

AC power should be supplied to the FradSwitch A/S 3 Port through a power cord terminated by a standard 3-prong plug, such as the 5-ft. (1.5-m) cord provided with the Switch. Connect the cord's outlet to the Switch's rear-panel power-inlet, then attach the cord's plug to a standard grounded AC outlet.

CAUTION!

When you apply power to the FradSwitch A/S 3 Port, 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 Switch's power inlet to the ground contact of a utility-power (mains) outlet. Do *not* leave the Switch 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 3 Port's fuse (located in the Switch's rear panel above the Switch's 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 Switch's fuse holders. If you ever suspect that the Switch's fuse might have blown or been damaged, unplug the Switch and make sure it is not powered up again until the problem can be checked and fixed.

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

4. Operation

The FradSwitch A/S 3 Port supports a wide range of applications. These include:

- Connection of a bridge/router using HDLC encapsulation over Frame Relay.
- Encapsulating private X.25 over Frame Relay networks.
- Connecting SDLC/QLLC/LLC environment T-PADs and FEPs over X.25 or Frame Relay Networks.
- Providing interfaces to DDS networks.
- SLIP communication and IP encapsulation over Frame Relay or X.25 protocols.

For more detailed configuration information, refer to the *Packet Switching Guide*.

4.1 The Switch's Controls, Indicators, and Connectors

4.1.1 FRONT-PANEL COMPONENTS

The FradSwitch A/S 3 Port's front panel is shown in Figure 4-1 below. Its numbered components are described in Table 4-1 on the next page.

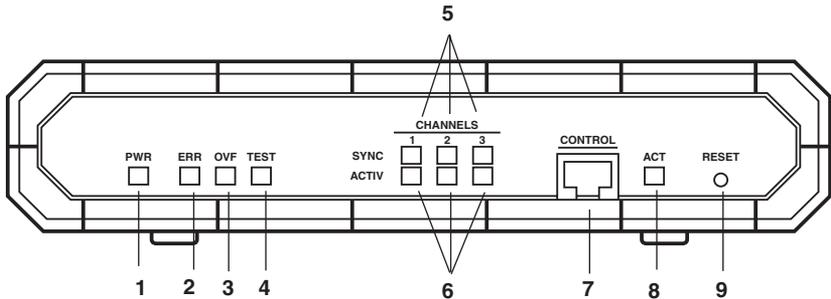


Figure 4-1. The Switch's front panel.

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

No. in Fig. 4-1	Component	Function								
1	PWR LED	Lights when the FradSwitch A/S 3 Port 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 3 Port's buffers are full. In a properly designed system, this condition usually indicates that one of the units connected to the Switch is not responding to the flow-control commands the Switch is sending it, which can happen if the Switch is configured incorrectly.								
4	TEST LED	Lights when the FradSwitch A/S 3 Port is in diagnostics mode (one of its test loops is active). Data traffic is interrupted during diagnostic testing.								
5	SYNC LEDs	<p>Indicate the synchronization status of the corresponding main-link port on the FradSwitch A/S 3 Port:</p> <table border="0"> <tr> <td data-bbox="412 906 529 927"><i>Condition:</i></td> <td data-bbox="557 906 674 927"><i>Indication:</i></td> </tr> <tr> <td data-bbox="412 946 447 967">Off</td> <td data-bbox="557 946 785 967">Switch not powered.</td> </tr> <tr> <td data-bbox="412 987 447 1008">On</td> <td data-bbox="557 987 955 1073">Switch powered and synchronized with the peer at the other end of the main link.</td> </tr> <tr> <td data-bbox="412 1092 543 1146">Continuous flashing</td> <td data-bbox="557 1092 974 1179">FradSwitch A/S 3 Port is powered but not synchronized with the corresponding peer.</td> </tr> </table>	<i>Condition:</i>	<i>Indication:</i>	Off	Switch not powered.	On	Switch powered and synchronized with the peer at the other end of the main link.	Continuous flashing	FradSwitch A/S 3 Port is powered but not synchronized with the corresponding peer.
<i>Condition:</i>	<i>Indication:</i>									
Off	Switch not powered.									
On	Switch powered and synchronized with the peer at the other end of the main link.									
Continuous flashing	FradSwitch A/S 3 Port is powered but not synchronized with the corresponding peer.									
6	ACTIV (Main-Link Activity) LEDs	Light to show activity (reception or transmission of frames) on the corresponding main-link port.								
7	Control Port	Connect a terminal to this port to configure the Switch through its firmware-based menu system.								
8	ACT (Control-Port Activity) LED	Lights when the control port is active (receives commands or transmits configuration information).								
9	RESET Button	Press to reinitialize the FradSwitch A/S 3 Port.								

