BLACK BOX
NETWORK SERVICES

Ultra 2 SCSI LVD Expander

FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA
RADIO-FREQUENCY INTERFERENCE STATEMENTS

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an experienced radio/TV technician for help.

Caution:

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 B 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 B prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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

Compliance —   FCC Part 15 Subpart J Class B, IC Class/classe B

Interface —   Wide (16-bit) Ultra2 SCSI ("Fast 40"), multimode (can be either LVD or single-ended, autosensing)

Protocol —   Transparent to synchronous or asynchronous communication

Data Rate —   Up to 80 Megabytes per second

Maximum Distance —   Extends LVD SCSI bus as far as 25 m (82 ft.) with a single unit, farther with daisychained units

User Controls —   (4) Internal jumpers for termination; additional internal jumpers are reserved

Indicators —   LEDs:
    (2) Front-mounted: Power and Busy;
    (5) Internal: (4) Bus Type, (1) Busy;
    An additional internal LED is reserved

Connectors —   (2) Micro D68 female (see **Appendix A** for pinouts)

Power —   110 to 220 VAC, 50 to 60 Hz (autosensing)

Size —   2.9"H x 4.8"W x 7.8"D (7.4 x 12.2 x 19.8 cm)

Weight —   3.3 lb. (1.5 kg)

2. Introduction

2.1 Overview

The Ultra2 SCSI LVD Expander is a Low Voltage Differential (LVD) 16-bit Wide SCSI-bus extender. The Expander effectively divides the SCSI bus into two LVD or SE (single-ended) segments—one segment connected to each of its two ports. The Expander translates signals, and facilitates communication, between the segments.

When used in conjunction with an Ultra2 SCSI host adapter, the Expander maintains backward compatibility with previous generations of devices on single-ended segments, while retaining optimal performance and maximum cable length of LVD. The Expander can also be used with an Ultra SCSI ("SCSI-3," 40-MB-per-second) host adapter to add Ultra2 devices to its bus and increase cable lengths. Because it performs only signal-level translation, the Expander operates transparently; users will hardly know it's there. It places no limits on the quantity or location of SCSI devices beyond the normal limits of the SCSI specification.

The Expander's ports are "multimode," meaning they can operate in single-ended or LVD mode. (This selection is controlled automatically by a sensing signal [DIFFSENSE] provided by the SCSI devices on the bus. As soon as you connect it to the bus, the Expander will autoconfigure its ports as necessary.) Because of this, you can use the Expander to effectively double the length of a single-ended SCSI bus, or to access LVD peripherals farther away from your host adapter than the normal maximum of 12 m (40 ft.). You can also connect two Expanders point-to-point across as much as 24 m (80 ft.) of cable, as long as there aren't any other SCSI devices in-line between them.

The Expander supports all current SCSI operations and can handle data rates up to 20, 40, or 80 megabytes per second, depending on the type of bus it's communicating with. Figure 2-1 shows a typical Expander application. If you'd like to examine a block diagram of the Expander, refer to **Appendix B**.
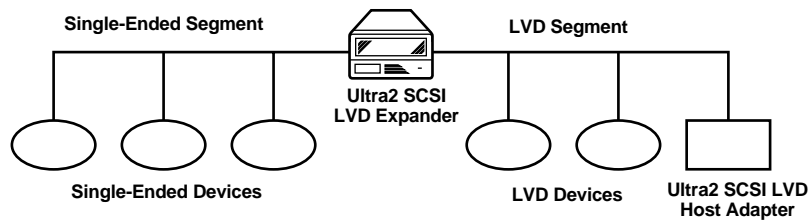

Figure 2-1. One SCSI bus with two physical segments: Using an Expander to access legacy single-ended devices with an LVD host adapter.

2.2 Features

- Supports legacy and Ultra2 SCSI devices on the same bus with LVD-to-LVD extension or SE-to-LVD conversion:
  - Fully backward-compatible with SCSI-1, SCSI-2 [Fast SCSI], and SCSI-3 [Ultra SCSI], and can be used with either Narrow or Wide buses.
  - Has switchable internal termination.

- Transfers data at up to 80 Megabytes per second (on a 16-bit Wide bus) in either direction.

- Supports as many as 16 SCSI devices.

- Does not require software or a SCSI ID.

- Can be used to extend your LVD bus as far as 25 m (82 ft.), or to create an LVD link that extends your single-ended bus.

