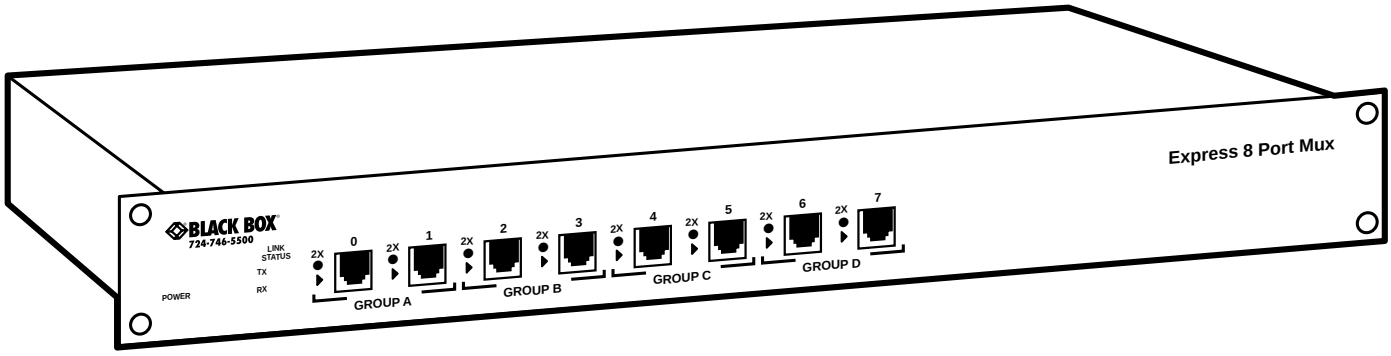
1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746

BLACK BOX®
NETWORK SERVICES

JUNE 2000
IC219A

Express 8-Port Mux



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
INDUSTRY CANADA
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 J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

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

INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

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.

Classification of LED Transmitter Device

The optical transmitter contains an LED system and is classified “CLASS 1 LED PRODUCT” per EN60825-1 (+A11), Safety of Laser Products. Contact Black Box Corporation for repair if your Express 8-Port Mux ever requires maintenance.

TRADEMARKS USED IN THIS MANUAL

ST is a registered trademark of AT&T.

AS/400 and IBM are registered trademarks of International Business Machines Corporation.

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Contents

1. Specifications

Active Pair: Port configurable

Fiber Optic Budget: 12 dB, typical

Input Impedance: 100 ohms, nominal

Maximum Distance: Host to mux: 2000 ft. (609.6 m); Mux to device: 2200 ft. (670.5 m); Mux to mux: 6600 ft. (2011.7 m)

Speed: 1 or 2 Mbps, depending on IBM® 5250 protocol

Connectors: (8) RJ-45, (1) DB25 M, (1) pair of ST®

Indicators: LEDs: Power, Port Activity, Mode

Peak Power Wavelength: 820 nanometers

Operating Temperature: 32 to 104°F (0 to 40°C)

Storage Temperature: 32 to 185°F (0 to 85°C)

Humidity Tolerance: Up to 95%, noncondensing

Power: 100–240 VAC, +5 VDC, external

Size: 1.75"H (1U) x 19"W x 8.8"D (4.4 x 48.3 x 22.4 cm)

Weight: 5.6 lb. (2.5 kg)

2. Introduction

This users' manual applies to the Express 8-Port Mux, which is used with the IBM 5250 protocol. The 5250 family of products consists of IBM System 34, 36, 38, and the AS/400®, along with many supporting devices manufactured by IBM and other companies. The Express 8-Port Mux works with all supporting devices that are designed within the 5250 specifications.

2.1 Description

The Express 8-Port Mux has the unique ability to allow multiple AS/400 controller polling groups to be transmitted over a single fiber optic pair. This feature allows all new AS/400e controllers to provide their maximum throughput potential, in either 1-Mbps Optimized or 2-Mbps Express mode, by transparently multiplexing the "split-polling" feature without requiring performance-robbing PTFs (Programming Temporary Fixes).

All new IBM controllers support the split-polling feature as a means of achieving higher throughput rates, even when connected to standard legacy devices. The Express 8-Port Mux allows the split-polling feature to remain enabled, with performance of up to 4 times greater than standard legacy 1-Mbps 5250 protocol.

The Express 8-Port Mux has 8 shielded RJ-45 port connections as well as a DB25 "direct connection," eliminating the need for the twinax "brick" and associated twinaxial cabling. The link between the two muxes uses multimode fiber cable with ST connectors. It can operate in both point-to-point and multipoint ring topologies, reducing hardware requirements by up to 50%. Other features include advanced noise filtering, LED port diagnostics, configurable UTP pin assignments, and a field-replaceable wide-ranging power supply.