FRADSWITCH A/S 3 PORT

4.1.2 REAR-PANEL COMPONENTS

The FradSwitch A/S 3 Port's rear panel is shown in Figure 4-2 below. Its numbered components are described in Table 4-2 below.

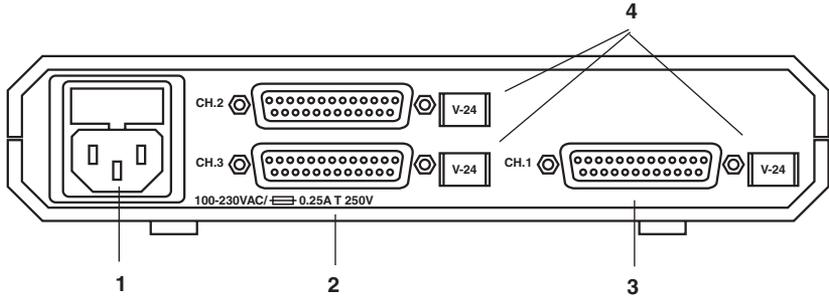


Figure 4-2. The Switch's rear panel (“-232/232” model shown).

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

No. in Fig. 4-2	Component	Function
1	Power Inlet	AC-power connector with integral fuse.
2	Ports 2 and 3: Local Main-Link Connectors	Connection points for local DTE or DCE devices.
3	Port 1: WAN Main-Link Connector	Connection point for packet-switching WAN equipment.
4	Interface Labels	Identify the interface carried by the corresponding connector: “V.24” for RS-232/V.24, “530” for RS-530, “V.35” for V.35, or “X.21” for X.21.

4.2 Basic Operating Instructions and Indications

Once you install and configure the FradSwitch A/S 3 Port, it normally operates unattended. After initial setup, operator intervention is only required when the Switch has to be reconfigured or if something goes wrong. Note that the Switch 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/S 3 Port 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 Switch has no ON/OFF switch. The Switch's PWR LED should light and some or all of its other LEDs should flash. (Which other LEDs flash might depend on how the Switch is configured.) If the ERR, OVF, or TEST LEDs light, make sure that after a short interval (during which the Switch performs its power-up self-test) the LED goes 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 channel is idle.

4.2.3 POWER-DOWN

To turn off the FradSwitch A/S 3 Port, unplug its power cord from AC power; the Switch has no ON/OFF switch.

4.3 Upgrading the Switch's Firmware

Because the FradSwitch A/S 3 Port has flash memory, you can upgrade its firmware without replacing its EPROMs. To do so, take these steps:

1. Connect a PC running terminal emulation to one of the Switch's three main-link ports (if any of these are RS-232/V.24 interfaces) or (preferably) the Switch's control port. 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. You will be prompted to enter a password; just hit [Enter] (the Switch's default password state is no password at all).
3. The Main Menu will appear:

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

Select :

4. 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 :

5. Select option 12. This screen will appear:

```

*****
*
*
*           WARNING !!!
*
*
*           THIS ACTION WILL ENABLE YOU TO DOWNLOAD
*
*           A NEW SOFTWARE VERSION AFTER RESET.
*
*                   * * *
*
*           Type:
*
*                   LINK1 for download through link 1.
*
*                   LINK2 for download through link 2.
*
*                   LINK3 for download through link 3.
*
*                   CHAN1 for download through front channel 1.
*
*
*           You should connect a terminal configured:
*
*                   9600, N, 8, 1 to the desired port.
*
*
*****

```

6. Type “CHAN1” and press [Enter] if the PC is attached to the control port; type “LINK1” and press [Enter] if the PC is attached to main-link port 1, etc. (If you select a 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, the front-panel control port.) After you make your selection, you will be returned to the System Control Menu.