- Can be daisychained to achieve even higher distances.

- Transparent operation—requires no software and no SCSI ID.

- Supports arbitration, parity, disconnect/reconnect, and sync or async data transfer.

- Can act as either a target or initiator on either connected SCSI-bus segment.

- LEDs show power status and bus activity at all times.

- Can optionally provide TERMPWR (terminator power) to either or both attached bus segments, regardless of whether they're LVD or SE. Handles TERMPWR with a resetting circuit protector and backflow-preventing diodes.

2.3 The Complete Package

Besides the Ultra2 SCSI LVD Expander itself, you should have received its power cord and this manual. If anything is missing or arrived damaged, call Black Box right away.

3. Configuration and Internal LEDs

3.1 Opening the Expander

To configure the Ultra2 SCSI LVD Expander's termination, or to get visual confirmation of more information than the external LED can provide, you'll need to access the Expander's internal jumpers and LEDs.

CAUTION!

To avoid receiving a potentially hazardous electric shock, make sure the Expander is turned OFF and unplugged when you open it. You might have to temporarily turn the unit ON *after* it has been opened in order to observe its internal LEDs—be very careful if you do this!—but never open the unit *while* the unit is ON.

Conversely, even while the Expander is OFF, you need to avoid damaging its circuit board with static electricity. If possible, stand on an anti-static mat when you open the Extender and wear anti-static gloves or wrist straps. At the very least, ground yourself before you open the Expander by touching something metal.

Take these steps to open the Expander:

1. Use a small Phillips-head screwdriver to unscrew the screws embedded in each of the Expander's four rubber feet. Remove the feet.

2. You'll see the edges of the Expander's wraparound housing on the bottom of the unit right next to the holes where the feet used to be. If necessary, gently pry one of these edges slightly outward so that the housing doesn't fit so snugly.

3. Carefully slide the housing toward the back of the unit and remove it.

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Now you're ready to set the jumpers. If you look at the open Expander from above, with its front panel facing right and its rear panel facing left, the jumper posts and internal LEDs will be arranged at the top and bottom edges of the circuit board, something like this:

JP12	JP11	JP10			JP4			JP1
	D7	D6						
			D4	D3			D2	D1
	JP9	JP8	JP7	JP6	JP5	JP3	JP2	
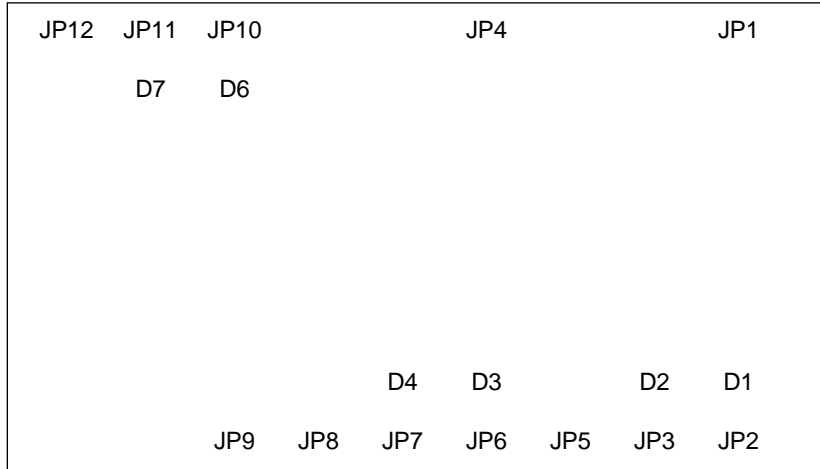
Jumpers will be on JP4 and JP9; a single wire going to the external LED will be connected to the right-hand post on JP8; and the two wires going to the external LED will be connected to JP7. All other jumper posts will be empty.

Jumper posts JP1, JP4, JP9, and JP12 control termination; their possible settings are described in **Section 3.1**. Jumper posts JP7 and JP8 form the electrical connection to the external Busy LED; don't disturb this connection. The other jumpers are reserved for factory testing and future use; don't install anything on them.

Board-mounted LEDs D1, D2, D4, D7, and D8 light in response to the conditions described in **Section 3.2**. LED D3 is reserved for factory testing.

