System Theory

System Concepts

The *Virtual Machine* concept is vital to understanding how the D/ESAM 820 functions. In order to clarify this concept, three types of source machines in the D/ESAM environment must be explained. These are:

- **Physical** machines (Physical D/ESAM inputs)
- **Virtual** machines
- **Logical** machines

Physical Machines and Physical Inputs

The first machine type in the D/ESAM environment is "**Physical**." A physical machine is the actual VTR, ATR or DTR in a facility that is connected to physical inputs of the D/ESAM electronics chassis. This is illustrated at the top of the **D/ESAM 820 Flow Diagram** (located at the end of this chapter) adjacent to the label "PHYSICAL MACHINES." Note that D/ESAM interfaces to a variety of physical machines, whether the machine is analog, digital or both. Inside the D/ESAM, analog sources are converted to digital and all audio signals are then mixed in the digital domain.

The D/ESAM 820 is designed to accommodate any combination of seven analog and/or digital input modules, providing up to a total of 56 physical inputs. Each physical input can be a single track analog input or one track of a dual-channel digital input.

The **Flow Diagram** shows three digital D-2 and two analog video tape machines, two CD players, two DAT machines, two 8-track audio tape recorders, two cart machines, standard tone inputs and miscellaneous digital inputs. Three digital and four analog input modules are used in this example.

Virtual Machines

The second machine type is "**Virtual**." A virtual machine provides the unique ability to group physical inputs and represent these inputs with a name and/or number (1-255).

Once sources are provided as physical inputs to D/ESAM, they can be arranged with track assignments similar to or different from the actual *physical* machine from which they originated.

Virtual machines are internal configurations of physical inputs originating from individual or multiple physical machines. Each virtual machine can include up to ten tracks, (nine audio plus cue).

An example of a virtual machine representing a physical machine is shown in the **Flow Diagram**. At the upper left is a D-2 tape machine (a physical machine) which we wish to represent in D/ESAM terms as virtual machine number one. It is also known as "DTR1" in this example, which is the legend printed on the first button on the Assignment Panel.

For this example, the following items should be noted on the flow diagram:

- D/ESAM physical inputs 1 through 4 are digital and connect to the D-2 machine's outputs 1 through 4 respectively.
- D/ESAM analog input number 33 connects to the D-2 tape machine's cue output.

It would be convenient to refer to D/ESAM physical inputs 1 through 4 and 33 as the actual physical tape machine name, "DTR1." This is accomplished by assigning the name and input numbers to a virtual machine number at the Maintenance Terminal. Thereafter, all references to virtual machine 1 will acquire physical input sources 1 through 4 and 33 for further processing.

The virtual machine concept permits flexibility of machine configuration that would not be possible with fixed physical inputs alone. A mix of analog and digital tracks can be represented in a known consecutive order (i.e. 1, 2, 3, 4, CUE) rather than physical input order (i.e. 1, 2, 3, 4, 33).

Logical Machines

The last machine type is "**Logical**." Logical machine designations (A through H, R and AUX) are currently used by most editing systems and are also used by D/ESAM. A logical machine provides the editor with a familiar and consistent means to identify tape machines used for editing.

Any of the ten logical machines can be assigned to any of the 255 virtual machines. In a given day, logical machine "A" can represent several different virtual machines as determined by the needs of the edit session or by editor preference.

Logical machines can include up to a maximum of nine audio tracks plus cue, but the number of tracks actually used by the logical machine is determined by the number of tracks available from the virtual machine.

NOTE

All parameters associated with a logical machine such as audio level, EQ values or phase invert will follow that logical machine – even if it is reassigned to another virtual machine.

An example of logical machine assignments is shown in the **Flow Diagram**, adjacent to the label "LOGICAL MACHINES."

Logical machine “A” has been assigned to virtual machine number 1 and therefore (in this example) assumes the four audio tracks plus cue provided by that specific virtual machine. In addition, any EQ, level and phase invert settings previously set on logical machine “A” will now be used with the *new* virtual machine track configuration.

Audio Flow Through The Mixer

The **Flow Diagram** illustrates a general signal flow diagram of the D/ESAM 820 Digital Audio Mixer. In the following description, labels in bold-faced capital letters correspond to similar labels on the flow diagram.

1. **PHYSICAL MACHINES**

   Audio signal flow originates from the physical machines, located at the top of the diagram.

2. **PHYSICAL INPUTS**

   Audio signals proceed down, connecting to D/ESAM's 56 physical inputs, located on 7 input modules. These signals are arranged in groups of 8 digital or 8 analog sources, as D/ESAM input modules are designed to accommodate either 8 digital or 8 analog channels.

