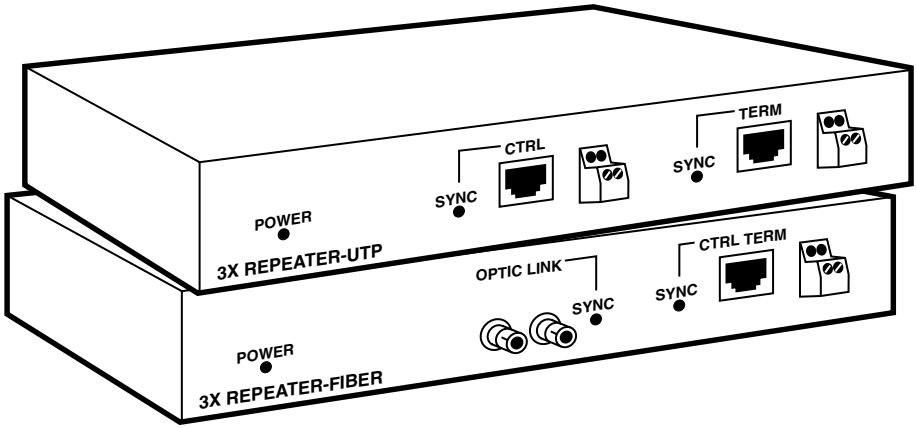
BLACK BOX®
NETWORK SERVICES

FEBRUARY 1996

IC052 IC075A
IC052E IC075AE
IC053 IC076A
IC053E IC076AE

3X Repeater—UTP
3X Repeater—UTP RJ-45
3X Repeater—Fiber
3X Repeater—Fiber RJ-45



CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **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 classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

18. Servicio por personal calificado deberá ser provisto cuando:

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

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

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

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

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

CONTENTS

1. Specifications

Maximum distance — Controller to repeater: 2250 ft. (685.8 m)
Repeater to workstation: 2250 ft. (685.8 m)
Repeater to daisychained repeater: 8200 ft. (2499.4 m)

Devices — IBM® 5251, 5291, 5292, 3180-12, 3196, and compatible terminals used in a 3X or AS/400® system

Speed — 1 Mbps

Cable Requirements — IC052, IC052E, IC075A, IC075AE: 22- or 24-gauge solid copper unshielded twisted pair;
IC053, IC053E, IC076A, IC076AE: Dual-fiber, multimode graded, 50 or 62.5 micron fiberoptic

Pin Configuration — Pin 3 ring, Pin 4 tip

Connectors — IC052, IC052E: (2) RJ-11 female, (2) pairs screw-type terminals
IC053, IC053E: (1) RJ-11 female, (1) pair screw-type terminals, (2) ST connectors
IC075A, IC07AE: (2) RJ-45 female, (2) pairs screw-type terminals
IC076A, IC076AE: (1) RJ-45 female, (1) pair screw-type terminals, (2) ST connectors

Indicators — LEDs: (1) power, (2) line sync

Temperature — Storage: -4 to 185° F (-20 to 85° C);
Operating: 50 to 104° F (10 to 40° C)

Humidity — 95%, noncondensing

Power — IC052, IC053, IC075A, IC076A: 110 VAC;
IC052E, IC053E, IC075AE, IC076AE: 220 VAC

Size — 1.3"H x 8.5"W x 4"D (3.3 x 21.6 x 10.2 cm)

Weight — 2 lb. (0.9 kg)

2. Introduction

Your 3X and AS/400 signals cover much longer distances with a 3X Repeater on line. The Repeater carries out all the vital functions for retransmission—each signal is resynchronized, reformatted, and filtered for noise before it is passed on.

2.1 UTP Repeaters

Four models are available:

- 3X Repeater—UTP (IC052) with 110 VAC power supply
- 3X Repeater—UTP (IC052E) with 220 VAC power supply
- 3X Repeater—UTP RJ-45 (IC075A) with 110 VAC power supply
- 3X Repeater—UTP RJ-45 (IC075AE) with 220 VAC power supply

With a single Repeater on your lines, you can set your workstation up to 4500 feet (1376.1 m) from your controller. Each additional Repeater adds 2250 feet (685.8 m) to your line, up to the maximum distance, as determined by the response time of your system.