3.2 Configuring Termination

Both ends of any single-ended or LVD SCSI-bus segment attached to the Expander need to be terminated in order to prevent electronic "echo" interference on the bus that would degrade its performance. You can use the Expander's internal jumpers JP1, JP4, JP9, and JP12 to control this termination. JP1 and JP4 affect the bus attached to Port B, while JP9 and JP12 affect the bus attached to Port A.

- **Termination at the Expander (JP4 and JP9):** How you should set jumpers JP4 and JP9, which control local termination at the Expander's ports, depends on how your cables will be attached to the Expander:

  – For each port into which you will be directly plugging a single cable, so that the SCSI-bus segment will *start or end* at that port, keep the jumper installed, just as it comes from the factory. If a segment will start or end at Port A, leave the jumper on JP9. If a segment will start or end at Port B, leave the jumper on JP4.
      Example: For simple conversion applications in which an LVD bus ends at the Expander and a single-ended bus starts, or vice versa, leave both of these jumpers installed.

  – For each port into which you will be plugging two cables through a three-connector adapter (*not* a stub cable!), so that the SCSI-bus segment will *pass through* that port, remove the jumper. If a segment will pass through Port A, remove the jumper from JP9. If a segment will pass through Port B, remove the jumper from JP4.
      Example: For applications in which you are allowing a segment of SE devices to tap into an LVD bus without forcing the LVD bus to operate at the data rate of the SE segment, remove the termination jumper for the port attached to the LVD bus. If the SE segment ends at the Expander, leave the termination jumper for the port attached to the SE segment installed. But if the SE segment also passes through the Expander, remove that jumper as well.

  Refer to Figures 3-1 through 3-3 on the next page. In an application such as that shown in Figure 3-1, both JP4 and JP9 should remain installed. In an application like that in Figure 3-2, with the Expander in the middle of one segment and at the end of another, remove the jumper for the port that's attached to the middle of the segment. In a wide-open application like that in Figure 3-3, in which the Expander is in the middle of both segments, remove both jumpers.

Termination enabled

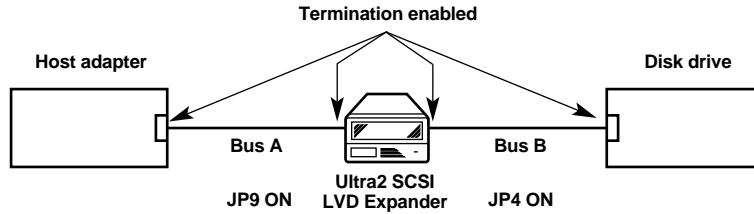Host adapter

Disk drive

Bus A

Bus B

JP9 ON

Ultra2 SCSI
LVD Expander

JP4 ON

Figure 3-1. Both segments end, and are terminated, at the Expander.

Termination
enabled

Host adapter

Multiconnector
ribbon cable

Disk drive

Bus A

Bus A

JP9
OFF

Bus A

Ultra2
SCSI LVD
Expander

Tape drive

JP4 ON

Termination
enabled

Bus B

Disk drive
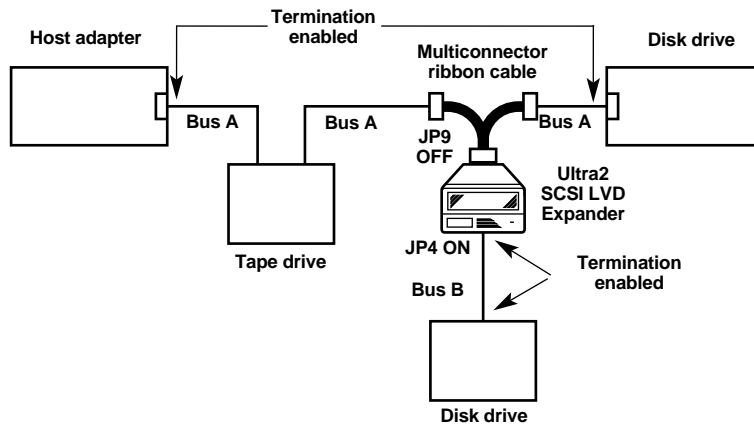
**Figure 3-2. One segment passes through the Expander, while the other ends
and is terminated.**