2.2 What the Package Should Include

Remove the packing material and check for the items below. If anything is missing or damaged, contact Black Box at (724) 746-5500.

- (1) Express 8-Port Mux (includes a 100-to-240-VAC input external power supply, attached on the rear panel)
- (1) AC power cord (North American units only)
- This users' manual

CAUTION

Do not apply power to any damaged component!

2.3 Connectors and Indicators

The Mux's LEDs and connectors are described below. Refer to Figures 2-1 and 2-2 to locate each connector or indicator.

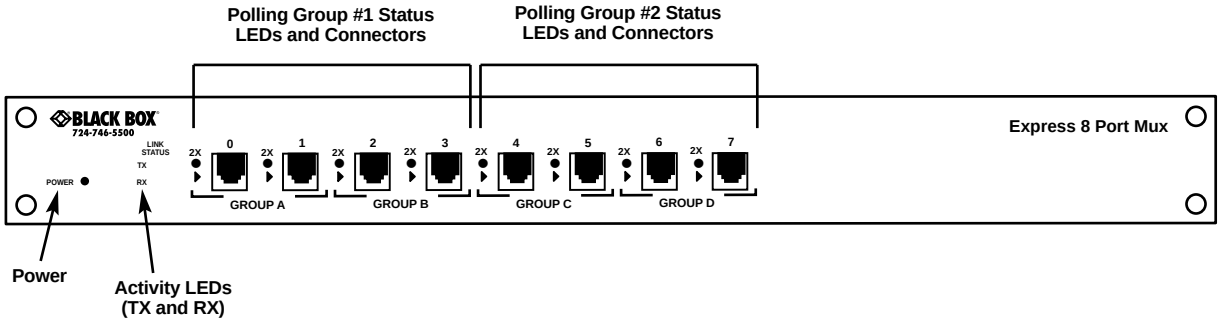


Figure 2-1. The Express 8-Port Mux's Front Panel.

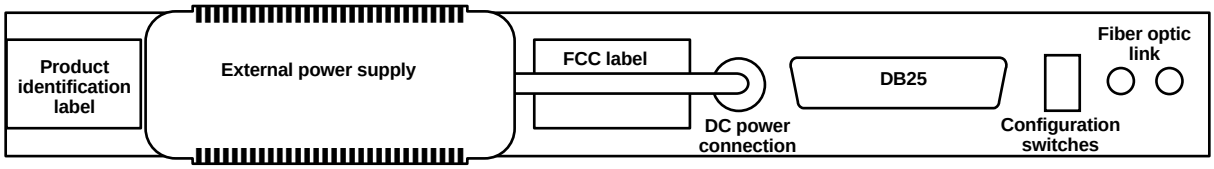


Figure 2-2. The Express 8-Port Mux's Rear Panel.

Power LED — On when the Express 8-Port Mux is powered up.

TX Activity LED — On when a signal is transmitted to the fiber optic aggregate link.

RX Activity LED — On when a signal is received from the fiber optic aggregate link and the Mux synchronizes to it.

Polling Group Status LEDs — The upper green LEDs are express mode indicators. These LEDs activate when an express signal is detected, and they remain on until a 1-Mbps signal is detected or a system reset occurs. The lower green LEDs are data activity indicators. These LEDs activate when a signal is present.

Polling Group Connectors — There are two polling groups. Each polling group has been divided into two port groups. Polling group #1 consists of ports 0 through 3 (port groups A and B), and polling group #2 consists of ports 4 through 7 (port groups C and D). *Ports within a polling group must be connected to ports from a common controller.*

3. Configuration

READ THIS FIRST!

1. **Do not look into any fiber optic connection or fiber optic cable.**
2. **Do not connect the Express 8-Port Mux to any type of public network.**
3. **Do not connect any outdoor cabling to the Express 8-Port Mux without proper lightning protection.**
4. **Do not use unauthorized power supplies or cables.**
5. **Do not connect to non-5250-protocol devices.**
6. **Do not disassemble or modify the power supply and its cables.**
7. **Disconnect all cables prior to configuration.**
8. **Devices attached to the UTP network must comply with the voltage and current limits for Class 2 Power-Limited Signal Circuits as defined by article 725 of the National Electrical Code and Section 16 of the Canadian Electrical Code.**
9. **For your safety, power outlets must be properly wired and grounded.**
10. **Never attempt to service equipment connected to the data cable network or the grounded receptacle during an electrical storm. Exposure to lethal voltages may occur when lightning is present.**

3.1 Active Pair Setup

Each Express 8-Port Mux is factory configured per customer request. The factory setting is circled on the identification label located on the rear panel. (Refer to Figure 2-2 to locate the identification label.)

The active pair may be re-configured by performing the following procedure:

- Disconnect all power to the unit.
- Remove the two top-cover screws on the rear panel.
- Gently slide the top cover back one inch.
- Hold the top cover and tilt it up.

