E-mu Systems, Inc.
applied magic for the arts

ESI-32
DIGITAL SAMPLING SYSTEM

SCSI

Using SCSI

SCSI (pronounced skuzzy) stands for Small Computer System Interface. SCSI is an industry standard hardware and software specification that allows high-speed data transfers between different pieces of equipment. SCSI devices can include hard disks, tape drives, optical disks and other types of digital equipment.

Why Use SCSI?

- SCSI is fast! SCSI is a parallel interface which transmits eight bits of information at a time at high speed over the SCSI cable. MIDI, in comparison, is a serial interface which can only send one bit of information at a time over its line.

- Compatibility: Since SCSI is an industry standard, equipment from many different manufacturers can be linked to work together.

- Expandability: Up to eight SCSI devices can be linked together (the ESI-32 counts as one SCSI device on the chain).

The SCSI Bus

✦ **Tip:** *Use the "Mount Drives" utility (Master/Global, Disk Utilities, 1) whenever an external SCSI device does not appear in the list of available devices.*

You may have noticed that the rear panel of most external storage devices have two SCSI connectors. This is because SCSI devices are connected together in a chain arrangement. The wires that connect the different pieces of equipment are called the SCSI bus.
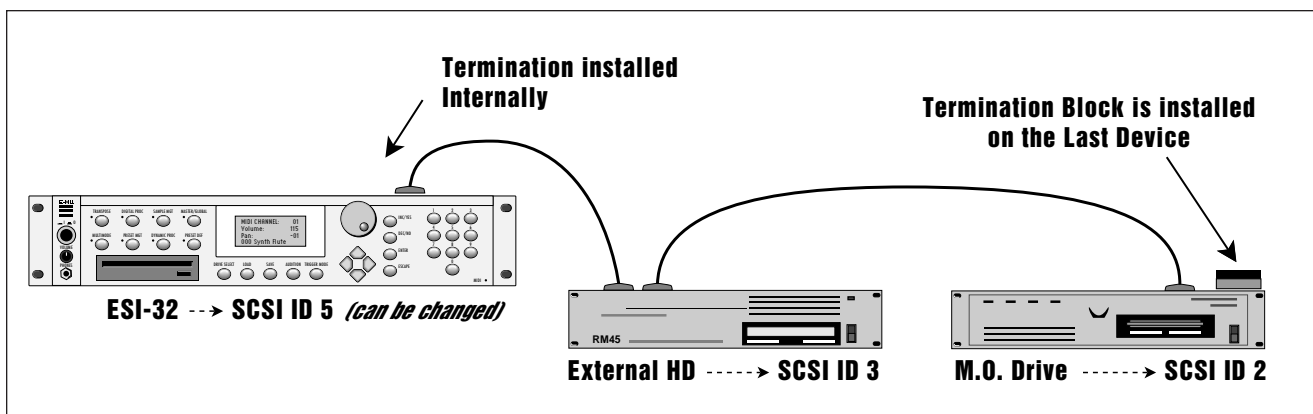
ID Numbers

Each device on the SCSI bus has its own ID number so that it can distinguish its data from data meant for another device. If data is being saved to a device with ID-2 for instance, all the other devices on the SCSI bus will ignore that data. If two devices have the same ID number, the system will not work. Each device must have its own unique ID number.

! Caution: *Make sure that no two devices have the same ID number since this can corrupt the startup directories of the Macintosh or the ESI-32.*

The SCSI ID number of the Macintosh is fixed at ID-7 and cannot be changed. The SCSI ID numbers of most other devices can be changed.

Many SCSI devices have hardware defined ID numbers, which means that they have a switch on the front or the back of the unit which allows the ID number to be easily identified and changed.

Termination installed Internally

Termination Block is installed on the Last Device

ESI-32 --→ **SCSI ID 5** *(can be changed)*

External HD -----→ **SCSI ID 3**

M.O. Drive ------→ **SCSI ID 2**

The following is a list of the default SCSI ID numbers:

ID - 7 (fixed)	Macintosh
ID - 6	Unassigned
ID - 5	ESI-32 (this number can be changed)
ID - 4	Unassigned
ID - 3	Unassigned
ID - 2	Internal Syquest 270MB Drive (if installed)
ID - 1	Unassigned
ID - 0	Internal Macintosh HD (if installed)

Types of SCSI Cables

There are two basic types of SCSI cables in use: DB25 and 50-pin Centronics. The two types of cable can be identified by their connectors, which are quite different. When buying SCSI extension cables, it is important to choose ones with the right type of connectors, since the two types will not interconnect without a special adapter. The type of SCSI connectors on the Macintosh are DB25 connectors. These are the type commonly found on the back of personal computers. The SCSI connector on the optional SCSI port is the 50-pin Centronics type. Use only high quality shielded cables that have all the pins connected. Many cables only have some of the pins wired.