Termination
Enabled

Host adapter

Disk drive

JP9 OFF

Multiconnector
ribbon cables

Ultra2
SCSI LVD
Expander

JP4 OFF

DVD-ROM drive

Termination
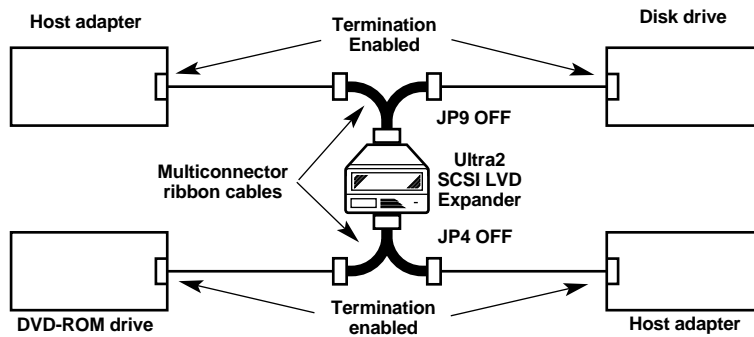enabled

Host adapter

Figure 3-3. Both segments pass unterminated through the Expander.

- **Termination at the Other End(s) of the Segment (JP1 and JP12):** The JP1 and JP12 jumper posts control whether or not the Expander provides TERMPWR output to support remote termination.

   To explain: Most of the current generation of SCSI host adapters, disk drives, and other devices have built-in internal terminators, like those in the Expander, that can be used to terminate the SCSI bus if that device happens to be the first or last device attached to the bus. The remote ends of the SCSI-bus segments that you'll be attaching to the Expander will probably be able to be terminated this way.

   But if, on a SCSI segment that will be attached to the Expander, the first or last device (or both) don't have an internal terminator, you will need to attach an external terminator to that device instead. (I) That external terminator will need to draw its power from a "terminator power" (TERMPWR) voltage that must be present on the SCSI bus. Most SCSI devices can be set to provide TERMPWR.

NOTE

It's easy to make mistakes when installing external SCSI termination. If you'll need to do so, please call Black Box Technical Support to discuss your application.

   If the remote termination for the segments that will be attached to the Expander can be handled with another device's internal terminator, or with an external terminator that gets its TERMPWR from some other device(s), you can leave jumper posts JP1 and JP12 in their factory-default setting (no jumpers installed). But if you'll need to use an external terminator *that gets its TERMPWR from the Expander* for remote termination on a segment attached to either of the Expander's ports, install a jumper on the posts for that port. Install a jumper on JP12 to have the Expander provide TERMPWR on Port A. Install a jumper on JP1 to have the Expander provide TERMPWR on Port B.

   Refer to Figure 3-1 on the previous page. In that illustration, the host adapter and disk drive both have enabled internal terminators. But if the host adapter didn't have an internal terminator and couldn't provide TERMPWR, you would have to install a jumper on the Expander's JP12 posts. If the same were true of the disk drive, you would have to install a jumper on the Expander's JP1 posts.

3.3 Observing the Internal LEDs

After the Expander is open, you can attach the SCSI buses and power cord to the Expander as described in **Chapter 4**, then turn the unit ON and examine the LEDs mounted on the Expander's circuit board. **Be very careful not to touch the inside of the Expander while it's open!**

The internal LEDs are in the locations shown in the board layout on page 10. They have these meanings:

- **D1:** When lit, Port B is operating in single-ended mode.

- **D2:** When lit, Port B is operating in LVD mode.

- (**D3:** Reserved for factory testing.)

- **D4:** When *steadily dark*, either the Expander is OFF or not receiving power or there is continuous heavy traffic on the attached SCSI-bus segments. When *steadily lit*, the Expander is ON but there is no activity on the SCSI bus. When *flickering*, the Expander is ON and there is a normal amount of traffic on the attached SCSI-bus segments.

    (Note that the Expander's external Busy LED will behave in the *opposite* way: dark with no activity, flickering with normal activity, steadily lit with heavy activity.)

- **D6:** When lit, Port A is operating in single-ended mode.

- **D7:** When lit, Port A is operating in LVD mode.

4. Installation and Operation

4.1 Connecting SCSI-Bus Cables

To attach the Ultra2 SCSI LVD Expander to one end of a SCSI-bus segment, run SCSI cable from the desired port on the Expander to another SCSI device.

CAUTION!

Do *not* connect older (non-Ultra2) differential SCSI devices—also known as "high-voltage differential" or "HVD" devices—to the Expander. This could damage or destroy the Expander.