Reconfigure the jumpers located behind the RJ-45 connectors as required. Settings for active pair assignment are shown below:

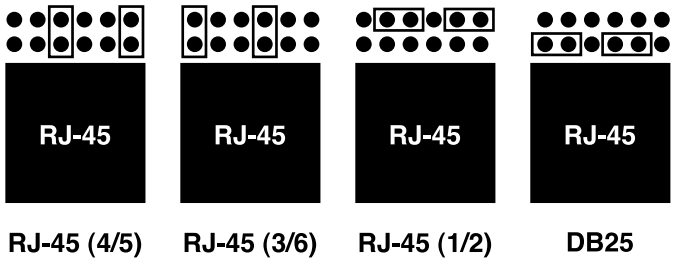


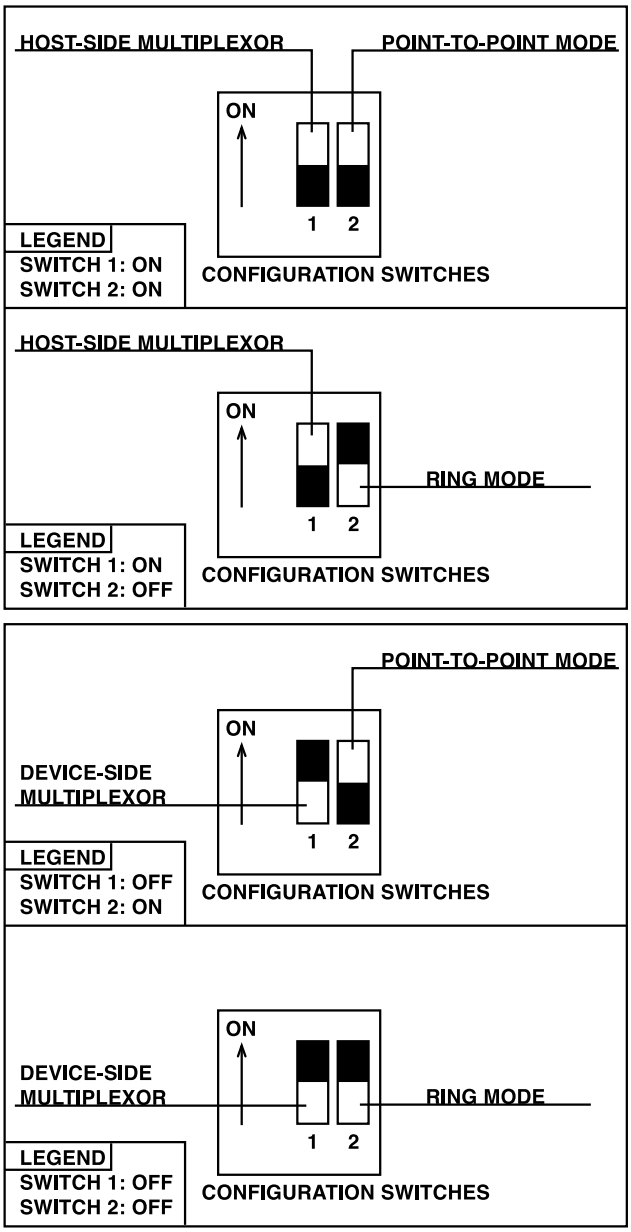
Figure 3-1. Active Pair Jumper Settings.

Note that connections to the DB25 and RJ-45 connectors are mutually exclusive. If any of the three pairs of the RJ-45 connectors are selected, the DB25 is disconnected. If the DB25 is selected, the RJ-45 connectors are disconnected. All jumper settings must be identical.

To reinstall the top cover, tilt the top cover down, and slide the top cover forward until it mates completely with the bottom cover. Install the two top-cover screws.

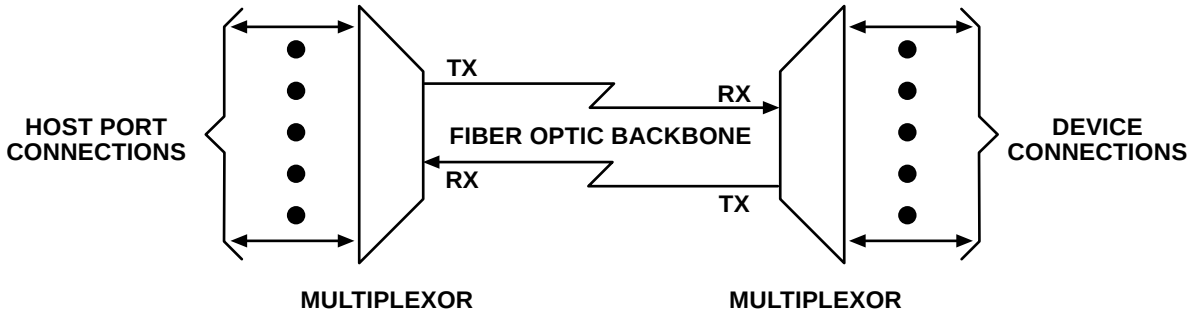
3.2 Configuration Switch Settings

The configuration switch settings are shown below.