   In this example, D/ESAM is configured with 3 digital and 4 analog input modules. A table to the right of the physical input array indicates the location and type of module used.

3. **VIRTUAL MACHINES**

   Next, the signals or tracks are regrouped into virtual machines, according to customer requirements. Virtual machine groups are designated by the user and are entered at the Maintenance Terminal.

   a. Groups may represent actual physical machines. For example, the D-2 machine located at top left has 4 digital tracks plus cue. It is represented by virtual machine number 1 and has been labeled “DTR1” on the Assignment Panel. Note that all tracks available from the physical machine are likewise represented by the virtual machine. Although the physical input numbers to D/ESAM are 1, 2, 3, 4 and 33, virtual track names will be 1, 2, 3, 4 and CUE.

   b. Groups may represent a special arrangement of tracks required by the editor. For example, it may be more convenient to swap stereo pairs at the virtual machine level. This is illustrated by the virtual machines “DAUX1” and “DAUX2,” which represent two arrangements of MISC. DIGITAL inputs 13 through 16. In the case of DAUX1, input pairs 13 and 14 are swapped with 15 and 16. DAUX2, on the other hand, represents the normal arrangement of input pairs. In track terms, DAUX1 represent tracks 1 and 2 swapped with 3 and 4, while DAUX2 represents a normal track arrangement.

4. **ASSIGNMENT PANEL**

Virtual machines 1 through 16 are available on the first optional Assignment Panel as shown. The second optional Assignment Panel, which supports virtual machines 17 through 32, is not shown. The third and last optional Assignment Panel, which supports virtual machines 33 through 48, is also not shown.

5. **LOGICAL MACHINES**

Next, virtual machines are assigned to logical machine names. The ten available logical names are A through H, R and AUX. All virtual machine tracks are assumed by the logical machine assigned to it. An example is logical machine "A" which is assigned to virtual machine "1" or "DTR1." The shaded areas shown in the logical machine's designation box indicate tracks which are no longer available when assigned to the associated virtual machine.

6. **FADER CHANNELS/MIX SOURCES**

Tracks from the logical machines can next be assigned and routed to fader channels/mix sources. In the example shown, logical machine A's tracks 1 through 4 are assigned to fader channels 1 through 4. The mix sources may *not* be 1 through 4, as the D/ESAM main processor selects the next available slots. It is possible to select any or all tracks from any logical machine for assignment to any of the twelve fader channels. A maximum of 16 mix sources are active at one time. Note that this would allow 12 sources to be mixed on Program/Preset busses and a 4-track record machine selected on Preview bus.

a. The cue track has a special use in D/ESAM. The A machine's analog cue track will replace any or all machine tracks 1 through 4 (as selected by user), when machine A's digital tracks 1 through 4 are silent. This is why the cue track appears to stop at logical machine A on the flow diagram.

7. **PRESET, PROGRAM, PREVIEW**

Normal signal flow through each fader channel/mix source consists of an effects (FX) processor and selector, phase invert processor and selector, program/preset faders and finally Program, Preset and Preview bus selections. The first four fader channel/mix sources are shown with FX and phase invert selectors *off*.

a. One exception to normal channel mix source flow is when the Record machine is selected on Preview. This causes fader and phase invert processors to be bypassed for preview selection only. The last four fader channel/mix sources on the diagram are shown with the record machine selected and the bypass path enabled for preview.

b. Any or all fader channels/mix sources can be routed to any or all of Program, Preset and Preview busses 1 through 4. The Preview bus has one additional source, Mix Out, that is exclusive of all other selections on the Preview bus.

c. Program, Preset and Preview bus sources are mixed or summed bus by bus.

8. **ANALOG PROGRAM OUT, DIGITAL PROGRAM OUT**

   The mixed output of Program and Preset busses can be *cut* or *dissolved* to and from each other. This Program/Preset signal is D/ESAM's mixer output (digital program out and analog program out). The diagram shows digital outputs 1 through 4 connected to a D-2 recorder's digital audio inputs 1 through 4.

9. **PREVIEW METERING**

   Preview bus levels and phase status are indicated by the preview meter panel, located in the lower right corner of the flow diagram.

10. **MONITORING**

    Preview bus monitoring functions, also shown in lower right corner of diagram, are monitor mix, mono, level settings and two channel/four channel monitoring. Monitor outputs are then connected to power amplifiers/speakers.

NOTE

REPLACE THIS ENTIRE PAGE WITH THE D/ESAM 820 FLOW DIAGRAM. THE DIAGRAM IS A 2-PAGE FOLD-OUT (# 910213)