To tap the Expander into the middle of a segment, first turn OFF the Expander's internal termination for the port where you will make this connection—see **Section 3.2**. Then get a "T"-style SCSI cable or adapter with three or more connectors and plug one of its central connectors into that port. Finally, run regular SCSI cables from the end connectors of the "T" cable/adapter to the previous device and next device in the segment.

CAUTION!

The T adapter or cable must be wired so that it does not contain a "stub" (does not branch)—stubbing/branching will cause your SCSI bus to fail. Instead, the cable or adapter should be constructed so that all of the wires run from one connector to the next, to the next, and so on, in sequence. For LVD "T" connections, we suggest our 7-connector LVD ribbon cable (product code EVMSCC22). For single-ended "T" connections, we suggest our 5-connector Ultra SCSI ribbon cable (product code EVMSCC16).

Keep in mind that the maximum cable lengths allowed on any SCSI bus are fairly strict, though they vary by the type of bus and by the cable size and insulation. Table 4-1 lists the maximum recommended cable lengths for each type of single-ended (SE) and low-voltage differential (LVD) SCSI interface that the Expander supports.

Table 4-1. Maximum Cable Lengths

Interface	Maximum Distance
SCSI-1 SE	6 m (20 ft.)
Fast/Wide (SCSI-2) SE	3 m (10 ft.)
Ultra Wide (SCSI-3) SE	*Fewer than 5 devices:* 3 m (10 ft.); *5 or more devices:* 1.5 m (5 ft.)
Ultra2 Wide LVD	*Multiple devices:* 12 m (40 ft.); *Two devices point to point:* 25 m (82 ft.)

4.2 Connecting AC Power and Observing External LEDs

Run the included power cord from the IEC 320 male inlet on the rear of the Expander to a working AC outlet. Once you've plugged in the unit, flip the rocker switch on the rear of the unit to turn the Expander ON. The green external Power LED on its front panel should light immediately. The Expander should now be ready for continuous operation.

The Expander's Power LED is easy to spot, even when it's dark; there is a special cutout for it in the lower right-hand corner of the front panel. The amber Busy LED isn't so easy to see when it's not lit; it's embedded in the venting in the front panel's upper right-hand corner. However, the Busy LED will begin flashing as soon as data begins flowing on either attached SCSI-bus segment. During exceptionally heavy traffic conditions, the flashing might become so persistent that the LED briefly appears to be steadily lit. (The Expander's internal Busy LED, D4, behaves in the opposite way—see **Section 3.3**.)

5. Applications

5.1 Applications That Will Work

Here are several ways in which Ultra2 SCSI LVD Expanders can be used in a SCSI-bus system, helping LVD and single-ended SCSI-bus segments to work as one logical SCSI bus. (As always, each bus segment must be terminated at both ends.)

Figure 5-1 shows how to use an Expander to extend an Ultra SCSI (SCSI-3) bus beyond its normal distance limits to reach faraway LVD devices.
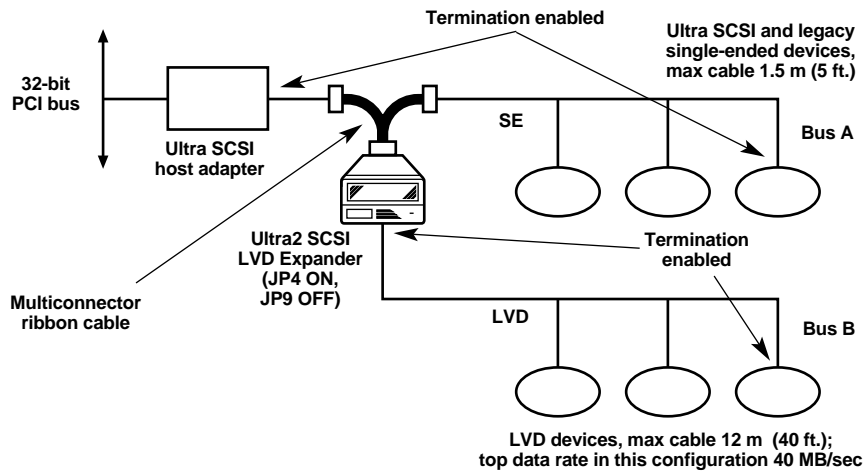
Figure 5-1. Extending an Ultra SCSI bus.