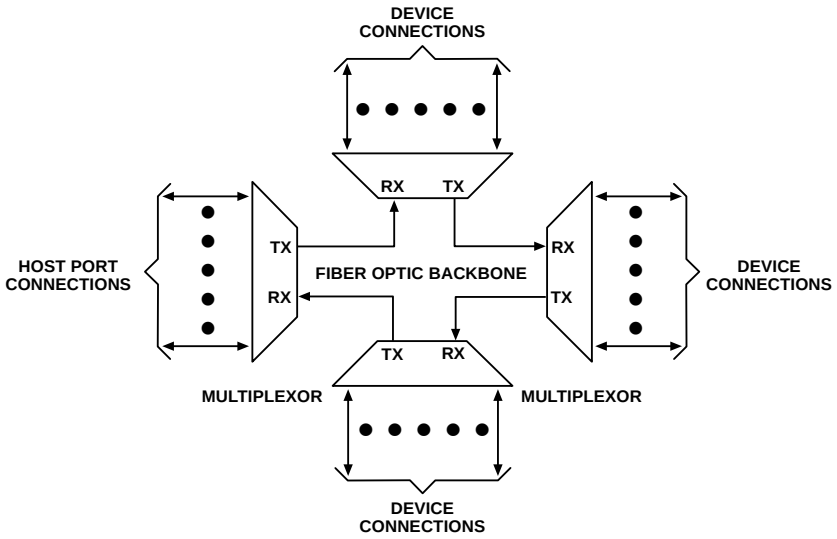


3.3 Mode Description

A point-to-point link is made up of two multiplexors connected by a single backbone (see the illustration below).

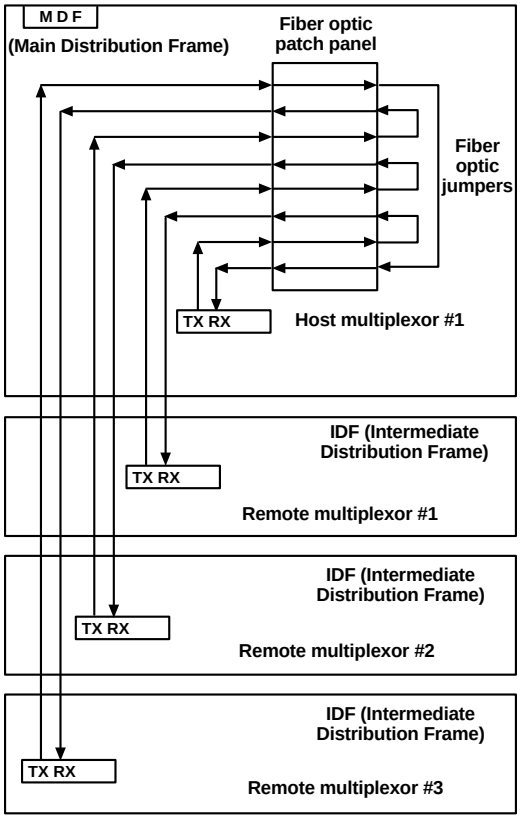


When multiple multiplexors are connected in series with fiber optic transmit to fiber optic receive, they form a ring topology (see the illustration below).



3.4 Collapsed Rings

The ring mode shown in **Section 3.3** is seldom implemented. Instead fiber optic cables usually star out from a central location. Therefore, a ring is created by interconnecting the fiber optic star segments at the central location. This technique is known as a collapsed ring.



3.5 Connections

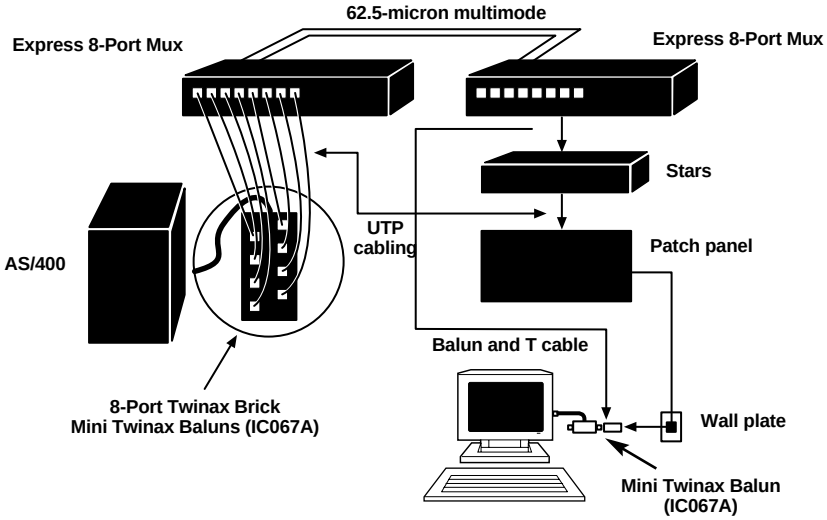


Figure 3-2. Typical AS/400 Installation.