The Repeater can handle screw terminal or RJ-11 connections, and works with 22- or 24-AWG unshielded twisted pair.

2.2 Fiber Repeaters

Four models are available:

- 3X Repeater—Fiber (IC053) with 110 VAC power supply
- 3X Repeater—Fiber (IC053E) with 220 VAC power supply
- 3X Repeater—Fiber RJ-45 (IC076A) with 110 VAC power supply
- 3X Repeater—Fiber RJ-45 (IC076AE) with 220 VAC power supply

Repeaters work in pairs. You can locate each repeater up to 2250 feet (658.8 m) from its controller or terminal, while your Repeaters may be separated from each other by distances of up to 8200 feet (2499.4 m). You can also cascade Repeaters to drive signals even further. Each additional Repeater adds 8200 feet to your line.

The Repeater uses 50-, 62-, or 100-micron fiberoptic cable terminated by ST connectors. For workstation and controller connections, it can handle screw terminal or RJ-11 connections, and works with 22- or 24-AWG twisted pair.

3. Installation — UTP Repeaters

3.1 General

Before you install your Repeater, check the contents of the carton. In addition to this manual, the package should contain an undamaged Repeater unit. If it has been damaged, call your sales representative for a replacement.

When you install the Repeater, you should follow all customary precautions for working with electrical equipment. Make sure there's no current flowing within your workstation, your controller, and your cable by shutting off power to your devices before you begin.

The site requirements for the Repeater are minimal. It should sit in a flat, stable, dry site that affords ample clearance for all connections, and has an AC outlet within 6 feet (1.8 m).

3.2 Preliminary

To get the best performance from your repeater, you should check the following:

- Your cable. It should not have any bridge taps, and the wires of the twisted pairs should be grouped, not separated. You should avoid using flat silver satin cable for long-distance runs — it is highly vulnerable to noise and may cause intermittent problems with transmissions.

  If you use multi-pair cable, you should use bulk lengths of 100 feet (30.5 m) or more, and you should avoid connecting multiple services under the same sheath.

- Polarity. You should make sure that wiring polarity between the host and your workstations is straight-through. The Repeater is sensitive to polarity reversals.

- Termination. The last workstation on the host should be properly terminated.

- Configuration. Your system should be able to recognize all the devices that are on-line.

3.3 Procedure

After you have checked your site, set your Repeater in place—no more than 2250 feet (685.8 m) from your controller, and no more than 2250 feet from your workstation.

Make sure you can distinguish between the tip lead and the ring lead on the balun that leads to your controller. When you attach your cables to the repeater, the tip lead of the balun will contact the tip lead of the connector marked "CTRL," while the ring lead of the balun will contact the ring lead of the same connector. The same arrangement will hold for the balun that leads to your terminal, and the connector marked "TERM."

Plug the Repeater into your outlet. The green LED, marked "Power," should glow. If it does not, check your power supply, and then check with your technical representative.

At this point, you should follow the steps given under one of the two headings below, depending on which attachment method you prefer. Figure 1 applies to both methods.

To Use Screw Terminal Connectors

1. Strip 1/4" of insulation from both lengths of twisted-pair wire (controller and workstation)
2. Connect the wires coming from the controller to the block marked "CTRL" and tighten the locking screws.
3. Connect the wires coming from the workstation to the block marked "TERM" and tighten the locking screws.
4. Check that the tip and ring contacts have not been crossed.
5. Turn on your workstation. The "CTRL-SYNC" and "TERM-SYNC" LEDs should flash.
6. Your unit now should be operational. You should see the sign-on screen from your system.

To Use Modular Connectors

1. Use 22- or 24-AWG twisted pair, with RJ-11 jacks attached, to connect the cables as shown in Fig. 1.
2. Check to make sure that the tip and ring contacts have not been crossed.
3. Turn on your workstation. The "CTRL-SYNC" and "TERM-SYNC" LEDs should flash.
4. Your unit now should be operational. You should see the sign-on screen from your system.