Figure 5-2 shows how Ultra2 SCSI devices and legacy devices can be mixed with no speed degradation for the Ultra2 devices.
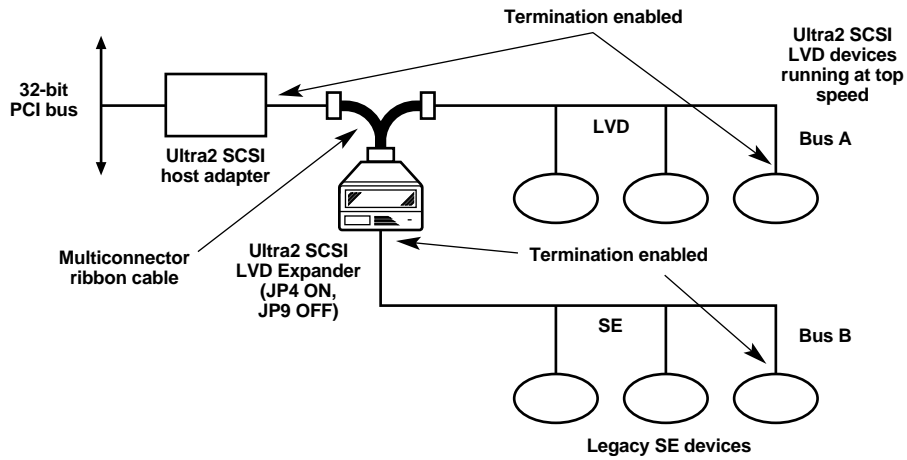
Figure 5-2. Adding legacy devices to an Ultra2 SCSI bus.

Figure 5-3 shows how to use a pair of Expanders to insert maximum LVD point-to-point cable length into a single-ended SCSI bus. (Normal configuration rules for SE segments still apply to the segments at either end of this Extender-to-Extender link.)
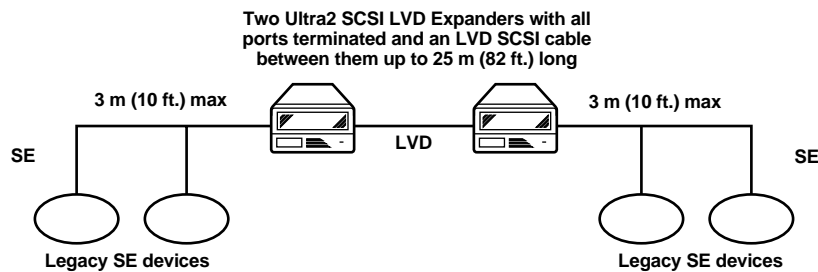
Figure 5-2. Adding maximum LVD point-to-point cabling.

5.2 Applications That Won't Work

Here are two ways that you must *avoid* trying to use the Ultra2 SCSI LVD
Expanders.

Applications like that shown in Figure 5-4 won't work, because devices on the left
must send data through more than two Expanders to reach the devices on the
right. Two is the maximum number of Expanders through which SCSI data can
pass.

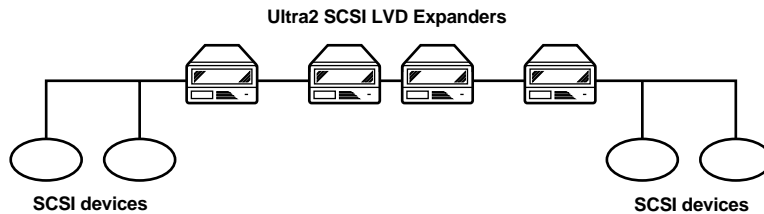**Figure 5-4. An application with too many Expanders.**

Applications like that shown in Figure 5-5 won't work either, because you can't
have two LVD segments connected by a SE segment. The two LVD devices would
attempt to communicate at 40 MHz, a transfer rate not supported by the SE
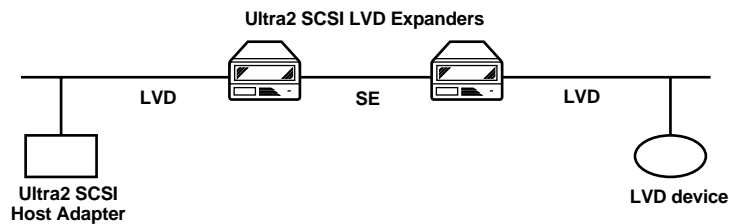segment, and the system would fail.