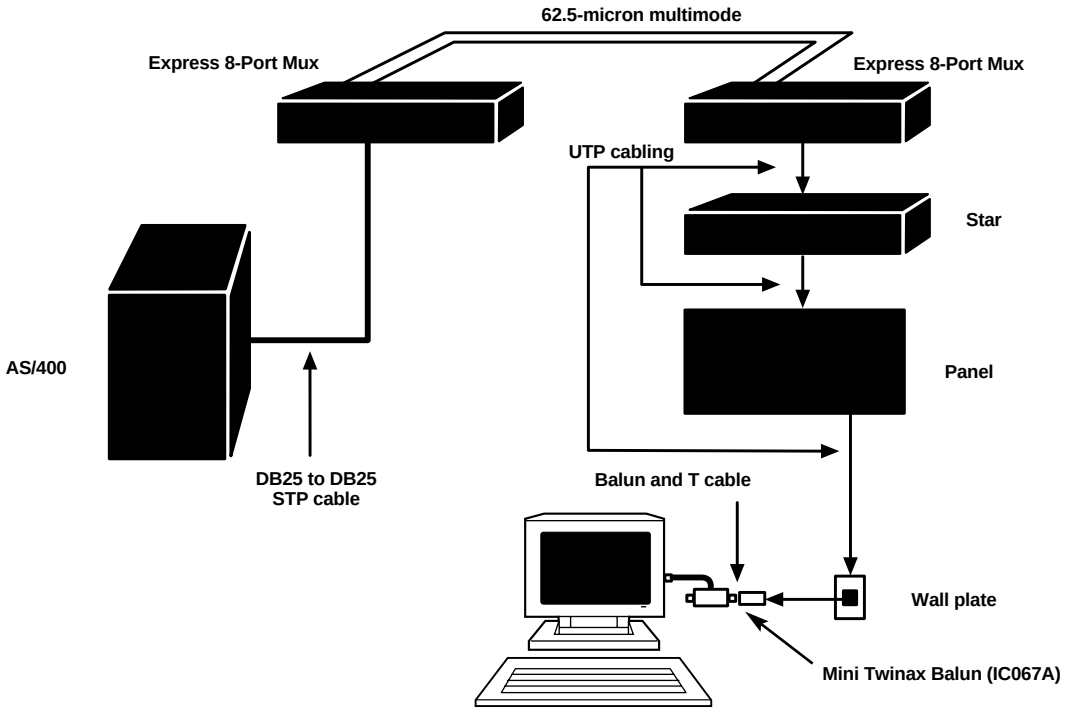


Figure 3-3. AS/400 Twinax Brick Detail.

