BLACK BOX®

NETWORK SERVICES

IntelliShare SCSI

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WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designated to provide reasonable protection against such interference when 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 required to correct the interference.

Contents

Introduction

Sometimes it is desirable to share a peripheral between two or more Host computers. However, it is not generally possible to connect the SCSI bus of one Host to that of another via the shared peripheral. This is particularly the case if the Hosts are of different types (i.e. a Unix computer and an AS400). SCSI switches are used to switch the peripheral between the hosts. The control of the switches (when and how to switch), and switched termination cause this approach to be problematic. Black Box's SCSI switch allows the peripheral to be connected to **both** Hosts simultaneously, but access is controlled via the SCSI Reserve/Release mechanism.

The SCSI Reserve / Release command allows a host to reserve the peripheral for its own use. Attempts to access from other hosts are then rejected until the first host Releases the peripheral. This has always been the sharing mechanism of choice by the peripheral manufacturers. However, not all operating system drivers support the SCSI Reserve/Release mechanism., and secondly, it is not possible to connect the SCSI busses of two hosts together.

The Black Box SCSI Switch overcomes all of these problems:

It effectively *joins and isolates the* host SCSI busses..

It allows a peripheral to be shared between two (or more) different Host computers, such that it is available to either at any time.

Black Box's SCSI Switch is a totally hardware solution. No special software or drivers are required. It is generally mounted in a small, tabletop enclosure, with SCSI connections to the host computers and the peripheral itself. It is also available as a tray mounted PCB, or in a rack mount configuration.

The Host accesses the peripheral in the usual way, however, if the peripheral is currently being used by the other host, then this Host receives a benign *not available, not ready or busy* message.

Features

- A Fast-Wide Differential SCSI Peripheral can be shared between two Fast Wide Differential Hosts.

- 40 Mbytes/sec Bandwidth.

- Switching between Hosts is Dynamic- no mechanical, or electronic switch signal is necessary.

Applications

- Sharing 3590/ 3570/Timberline drives between multiple hosts dynamically.

- Host fail-over protection for SCSI Raid or Tape Libraries.

The diagram below shows the SCSI Switch interfacing two Hosts to a single peripheral. This could be the robotics of a Library system. The Library system could have two internal drives -one for each host. In this way a large tape data base can easily be shared by two computers running different software.

Host
Computers

Dynamic
SCSI
Switch

Tape
Library
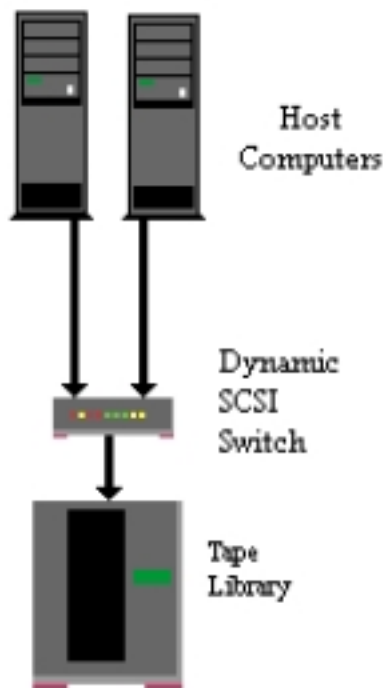
Technical Description

The SCSI AB Switch consists of two Host ports A & B and one peripheral port C. All three ports are Fast-wide differential SCSI interfaces. A SCSI transaction consists of Arbitration, Selection, followed by Command, Data and Status Phases in different combinations and orders, terminated by Bus Free. This activity is transacted between one (only) Initiator (Host) and one (only) Target (Peripheral). Multi-threaded SCSI activity is in fact a fast succession of different transactions between Hosts and different Targets. Regarding the Switch, only one Host port can have a SCSI transaction with the Target port at a time. From Bus free, the first Host port to begin a successful Arbitration with the target establishes the SCSI connection (or nexus) for that Host. This nexus ends on the next Bus free. The next nexus could be from either port. In this way the AB Switch allows multi-threaded activity from either port to the peripheral. There is no physical switch, the switching or sharing of the target is Dynamic.