✦ **Tip:** *Always use 50-pin Centronics-type cables with the ESI-32 These cables have much better electrical characteristics and have fewer problems. Additionally, make sure that all 50 pins of the cables are actually wired. Some SCSI cables have only half of the pins wired.*

Terminating SCSI Cables

The total length of the SCSI chain should not exceed 15 feet. A general rule for SCSI cables is: **The Shorter the Better!**

Terminating resistors or terminators are special resistor packs that are installed on the **first and last device in the SCSI chain.** Terminators are used to reduce line echoes or standing waves on the SCSI bus. An analogy in an audio system would be impedance matching.

Terminators can either be hidden inside a SCSI device or they can take the form of termination blocks which can simply be plugged into the SCSI port.

! **Caution:** *Turn all devices OFF whenever you change the SCSI cable. Serious damage to the ESI-32 may result from connecting and disconnecting SCSI cables with the power on*

In addition, devices left on when the cable is unplugged may not respond properly until powered off and on.

Terminators apply power to an array of resistors which ensure a full 5 volt swing between high and low levels on the SCSI line. The host system is required to provide **Termination Power**. Termination power has its own wire in the SCSI cable and supplies power to the termination block. On external hard disk drives, SCSI terminator power is almost always turned Off and the drives are left un-terminated.

The ESI-32 is shipped with termination power On with the termination resistors left in place. This assumes that the ESI-32 will be placed at one end of the SCSI chain. **The ESI-32 has an automatic system which ONLY supplies terminator power when it is NOT being supplied by another device.** Therefore, you don't need to worry about terminator power when connecting the ESI-32.

The more devices you have connected to SCSI and the longer your cables are, the more it becomes important to have the cables properly terminated.

Using ESI-32 and a Computer on the SCSI Bus

The ESI-32 can now be connected to the SCSI along with another ESI-32 an EIIIX, or a personal computer. Multiple "Master" devices on the SCSI bus is not normally allowed by the standard SCSI protocol. This is only possible because of ESI-32's advanced SCSI and **SMDI** (or **S**CSI **M**usical **D**ata **I**nterchange) implementation. The ESI-32's SMDI implementaion allows sample data to be exchanged over the SCSI bus in a way similar to the MIDI Sample Dump Standard, except *MUCH* faster.

The computer should normally be positioned at one end of the chain and the ESI-32 at the other. The SCSI chain is properly terminated at each end by the computer and the ESI-32. Devices in the middle of the chain should not have termination resistors installed.
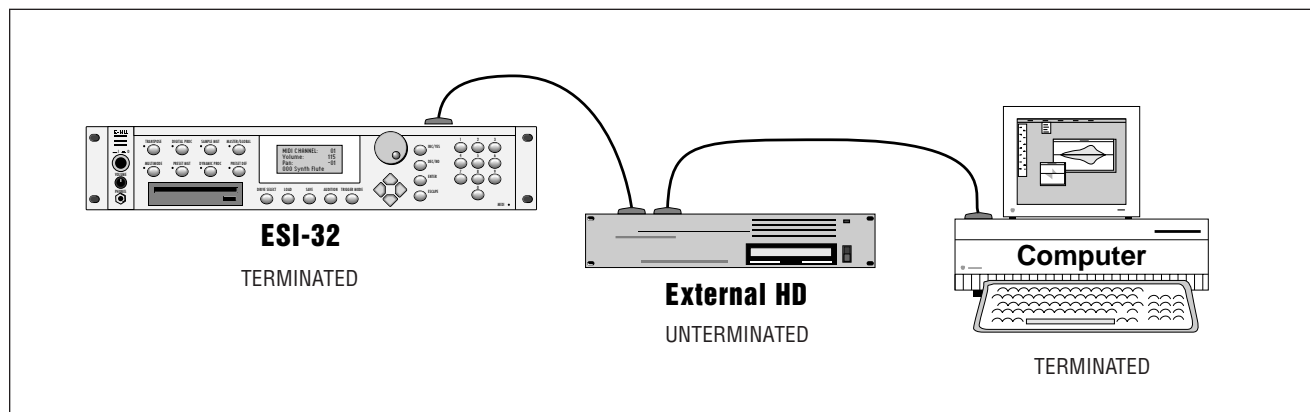
PC Compatibles - The ESI-32 has been tested with IBM PC compatible computers using the Adaptec model 1542C SCSI option card. Sound files can be transferred between a PC computer and the ESI-32 using Sonic Foundry's Sound Forge™ or other sample editing software.

Macintosh - Sound files can be transferred between a Macintosh computer and the ESI-32 using Passport's Alchemy™ or other digital sample editing software. The ESI-32 is able to access approved Macintosh internal CD-ROM drives with CD-ROMs containing ESI-32 compatible files. Similarly, a Macintosh can access an internal ESI-32 Syquest drive with a cartridge that has been formatted for the Macintosh.

- The ESI-32 is strictly a "Slave Device" when using SMDI, meaning that it CANNOT initiate SMDI transfers. This should not normally present a problem however, since a computer based editor will always have a facility for initiating SMDI transfers.