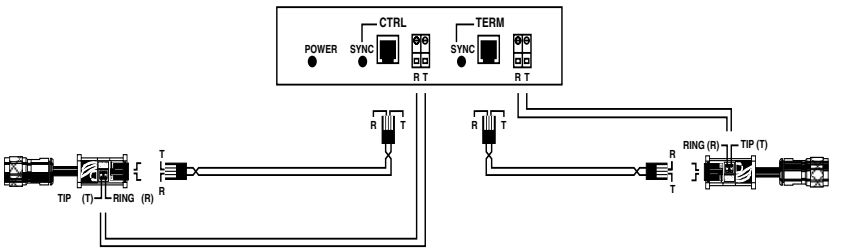

Fig. 3-1. Cabling the Repeater.

4. Installation—Fiber Repeaters

4.1 General

Before you install your Repeater pair, check the contents of the shipping cartons. In addition to this manual, each package should contain an undamaged Repeater unit. If it has been damaged, call your sales representative for a replacement.

When you install the pair, follow all customary precautions for working with electrical equipment. Make sure there's no current flowing within your workstation, your controller, and your cable by shutting off power to your devices before you begin.

The site requirements for your Repeaters are minimal. They should sit in a flat, stable, dry site that affords ample clearance for all connections, and AC outlets should lie within 6 feet (1.8 m).

4.2 Preliminary

To get the best performance from your Repeater pair, you should check the following:

- Your cable. Your fiberoptic cable and the cable that leads from your controller and workstation should be in top condition, with all connectors secure and no breaks. You should not use flat silver satin cable for your controller or terminal connections, since it is highly susceptible to noise.
- Polarity. You should make sure that wiring polarity for your Repeaters is straight-through. They *are* sensitive to polarity reversals.
- Termination. The last workstation on the host should be properly terminated.
- Configuration. Your system should be able to recognize all the devices that are on-line.

4.3 Procedure

After you have checked your site, set your Repeaters in place—no more than 2250 feet (685.8 m) from your controller, no more than 2250 feet from your workstation, and no more than 8200 feet from each other.

Make sure you can distinguish between the tip lead and the ring lead on the baluns that lead to your controller and workstation. When you attach your cables to the repeater, the tip lead of the balun will contact the tip lead of the connector marked "CTRL TERM," while the ring lead of the balun will contact the ring lead of the same connector.

Plug each Repeater into its own outlet. The green LED, marked "Power," should glow. If it does not, check your power supply, and then check with your technical representative.

At this point, you should follow the steps given under one of the two headings below, depending on which attachment method you prefer. Figure 1 applies to both methods.

To Use Screw Terminal Connectors

1. Strip 1/4" of insulation from both lengths of twisted-pair wire (controller and workstation).
2. Connect the wires coming from the controller to the block marked "CTRL" and tighten the locking screws.
3. Connect the wires coming from the workstation to the block marked "TERM" and tighten the locking screws.
4. Check to make sure that the tip and ring contacts have not been crossed.
5. Remove the fiberoptic covers from the Repeater and attach your fiber cable, making sure that your "TX" cable connects to the "TX" port, and your "RX" cable attaches to your "RX" port. Use Figure 1 below to guide you.
6. Turn on your workstation. The "CTRL-SYNC" and "TERM-SYNC" LEDs should flash.

To Use Modular Connectors

1. Use 22- or 24-AWG twisted pair, with RJ-11 jacks attached, to connect the cables as shown in Figure 1.
2. Check to make sure that the tip and ring contacts have not been crossed.
3. Remove the fiberoptic covers from the Repeater and attach your fiber cable, making sure that your "TX" cable connects to the "TX" port, and your "RX" cable attaches to your "RX" port. Use Figure 1 below to guide you.
4. Turn on your workstation. The "CTRL-SYNC" and "TERM-SYNC" LEDs should flash.