In practice alternate SCSI nexus activity from either port does not occur. When a Host first accesses the peripheral, it will typically SCSI Reserve it. If the Host on the other port attempts to access the peripheral, it will receive a SCSI Reserved signal, until the original Host SCSI Releases the Target. In this way, it is the protocol of the SCSI bus that is switching the Peripheral between the two SCSI Ports.

Because, each host is interfaced to the peripheral through the IntelliShare SCSI card, there are no issues about joining different Host SCSI busses together. The busses are effectively joined on the private bus which is a controlled environment.

Care when Booting

During the boot process, several SCSI resets are issued to the devices. These resets will generally be passed through to the peripheral- *even if it is currently reserved. For this reason the operator should only boot one host when the other is not accessing the peripheral.*

Generally, Unix and NT Hosts need to sense the SCSI device at boot time. This allows the NT Operating system to load and link the correct drivers for the SCSI device*. If the NT system is booted while the drive is varied on at the AS400, the NT system will not sense the drive, and subsequent NT backups will fail.* The NT system should be booted when the AS400 is not accessing the drive, and it is *varied-off* in the AS400.

Similarly, the AS400 should not be IPL'd when a backup is proceeding on the NT system. The AS400 will reset the drive and cause the NT backup to fail.

AS400 switching by Vary-ON, Vary-OFF

The AS400 will issue an automatic release command on a Vary-off of the drive only (not the controller). This is then a convenient way to share a drive between two AS400's. Operate the switch by a vary off the drive at one host, then vary on at the other host etc.

Use *vary-on* and not *vary-on with reset.* The latter will show errors in the message log.

AS400 device description set-up.

Unload on Vary off: If selected, this may cause long vary-off times- choose *NO.

Vary-on/off at IPL. It is recommended that vary-off at IPL is chosen.

Choice of power-supply

It is important to power the switch from a similar source to the tape drive itself. This is because if the drive is power cycled without the switch, the switch may "loose" the drive and an error occur. This situation can occur with a power-down and power-up IPL. Ensure that if the drive is power cycled, the switch is also, either at the same time or a short while after.

Many Hosts Sharing a Single Drive - Customer Beware

The Switch allows a number of Hosts to share a single tape drive very easily. However it is then very easy for one Host to overwrite another Host's data. This is a *Customer Beware* issue. The customer must put procedures in place to avoid this. Such procedures could be to always unload the drive at the end of a Host's job. In this way, an operator must then replace the tape (with a new one) for the next Host to access the drive. In the AS400 world, the Unload can be selected from the command Line, and in the Unix world, use an mt command such as mt-f /dev/rmt/0 rewoff.

Using the Switch in Unix and NT environments

Drives Shared between an AS400 & NT:

NT is not sleighed to support Reserve and Release until the version NT2000. However, this is not a problem if the Drive is being shared between an AS400 and NT.   Here, the AS400 controls the Switch with its Vary On, Vary Off mechanism.   When the drive is Varied On to the AS400, it is not available to NT, when it is Varied Off on the AS400, it is available to NT.

Drives Shared between an AS400 & Unix:

Most Versions of Unix now support Reserve and Release. The mt commands can be used to issue Reserves and Releases to the drive (/dev/rmt/1h) , such as:

```
mt-f /dev/rmt/1h status
mt-f /dev/rmt/1h rew                    ---Reserve

mt-f /dev/rmt/1h -offline, (or rewoff)          ---Release
```

If the drive is being used with standard Unix Utilities, tar, cpio,dd etc, these will issue the Reserve when the driver is opened and the Release upon closure. Again the AS400 should control the Switch.   When the drive is Varied On to the AS400, it is not available to Unix, when it is Varied Off on the AS400, it is available to Unix.

Installation

The Black Box SCSI Switch is mounted in a small, enclosure with two or more SCSI-In connections and a SCSI-Out connection. The SCSI-Out connector marked TAPE is attached to the peripheral, and the host computers are connected to the HOST 1 & HOST 2 connectors (SCSI-Ins). Each host will "see" the peripheral at its SCSI ID.