7. Reset the Switch by either (a) selecting option 9 at the System Control Menu (the preferred method), (b) pressing the RESET button on the Switch’s front

FRADSWITCH A/S 3 PORT

panel, or (c) unplugging the Switch 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
*          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 Switch as “ASCII” or (preferably) “raw ASCII” data. When the firmware is downloaded successfully, the following message will appear:

```
Successful download
```

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

5. Troubleshooting

5.1 Things to Try First

If a problem occurs with your FradSwitch A/S 3 Port, try these things *first*:

- Make sure that the Switch 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 Switch is powered ON and operating normally.
- Check the Switch's indicators.
- Make sure that the configurations of the local FradSwitch A/S 3 Port and the remote PAD or switch 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 Switch 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/S 3 Port 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/S 3 Port:

- 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 Materials Authorization (RMA) number.

Appendix: Connector Pinouts

A.1 The RS-232 Interfaces

Here are the EIA/TIA RS-232 pinouts for the FradSwitch A/S 3 Port's RS-232/V.24 main-link-ports and for the Switch's front-panel control port. Note that the main-link port is a DB25 female connector with standard RS-232 pinning and that the control port is a proprietarily pinned RJ-45 female connector.

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

A.2 The RS-530 Interface

Here is the EIA/TIA RS-530 pinout for the FradSwitch A/S 3 Port's RS-530 main-link-ports. This is also the pinout for the unadapted X.21 main-link ports; the adapter cable that comes with the X.21 versions of the Switch patches these ports to their standard DB15 connector (see **Section A.4**).

ITU-T V.24 Circ. Ref.	RS-530 (DB25) Pin	RS-530 Circuit Ref.	Signal Abbreviation	Signal/Lead Name
101	1	—	SHD	Shield (Chassis Ground)
102	7	AB	SGND	Signal Ground
103	2	BA	TD A	Transmitted Data A
		BA	TD B	Transmitted Data B
104	3	BB	RD A	Received Data A
		BB	RD B	Received Data B
105	4	CA	RTS A	Request to Send A
		CA	RTS B	Request to Send B
106	5	CB	CTS A	Clear to Send A
		CB	CTS B	Clear to Send B
107	6	CC	DCR A	DCE Ready A
		CC	DCR B	DCE Ready B
108.2	20	CD	DTR A	DTE Ready A
		CD	DTR B	DTE Ready B
109	8	CF	RLSD (CD) A	Rcvd. Line Sgnl. Detector (Carrier Detect) A
		CF	RLSD (CD) B	Rcvd. Line Sgnl. Detector (Carrier Detect) B
113	24	DA	TSETT (EXTTC) A	Transmitter Signal Element Timing (DTE) (External Transmit Clock) A
		DA	TSETT (EXTTC) B	Transmitter Signal Element Timing (DTE) (External Transmit Clock) B
114	15	DB	TSETC (TC) A	Transmitter Signal Element Timing (DCE) (Transmit Clock) A
		DB	TSETC (TC) B	Transmitter Signal Element Timing (DCE) (Transmit Clock) B
115	17	DD	RSETC (RC) A	Receiver Signal Element Timing (DCE) (Receive Clock) A
		DD	RSETC (RC) B	Receiver Signal Element Timing (DCE) (Receive Clock) B
140	21	RL	RL	Remote Loopback
141	18	LL	LL	Local Loopback
142	25	TM	TM	Test Mode

A.3 The V.35 Interface

Here is the ITU-T V.35 pinout for the FradSwitch A/S 3 Port's V.35 main-link-ports, both unadapted (propriarily pinned out on DB25) and patched with adapter cable (pinned out on standard M/34).