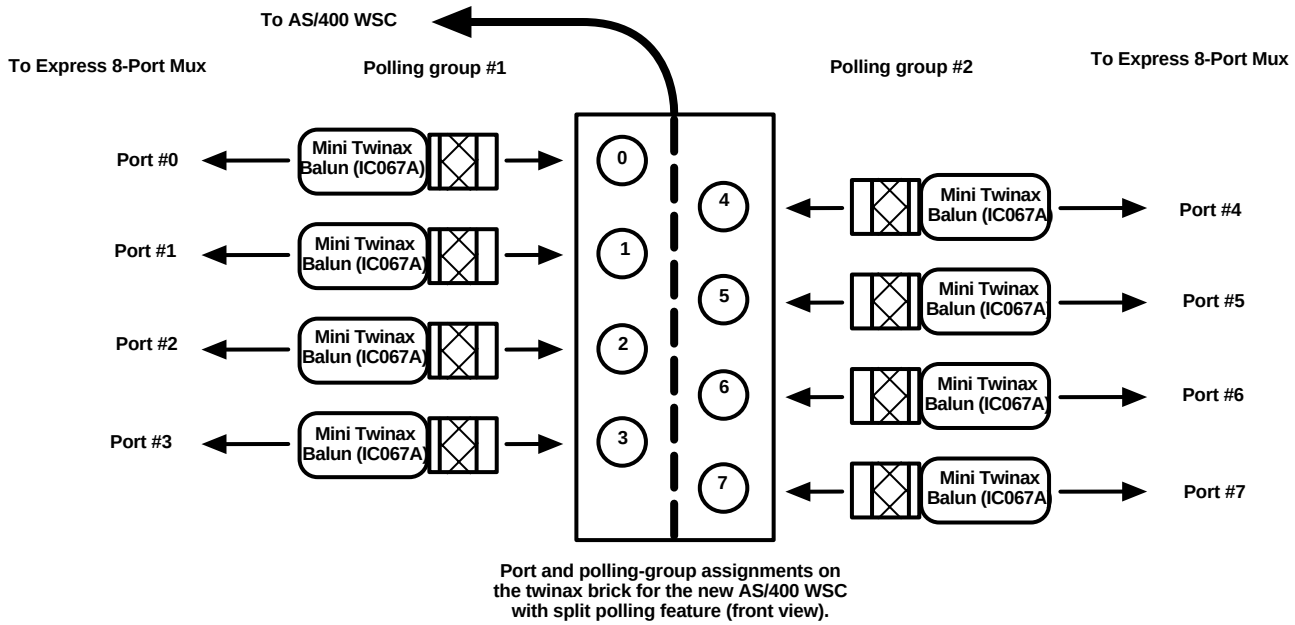


Figure 3-4. Typical AS/400 Direct Connect Installation.

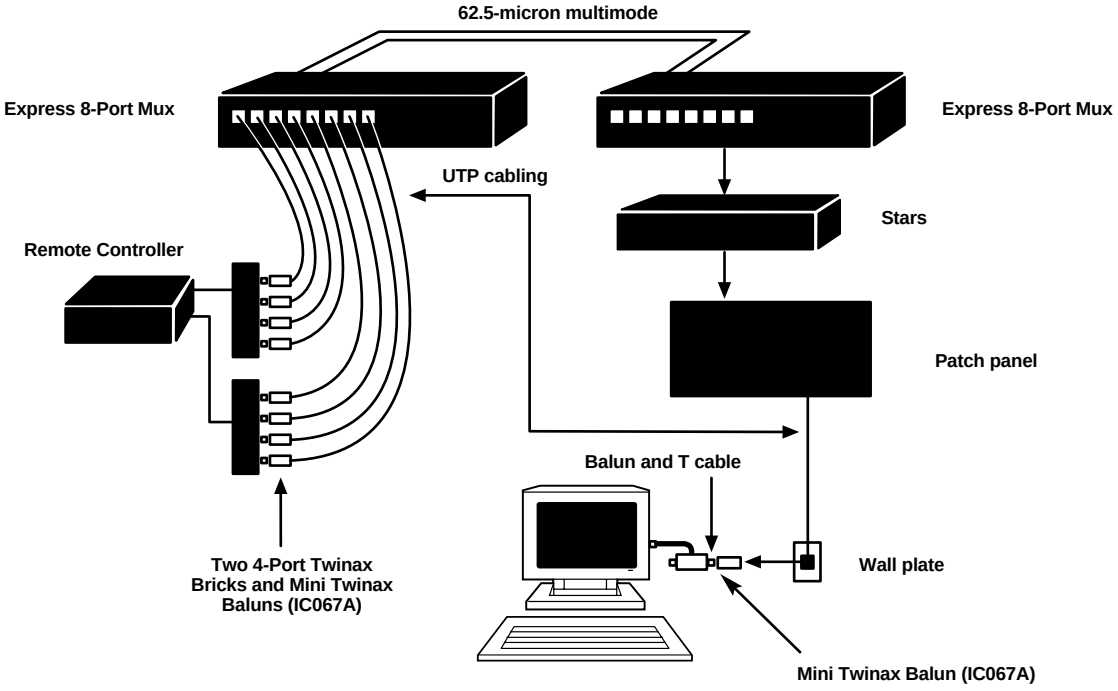


Figure 3-5. Typical Remote Controller Installation.

A major difference between the newer workstation controllers and the older ones is the number of polling groups. The older WSCs had one polling group for all eight ports. The newer WSCs have two polling groups. Divide the twinax brick in two. Ports 0 through 3 make up one polling group, and ports 4 through 7 make up the other polling group. The twinax brick detail illustrates a proper connection.