All SCSI Connections are fast-wide differential.
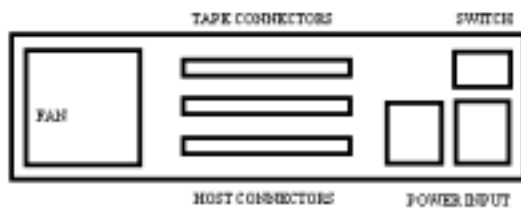
Ensure that the Tape Drive is terminated with a differential terminator. Ensure the Tape drive is set to SCSI ID 0, 1, 2 or 3.

In the AS400 environment

For a new installation it may be desirable to first create the devices in OS400 for each computer. This can be done by connecting the drive directly to the feature and using STRSST. This can be done through the Switch for each host in turn, but be careful to vary-off the drive in other hosts before proceeding with the next etc.

Ensure that the drives in the Hosts are *varied off*.

Connect a cable between the Switch tape connector and the Tape drive. Power on the Drive.

Connect each AS400 to the Host1 & 2.. (etc) Switch inputs. Power on the Switch. Vary on one Host and check the drive, then vary the drive off at this Host and vary on the next etc for testing.

In the NT/UNIX environment

Ensure that the Host's SCSI channel is dedicated to the Switch only, and that there are no other internal SCSI devices attached to the same bus. This is important not only for operational reasons, but also ensures maximum throughput for the switched device.

Boot the Hosts in turn, with the Switch and tape device connected and powered on. This will allow the operating systems to create the appropriate device drivers.

Troubleshooting

Error LED illuminated:

The front panel error LEDS indicate SCSI cable errors on the indicated SCSI channel. This can either be due to the cable being plugged into a single-ended Host or drive, or the Drive being terminated with a Single-ended terminator. The Switch should be used only with Differential Hosts, Drives and terminators.

Drive Termpower LED not illuminated:

This LED should normally be on.   If it is off at any time, this indicates a problem with the Drive or Switch to Drive cable

Tape drive will not vary-on from a given Host:

Ensure that the drive is powered-on and varied off in the other host. Ensure that the front panel Drive Termpower LED is illuminated. Power-cycle the Switch. If the problem persists check the SCSI cable connections, and check that the drive has a differential terminator installed.

Tape drive varies on okay, but backups fail or hang:

Isolate the Switch from the problem as follows.   Vary off the drive from both Hosts. Power-off the drive and the Switch. Disconnect the Switch from the drive and connect one AS400 Host directly to the tape drive. Ensure that the drive is still terminated. If the Drive still fails or hangs, the problem could still be down to the cabling.   If the backup works okay, then the problem may still be down to the isolated cabling or the Switch.

Cable lengths

Sometimes with fast tape drives long cable length can cause hangs and failures. For Differential SCSI 20 Mbytes/sec bandwidth can only be reliably achieved with a maximum cable length of 12 Metres. The Switch itself incurs delays equivalent to 5 Metres of cable length.

Specifications

Power: 110-240 VAC Autosensing 50-60 cycles

Dimensions L292mm X W211mm X H 64mm   (A4 footprint)

Operating Temperature: 5 to 40 degrees Celsius

Weight: 4 Kg (Shipping)

MTBF: 300,000 power-on-hours.

SCSI Busses: All Fast Wide differential- 68 way female bulkhead connectors with screw lock strain-relief

Termination: All busses internally terminated via removable terminator packs

Termpower: Termpower can be supplied out. This is enabled via jumper links, and
      is supplied from 5A schottky diodes and resettable fuses.

Front Panel LEDs

Target Bus Error - RED LED . Normally off,   If this LED comes on SWITCH OFF the power and disconnect the Target SCSI cable. This indicates that there is an error on the target SCSI bus. Either the target or its terminator is actually a Single-ended SCSI device, or the SCSI cable is bad.

Termpower Target -YELLOW LED. Normally on.

Bus Free - Green LED - indicates when the peripheral is in a Bus Free state - Normally on when there is no host activity or the Host has disconnected for a period of time (Space Rewind etc.).

Host1,2 Busy Green LED . Indicates SCSI Busy (Activity) on the respective Host busses.

Host1,2 Reserve - Shows which Host has reserved the peripheral.