

System overview

Features

The **Direct-to-Disk®** is a comprehensive digital audio recording facility featuring fast, accurate, non-destructive editing capabilities.

Direct-to-Disk flexibility

The Direct-to-Disk offers the power to record up to 16 tracks of music, sound effects, Foley effects or dialog live directly to hard disk, and then cut and paste audio cues to quickly and precisely build a sequence and lock to film or video.

The Direct-to-Disk is operated from a high-resolution computer terminal with a keyboard and mouse, and features flexible sound editing options.

The MIDI* option places the Direct-to-Disk into a network of synthesizers, sequencers, drum machines or other audio processing equipment. The system is also capable of locking to incoming time code in four SMPTE** formats.

* Musical Instrument Digital Interface

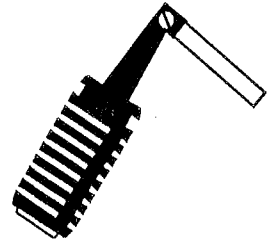
** Society of Motion Picture and Television Engineers

In the recording studio

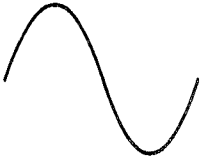
You can record multiple takes of a live overdub, create a Foley effects track, download a music track or record it live directly to hard disk using the Direct-to-Disk system. There's no tape rewind time and no cutting and splicing of tape. Fast and efficient, the Direct-to-Disk frees you to spend more time creating, and less time waiting for the tape machine to catch up.

When scenes are altered, you can quickly and precisely edit an entire sequence or an individual cue, or alter a sequencer music track note by note, all from the computer terminal. You can record live vocal or instrumental performances of nearly one hour of continuous recording time on the Direct-to-Disk.

The Direct-to-Disk can lock to film or video in less than a second using SMPTE time code and can receive and display in different formats, including 24, 25 and 30 frames per second and Drop Frame. Synchronization is accurate to 1/80th of a frame.



Features (con't)



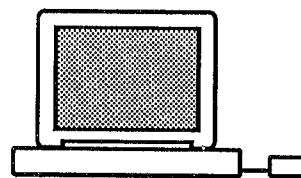
Sampling

Instrumental or vocal sound and sound effects can be placed onto Direct-to-Disk tracks using high fidelity digital **sampling**. The sampling system uses a 16-bit converter which gives a dynamic range of 96 dB, 6 dB greater than the dynamic range of hearing. The **Sample-to-Memory™** option lets you sample any sound at rates of up to 100 kHz.

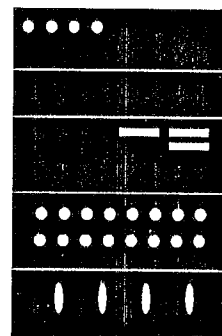
Computer accuracy and flexibility

A high-resolution graphics **terminal** and a hand-operated **mouse** communicate with the main and Direct-to-Disk computers located in the **signal processor**.

Sounds and sequences can be accessed and precisely edited from terminal displays. Audio cues can be edited to 1/80th of a frame accuracy. You can display and edit sequencer music tracks note-by-note using either computer music notation or standard music notation. You can also edit a sequence using the Sequence Editor or the Audio Event Editor. MIDI port assignments can also be made from the terminal.



Terminal and mouse



Signal processor

The sequencer

The **sequencer** can record and play back a series of audio events—musical notes, MIDI data, a sound effect, a Foley effect or dialog—occurring at a precise moment in time from any of the 200 sequencer tracks or up to 16 Direct-to-Disk tracks. During playback, the sequencer triggers each of these events at the appropriate time, assuring precise audio synchronization.

The sequencer can be activated by incoming MIDI data or locked to picture and triggered by incoming time code.

Sequences are stored on disk in special storage areas called sequence files and can be recalled using the computer terminal. The hardware which acts as the sequencer is the **Memory Recorder**.

Multitrack recording

The Direct-to-Disk is similar in operation to a digital tape recorder, with the added advantages of improved accuracy, no tape rewind time and no cutting and splicing of tape.

After defining a recording area—or **project**—on the Direct-to-Disk, you can record up to 16 live tracks. The number of available inputs determines the number of tracks that can be recorded on at one time. Tracks associated with the Direct-to-Disk system are referred to as Direct-to-Disk tracks, or **project tracks**, to distinguish them from the 200 **sequencer tracks**.

Audio cues originating from the recorded material on the project tracks are assembled into a sequence. Each cue, which could be music, sound effects or dialog, such as a three-bar intro, the sound of a car door opening or a live overdub, is created in the Direct-to-Disk Audio Event Editor. These cues can be easily and precisely created, edited, synced to picture and triggered by the sequencer, without ever altering the original recording. Even when the cues are edited, they remain in sync.

Direct-to-Disk digital editing leaves your original material untouched while using it as a resource for a complex edit decision list.

Features (con't)

Music Printing option

You can transcribe your musical performances from a MIDI interface into standard music notation with the **Music Printing** option. A single score page holds up to 64 staves, complete with time signatures, key signatures and standard clef signs. Traditional symbols such as those for chords, bowing, slurs and pedaling are augmented by user-defined symbols of any design.

The system supports a complete range of printers, including dot matrix for drafts, laser printers for high quality and digital typesetters for engraving quality.

Choeur des Filenses

(excerpt)

FRANZ LISZT

Allegretto $\text{♩} = 152$

p grazioso
Ra Ra Ra Ra Ra Ra

p dolce
Ra Ra Ra Ra *

cresc.
poco a poco rallent

p animando
Ra Ra *

lento
pp

a tempo
leggero
Ra Ra Ra Ra Ra Ra *

vivo
lento
dolce
Ra Ra Ra Ra *

How the system works

The Direct-to-Disk system components fall into the following four functional categories:

- input devices,
- signal processors,
- output devices,
- storage devices.