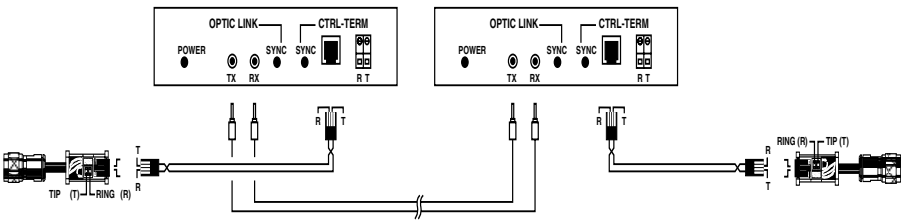

Figure 4-1. Cabling the Repeater Pair.

5. Jumper Settings

There are six jumper pins behind each port, identified by the letters A, B, C, D, E, and F. There are two jumpers at each location to define the pin configuration. The following describes the jumper settings on the printed circuit board: R=RING, T=TIP.

Table 5-1. Jumper Pins on the Connectors.

Connector	Pin					
	A	B	C	D	E	F
RJ-12	N/C	1	3	4	2	5
RJ-45	2	1	5	4	6	3

Table 5-2. Jumper Settings.

Jumpers	Pin Configuration			
C & D	RJ-12	R3	T4	(USOC)
C & D	RJ-45	R4	T5	(USOC)
E & F	RJ-12	R2	T5	(ROLM)
A & B	RJ-45	R1	T2	(AT&T)

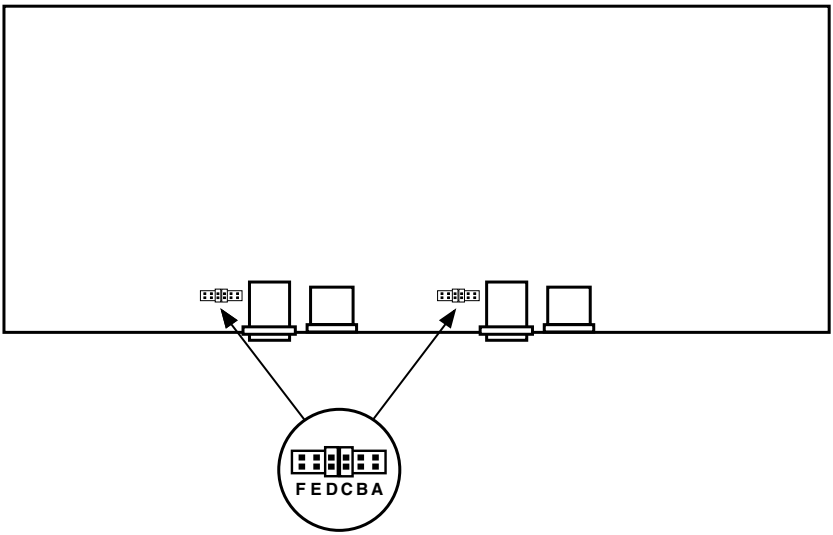

Figure 5-1. Jumper Locations.

6. Operation and Troubleshooting

4.1 Normal Operation

The LEDs indicate normal operation. The green "POWER" LED should glow, and the two red "SYNC" LEDs should flash to indicate packet transfers. The Repeater requires little in the way of maintenance, and can be expected to transfer data for months, if not years with little or no attention.

4.2 Problem-Solving Checklist

You may notice a change in the performance of the Repeater for a number of reasons. The checklist below can eliminate some of the common causes of trouble. When you have exhausted these solutions, call your technical support representative.

CAUTION

Don't try to repair the Repeater yourself. There are no user-serviceable parts within the Repeater. If you open the case, you may harm yourself, damage your equipment, or compound the problem with your Repeater.

- **All LEDs remain dim**

  Check your AC plug and your power supply.

- **"SYNC" LEDs won't flash**

  Check your cable connections. Tighten any loose wiring on your Repeater, your controller, and your workstation. Make sure your baluns are in working order.

  Check the polarity of your lines. The Repeater is sensitive to reversed polarities.

  Make sure that your fiber cables are undamaged, and your connections are secure and free of dust.

- **Noisy or corrupted data**

  Replace any bridged cables, and, if possible, replace any flat silver satin cable by unshielded twisted-pair cable. Flat silver satin cable is quite vulnerable to interference.

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