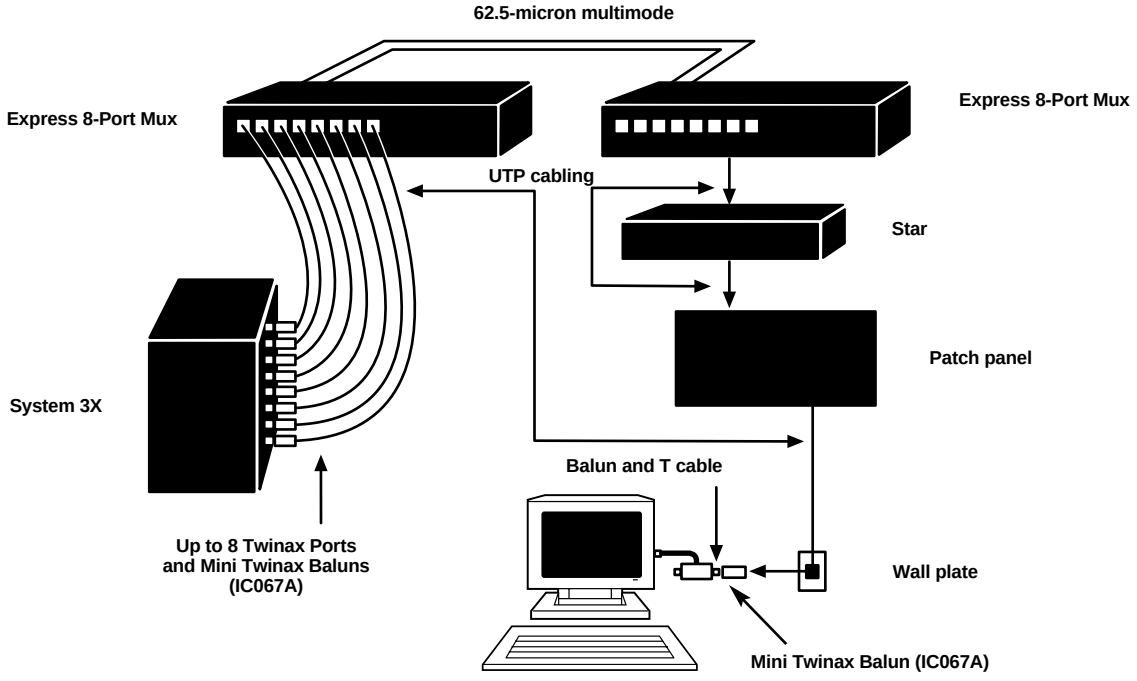


Figure 3-6. Typical System 3X Installation.

4. Installation

READ THIS FIRST!

1. **Do not look into any fiber optic connection or fiber optic cable.**
2. **Do not connect the Express 8-Port Mux to any type of public network.**
3. **Do not connect any outdoor cabling to the Express 8-Port Mux without proper lightning protection.**
4. **Do not use unauthorized power supplies or cables.**
5. **Do not connect to non-5250-protocol devices.**
6. **Do not disassemble or modify the power supply and its cables.**
7. **Disconnect all cables prior to configuration.**
8. **Devices attached to the UTP network must comply with the voltage and current limits for Class 2 Power-Limited Signal Circuits as defined by article 725 of the National Electrical Code and Section 16 of the Canadian Electrical Code.**
9. **For your safety, power outlets must be properly wired and grounded.**
10. **Never attempt to service equipment connected to the data cable network or the grounded receptacle during an electrical storm. Exposure to lethal voltages may occur when lightning is present.**

4.1 Host-Side Multiplexor Installation

1. Set the configuration switches on the rear panel of the host-side Express 8-Port Mux as follows:

   Switches 1 and 2 ON for a point-to-point application

   or

   Switch 1 ON and Switch 2 OFF for a ring application.

2. The Express 8-Port Mux is designed for a 19" rack. The unit should be properly installed using all four mounting holes. Rack hardware is not provided. We recommend using plastic or nylon washers under mounting screws to protect the chassis's finish.

3. A polling group is a group of ports which have one port active at a time. The new AS/400 workstation controllers (WSCs) have two polling groups. Ports 0 through 3 and ports 4 through 7 constitute the two groups. The Express 8-Port Mux can accommodate two polling in the same fashion. *Do not connect more than one host polling group to an Express 8-Port Mux polling group.* Connect the host ports to the Express 8-Port Mux ports.

WARNING

Do not look into any fiber optic connector or fiber optic cable.

4. The Express 8-Port Mux has ST fiber optic connectors. Connect the multimode fiber optic cables to the optical link connectors on the rear panel of the Express 8-Port Mux. Note the fiber color or number on the "TX" and "RX" to ensure proper connection to the remote multiplexor. Strain relieve and label all cables.

5. The external power supply is mounted on the Express 8-Port Mux's rear panel. The AC power cord must be firmly inserted into the external power supply and strain relieved.

6. Plug the other end of the AC power cord into a properly wired outlet. All data and mode LEDs on the Express 8-Port Mux will activate for two seconds and fade off. The amber power LED on the front panel, the green power LED on the top of the external power supply, and the TX LED will activate and remain on. At this time the data activity LEDs will flash at the host's polling rate. The RX LED will be off until the remote Mux is installed.