ITU-T V.24 Circ. Ref.	V.35 (DB25) Pin	V.35 Adapter (M/34) Pin	Signal Abbreviation	Signal/Lead Name
101	1	A	FGND	Frame Ground
102	7	B	SGND	Signal Ground
103	2	P	SD A	Send Data A
	14	S	SD B	Send Data B
104	3	R	RD A	Receive Data A
	16	T	RD B	Receive Data B
105	4	C	RTS	Request to Send
106	5	D	CTS	Clear to Send
107	6	E	DSR	Data Set Ready
108.2	20	H	DTR	Data Terminal Ready
109	8	F	RLSD (CD)	Rcvd. Line Signal Detector (Carrier Detect)
113	24	U	TSETT (EXTTC) A	Transmitter Signal Element Timing (DTE) (External Transmit Clock) A
	11	W	TSETT (EXTTC) B	Transmitter Signal Element Timing (DTE) (External Transmit Clock) B
114	15	Y	TSETC (TC) A	Transmitter Signal Element Timing (DCE) (Transmit Clock) A
	12	AA	TSETC (TC) B	Transmitter Signal Element Timing (DCE) (Transmit Clock) B
115	17	V	RSETC (RC) A	Receiver Signal Element Timing (DCE) (Receive Clock) A
	9	X	RSETC (RC) B	Receiver Signal Element Timing (DCE) (Receive Clock) B
140	21	HH	RL	Remote Loopback*
141	18	JJ	LL	Local Loopback*
142	25	LL	TM	Test Mode*

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

A.4 The X.21 Interface

Here is the ITU-T X.21 pinout for the FradSwitch A/S 3 Port's X.21 main-link-ports, both unadapted (pinned out as per RS-530 on DB25) and patched with adapter cable (pinned out on standard DB15).

ITU-T V.24 Circ. Ref.	RS-530 (DB25) Pin	V.35 Adapter (M/34) Pin	Signal Abbrev.	Signal/Lead Name
101	1	1	—	Frame Ground
102	7	8	G	Signal Ground
103	2	2	T A	Trasnmit A
	14	9	T B	Transmit B
104	3	4	R A	Receive A
	16	11	R B	Receive B
105	4	3	C A	Control (Request tio Send) A
	19	10	C B	Control (Request tio Send) B
109	8	5	I A	Indication (Carrier Detect) A
	10	12	I B	Indication (Carrier Detect) B
113	24	7	E A	External Signal Element Timing (External Clock) A*
	11	14	E B	External Signal Element Timing (External Clock) B*
114	15	6	S A	Signal Element Timing (Transmit Clock) A
	12	13	S B	Signal Element Timing (Transmit Clock) B

*The E A and E B signals are not included in the standard X.21 interface. On the Switch, 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.

A.5 The DDS Interface

Here is the pinout for the DDS main-link port (Port 1, the modular RJ-48 socket) on “-DDS” models of the FradSwitch A/S 3 Port. All unlisted pins are unused.

DDS (RJ-48) Pin	Signal/Lead Name
1	Receive (RX) Ring
2	Receive (RX) Tip
4	Transmit (TX) Ring
5	Transmit (TX) Tip

NOTICE

This manual contains information that is proprietary to the manufacturer. No part of this publication may be reproduced in any form whatsoever without prior written approval.

DISCLAIMERS

No representation or warranties for fitness for any purpose other than what is specifically mentioned in this manual is made either by the manufacturer or its agents.

The manufacturer shall not be liable for any direct, indirect special, incidental, or consequential damages, whether based on contract, tort, or any legal theory.



© Copyright 2002. Black Box Corporation. All rights reserved.

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746