Input devices

The computer receives its information from an **input device**, also called a **control interface**.

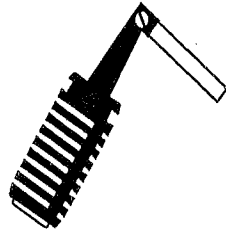
The computer terminal is the basic Direct-to-Disk control interface. Terminal keys and a hand-operated mouse are used for data input.

Other control interfaces are

- another synthesizer or sequencer through a MIDI interface;
- a microphone or tape for placing live sounds, such as dialog, sound effects or instrumental sounds, into the system;
- a modem.

Most of these input devices are designed to receive data from human sources. Some data is the raw material to be processed—sounds, musical performance or text; some consist of control signals telling the computer directly what to do or requesting that certain programs or sets of instructions be followed.

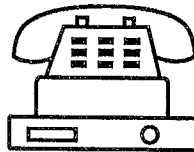
Input devices



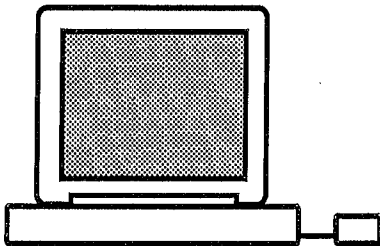
microphone



MIDI interface



modem



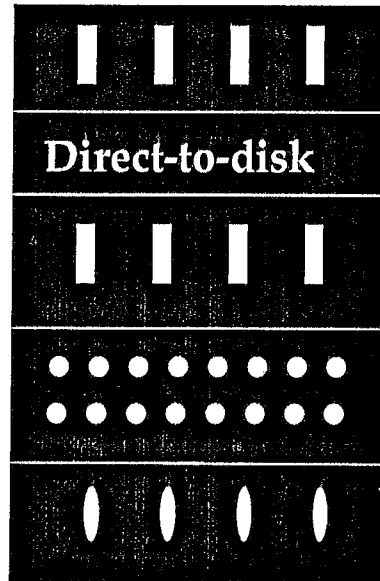
*computer terminal.
and mouse*

How the system works (con't)

Signal processor

The signals or data placed into the system from the input devices are sent to the CPU in the **signal processor** where the computer converts them into computer language and places them into computer memory.

The processed information is then routed to the appropriate output or storage device.



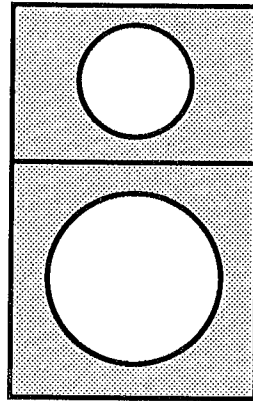
*The Direct-to-Disk
signal processor*

How the system works (con't)

Output devices

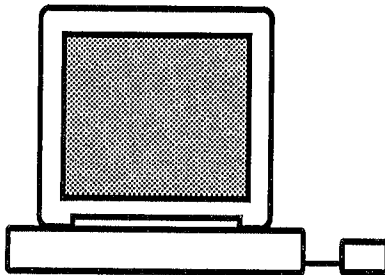
The information is processed and then converted at the **outputs** into sound signals, visual signals on the terminal displays or digital signals.

Direct-to-Disk sound output is produced by a voice—two **digital-to-analog converters (DAC)** for each Direct-to-Disk track. Visual signals may be terminal displays, flashing terminal buttons or lights on the meter bridge. Digital signals are sent directly to another computer component such as a **storage device**.

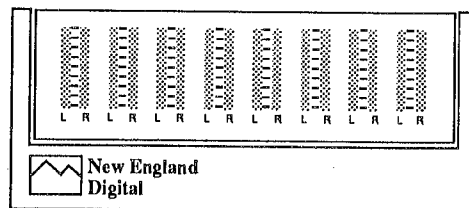


Output devices

sound



displays



meter bridge

How the system works (con't)

Storage devices

Data which is in the computer's memory when the power is turned off—cues, sequences, editing—is lost. For permanent storage, sounds and sequences must be placed onto **storage devices**, such as hard disks, floppy disks or tape cartridges.

When a command is received by the computer from the control interface instructing it to store, the computer

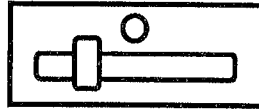
- checks the specified storage device for sufficient space;
- sends the data to the device;
- enters the name of the data on a directory for future reference.

Sound recorded onto Direct-to-Disk tracks is stored automatically to Wren hard disk drives installed in the Direct-to-Disk signal processor. Each drive stores information from two tracks.

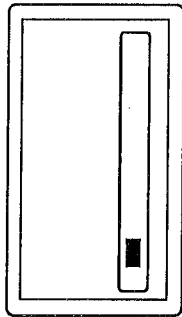
An internal floppy disk drive and Winchester hard drive reside in the signal processor for storage and retrieval of system software and sequences.

Projects and tracks can be stored permanently on tape cartridges using the optional tape drives installed in the signal processor.

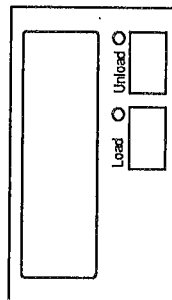
Storage devices



floppy drive



*Direct-to-Disk
hard disk drive*



*Direct-to-Disk tape
drive*