Figure 5-5. An application with an SE segment between two LVD segments.

6. Troubleshooting

6.1 Calling Black Box

If you determine that your Ultra2 SCSI LVD Expander is malfunctioning, *do not attempt to alter or repair the unit.* It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

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

- the nature and duration of the problem;

- when the problem occurs;

- the components involved in the problem—that is, what type of cable, SCSI host adapter, SCSI devices, etc.;

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

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

6.2 Shipping and Packaging

If you need to transport or ship your Expander:

- 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 A: Port Pinouts

The tables in this appendix show the possible pinouts of Ports A and B on the Ultra2 SCSI LVD Expander. If the Expander detects that a port is attached to an LVD bus, it will use the LVD pinout listed in **Section A.1**. If the Expander detects that a port is attached to a single-ended bus, it will use the SE pinout listed in **Section A.2**. Each of these tables also lists the wire (conductor) number that carries the signals when you use flat-ribbon cable.

A.1 Low-Voltage Differential (LVD) Pinout

Signal Name	Pin No.	Wire No. in Cable	Wire No. in Cable	Pin No.	Signal Name
+DB(12)	1	1	2	35	-DB(12)
+DB(13)	2	3	4	36	-DB(13)
+DB(14)	3	5	6	37	-DB(14)
+DB(15)	4	7	8	38	-DB(15)
+DB(P1)	5	9	10	39	-DB(P1)
+DB(0)	6	11	12	40	-DB(0)
+DB(1)	7	13	14	41	-DB(1)
+DB(2)	8	15	16	42	-DB(2)
+DB(3)	9	17	18	43	-DB(3)
+DB(4)	10	19	20	44	-DB(4)
+DB(5)	11	21	22	45	-DB(5)
+DB(6)	12	23	24	46	-DB(6)
+DB(7)	13	25	26	47	-DB(7)
+DB(P)	14	27	28	48	-DB(P)
GROUND	15	29	30	49	GROUND
DIFFSENS	16	31	32	50	GROUND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
RESERVED	19	37	38	53	RESERVED
GROUND	20	39	40	54	GROUND
+ATN	21	41	42	55	-ATN
GROUND	22	43	44	56	GROUND

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Signal Name	Pin No.	Wire No. in Cable	Wire No. in Cable	Pin No.	Signal Name
+BSY	23	45	46	57	-BSY
+ACK	24	47	48	58	-ACK
+RST	25	49	50	59	-RST
+MSG	26	51	52	60	-MSG
+SEL	27	53	54	61	-SEL
+C/D	28	55	56	62	-C/D
+REQ	29	57	58	63	-REQ
+I/O	30	59	60	64	-I/O
+DB(8)	31	61	62	65	-DB(8)
+DB(9)	32	63	64	66	-DB(9)
+DB(10)	33	65	66	67	-DB(10)
+DB(11)	34	67	68	68	-DB(11)

A.2 Single-Ended (SE) Pinout

Single-ended signals whose names are preceded by "-" are active low.

Signal Name	Pin No.	Wire No. in Cable	Wire No. in Cable	Pin No.	Signal Name
RETURN	1	1	2	35	-DB(12)
RETURN	2	3	4	36	-DB(13)
RETURN	3	5	6	37	-DB(14)
RETURN	4	7	8	38	-DB(15)
RETURN	5	9	10	39	-DB(P1)
RETURN	6	11	12	40	-DB(0)
RETURN	7	13	14	41	-DB(1)
RETURN	8	15	16	42	-DB(2)
RETURN	9	17	18	43	-DB(3)
RETURN	10	19	20	44	-DB(4)
RETURN	11	21	22	45	-DB(5)
RETURN	12	23	24	46	-DB(6)
RETURN	13	25	26	47	-DB(7)
RETURN	14	27	28	48	-DB(P)
GROUND	15	29	30	49	GROUND
GROUND	16	31	32	50	GROUND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
RESERVED	19	37	38	53	RESERVED
GROUND	20	39	40	54	GROUND
RETURN	21	41	42	55	-ATN
GROUND	22	43	44	56	GROUND
RETURN	23	45	46	57	-BSY
RETURN	24	47	48	58	-ACK
RETURN	25	49	50	59	-RST
RETURN	26	51	52	60	-MSG
RETURN	27	53	54	61	-SEL
RETURN	28	55	56	62	-C/D