4.2 Device-Side Multiplexor Installation

1. Set the configuration switches on the rear panel of the device-side Express 8-Port Mux as follows:

   Switch 1 OFF and Switch 2 ON for a point-to-point application

   or

   Switches 1 and 2 OFF for a ring application.

2. The Express 8-Port Mux is designed for a 19" rack. The unit should be properly installed using all four mounting holes. Rack hardware is not provided. We recommend using plastic or nylon washers under mounting screws to protect the finish.

WARNING

Do not look into any fiber optic connector or fiber optic cable.

3. The Express 8-Port Mux has ST fiber optic connectors. For point-to-point applications, connect the multimode fiber optic cable attached to the host side Multiplexor's "TX" to the device side Multiplexor's "RX" optical link connector located on the rear panel of the Express 8-Port Mux, and connect the multimode fiber optic cable attached to the host side Multiplexor's "RX" to the device side Multiplexor's "TX" optical link connector located on the rear panel of the Express 8-Port Mux. For ring applications, connect the fiber optic TX of a Multiplexor to the fiber optic RX of the next multiplexor downstream in the ring until the ring is complete. Make sure that the cables are properly strain relieved and labeled.

4. Connect the Express 8-Port Mux ports to the host ports of the active- or passive-star hub and follow the installation procedure for the hub.

5. The external power supply is mounted on the rear panel of the Express 8-Port Mux. The AC power cord must be firmly inserted into the external power supply and strain relieved.

6. Plug the other end of the AC power cord into a properly wired outlet. All data and mode LEDs on the Express 8-Port Mux will activate for two seconds and fade off. The amber power LED on the front panel, the green power LED on the top of the external power supply, and the "TX and RX" LEDs will activate and remain on. If any terminals are on, the data activity LEDs will activate. If express devices and an express host are attached, the port status LEDs (upper green LEDs) will activate. Devices in a ring application will not show a sign-on screen until the ring is complete.

5. Troubleshooting

5.1 Possible Problems

If you experience problems with your Express 8-Port Mux, follow the guidelines below.

1) Collect all information relevant to this application.

- Express 8-Port Mux serial numbers.
- Host type and operating system software level.
- Quantity, and type of peripheral devices.
- Interconnecting cable types and distances.
- Equipment environment.
- Interconnection diagrams.

2) Set up the application with all Multiplexors in one room interconnected with fiber optic jumpers. Verify the application with a host port and a terminal.

3) Search through the common problems and possible causes provided in this chapter.

The Express 8-Port Mux front-panel power LED is off.

- Verify that the AC and DC connections are proper.
- Verify that the AC outlet is functioning correctly.

If the problem persists, observe the status of the external power supply's LED and contact Technical Support.

The Express 8-Port Mux RX LED is off or flashing.

- Verify that the fiber optic connectors are properly connected.
- Verify that the fiber optic budget and distance has not been exceeded.

The Express 8-Port Mux TX LED is off.

- Contact Technical Support.

A device is down or unstable.

- Verify that there is one host polling group per Express 8-Port Mux polling group.
- Verify that the host's device type matches the device.
- Verify that the host workstation controller's capacity has not been exceeded.
- Verify that the device is properly terminated. A peripheral is terminated when its twinaxial port has two 54.9-ohm resistors located between the "A" phase pin & earth ground and the "B" phase pin & earth ground. Termination is provided by a "Y" or "T" cable assembly or by a terminating balun (that is, ASFT series).
- Verify that there are no polarity reversals in the cable.
- Verify that the cable distance does not exceed the Express 8-Port Mux specification.
- Verify that the cable is data grade.
- Verify that the wiring uses natural pairs.
- Verify that the wiring avoids sources of environmental noise.
- Verify that the balun's pinout matches the Express 8-Port Mux's pinout.
- Verify that the host side balun's pinout/polarity match the device side balun's pinout/polarity.

Devices interfere with each other.

- Verify that there is one host-polling group per Express 8-Port Mux polling group.
- Verify that devices on star segments have unique addresses.
- Verify that all devices are properly terminated.

Devices cannot operate in Express mode.

- Verify that the host and the device are capable of Express mode.
- Verify that all interconnecting components support the Express mode.
- Verify that all devices on the port are Express ready.
- Verify that all cable distances are within the Express specification.
- The controller may have downshifted to 1 Mbps because of errors during installation. The controller will retry the Express mode in approximately one hour.

Flashing Express LEDs.

- Determine the number of Express devices on the port. If there are less than seven devices, the flashing Express LED is normal.

Express LED on without data activity.

- If the host is disconnected during an express connection, the express LED remains on.

5.2 Calling Black Box

If you determine that your Express 8-Port Mux is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box 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.

5.3 Shipping and Packaging

If you need to transport or ship your Express 8-Port Mux:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Express 8-Port Mux for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Materials Authorization (RMA) number.