✹ **Caution:** A sample transferred into the ESI-32 is automatically placed across the entire keyboard, overwriting the current preset's sample placement. Create a new empty preset before downloading via SMDI to avoid trashing the current preset.

- Besides the raw sample data, additional information about the sample is included in a SMDI file.
  - ➢ Sample name and number (samples 1-999)
  - ➢ Multichannel/Stereo/Mono status
  - ➢ Sample length plus one set of loop begin/end points
  - ➢ Sample rate, pitch and bit resolution
  - ➢ Sample key placement (an E-mu extension to SMDI)

✦ **Tip:** *You can check the "Memory Available" screen when downloading samples via SMDI to keep track of how much RAM you have left.*

! **Caution:** *When using Alchemy, you must add **one** to the sample number you want transferred.*

! **Caution:** *You cannot transfer to or from sample 000 (the clipboard).*

ESI-32
TERMINATED

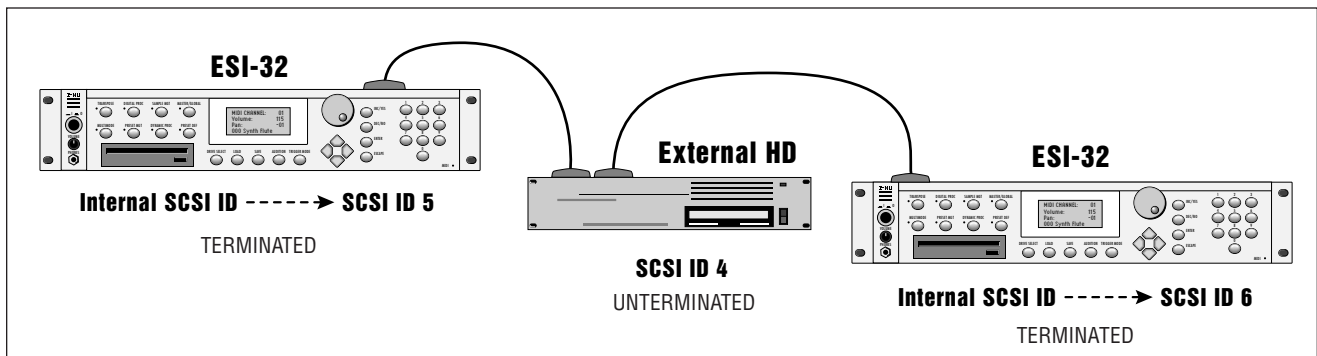**External HD**
UNTERMINATED

Computer
TERMINATED

Using Multiple Samplers on the SCSI Bus

ESI-32 version 2.0 software adds arbitration to the SCSI protocol so that multiple "Master" devices can share the bus without a system crash. Two ESI-32's (an EIIIX, an e-64, or an E-IV) can share the same sound library, without having to duplicate the storage media.

When connecting your system for use with multiple ESI-32's, be sure to observe the following rules:

- **NEVER try to write to two devices at the same time or write to one device while loading from another.** Designate one unit as the Master which is the *ONLY* unit allowed to write. Turn Undo Off on all units except the Master. Simultaneous reads are OK.
- Keep SCSI cable lengths as short as possible (Under 12 feet total).
- Make sure that each SCSI device has its own unique ID number. (Remember that the ESI-32 and EIIIX each use up an ID number in addition to their internal hard disks.)
- Make sure the system is correctly terminated - The ESI-32's should normally be on the ends of the SCSI chain.

ESI-32

Internal SCSI ID -----> **SCSI ID 5**

TERMINATED

External HD

SCSI ID 4
UNTERMINATED

ESI-32

Internal SCSI ID -----> **SCSI ID 6**
TERMINATED

SCSI Problems

In diagnosing SCSI problems the first rule is: Don't panic, *Experiment!* If you have several SCSI devices hooked up, try disconnecting one of the devices and maybe change the order of the units on the line. The following checklist may help you find the solution to your unique SCSI setup.

! Caution: *Use the **Install File System** option #8 (see Master, Format) when formatting **Iomega Zip** drive cartridges. The normal format procedure will not work and corrupts the disk.*

1. Make sure the drive is mounted. Mount the drives using the Mount Drive utility (Master/Global, Disk Utilities, 1).

2. Check the SCSI ID numbers. No two numbers can be the same.

3. Read the documentation again. Learn all you can about your peripheral devices. The answer may be right in front of you.

4. Play with the order in which devices are powered up. Normally the "Big Bang" method works best (turn everything on at once), but another order may work better in your unique system.

5. Always suspect the cable when something doesn't work on the SCSI bus. Remember: The shorter the cables are, the better.

6. Simplify the situation. Disconnect one or more drives until you get the system to work.

7. Are the ends of the SCSI bus terminated?

8. If all else fails, call us at 408-438-1921. Telephone support hours are 9:00 to 5:00 PST, Monday through Friday.