ULTRA2 SCSI LVD EXPANDER

Signal Name	Pin No.	Wire No. in Cable	Wire No. in Cable	Pin No.	Signal Name
RETURN	29	57	58	63	-REQ
RETURN	30	59	60	64	-I/O
RETURN	31	61	62	65	-DB(8)
RETURN	32	63	64	66	-DB(9)
RETURN	33	65	66	67	-DB(10)
RETURN	34	67	68	68	-DB(11)

Appendix B: Block Diagram

Figure B-1 on the next page is a basic block diagram of the Expander. The receiver/transmitter pairs move the data from one bus to the other through the internal logic of the Expander, which takes care of cleaning up the signals as well as translating any differences between the buses.

   The Expander contains logic to control the signal flow between the two SCSI ports. It also has filtering and delay circuits to remove false edges from the REQ and ACK signals. This logic enables the bus segments to be in the same SCSI bus state after a short delay.
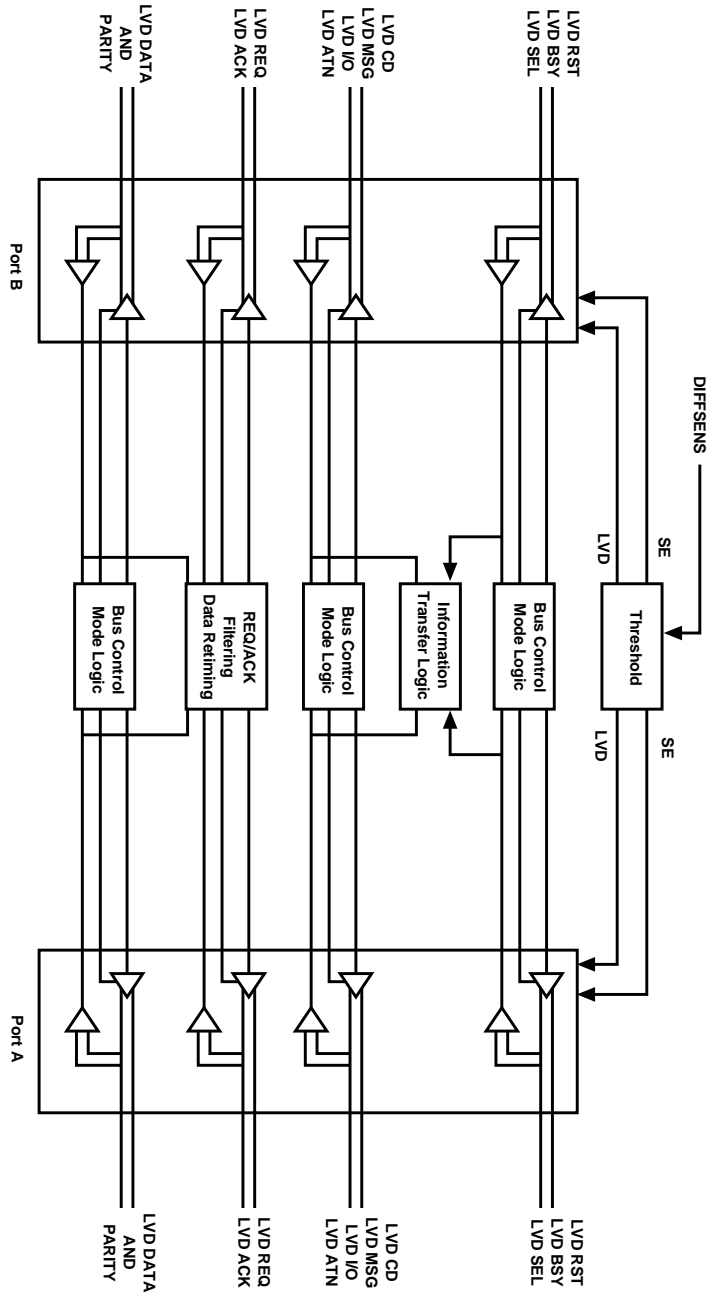
Figure B-1. Block diagram.

DISCLAIMERS

Information in this manual is subject to change without notice.

The manufacturer and its agents assume no responsibility for errors appearing in, or information omitted from, this manual.

NOTES