System Administrator Manual
Broadcast Electronics

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AudioVAULT System Administrator Training Manual
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Table of Contents

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Section 1: Common Concepts

By the end of this section, you should be familiar with the following concepts:

- The basics of digital audio systems
- The necessary components of an AudioVAULT system
- Networking fundamentals including
  - The difference between 10BaseT and 100BaseT
  - The difference between a Hub, a Switch, a Bridge and a Router
  - EIA/TIA 586A wiring specifications
- Factors affecting integration of your AudioVAULT

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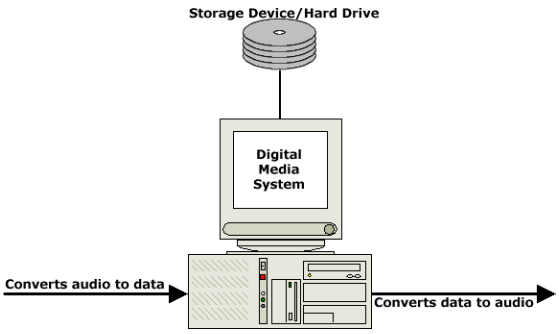
INTRODUCTION TO DIGITAL AUDIO

More and more radio stations are turning to digital audio systems as the technology becomes more efficient, less expensive, and better suited to radio environments.

Digital audio systems are simple in concept. They are computer-based products with a few basic capabilities:

- A method of converting analog or digital sound into a digital audio file with computer software.
- A method of storing those digital audio files on a computer hard drive or other storage device.
- A method of converting stored digital audio files back into analog or digital sound with computer software.



Each system handles these three basic tasks with varying levels of complexity. Some may be hardware and software solutions, some may be just software. Most will take different approaches to user interfaces and storage schemes. Each approach has its own strengths and weaknesses.

Digital audio systems embody a unique marriage of technologies. Even though they can be overwhelming at first glance however, in many ways you're simply replacing the media you're using now.

For example, many radio stations record audio onto carts. With a digital audio system, instead of storing audio on magnetic tape, it's stored on hard drives. A piece of hardware called a **sound card** converts audio from the microphone into a digital file that's stored on a computer disk. For engineers responsible for station wiring, many of the same rules apply: you still will have audio wires going to the input of a recording device, and audio wires running from an output. Instead of wiring to the back of a cart machine however, you'll wire to and from an audio card.

STORING DIGITAL AUDIO

When sound is picked up by a microphone and fed through an amplifier, it is converted into voltage levels. Your **sound card** measures that voltage level several times per second and records the information as a series of digital **bits** on a hard drive or other **digital storage device**. The result of this process is a **digital audio file**. To play back a file, your audio card reads from this digital storage and converts those bits back into audible sound.

Sample rate applies to how many snapshots, or samples, are recorded over a second of audio. The more samples there are per second of audio, the more accurate the recreated waveform can be. A 44.1K sample rate means that 44100 samples are recorded every second.

Another factor affecting storage of digital audio is compression rate. Digital audio files can be uncompressed (**linear** or **PCM**) or **MPEG compressed**. The AudioVAULT system from Broadcast Electronics for example, uses MPEG-Layer 1 and MPEG-Layer 2 compression schemes, allowing you to compress files to 24:1!

For CD-audio quality, you need to sample 44,100 times per second, giving you very large audio files. Compression uses mathematical equations to remove the irrelevant and redundant parts of the signal, reducing the size of the file. On playback, similar equations are used to restore the pieces removed during the encoding process. The higher the sample rate, the more space is needed to store the information on the hard drive. It takes 176,400 bytes of space to store a second of 44.1K stereo audio. To store the same second of stereo audio sampled at 32K, you'll use 128,000 bytes of space.

You're not limited to a single sample or compression rate as the AudioVAULT system can adapt to differing rates on the fly. It's fairly common to have 44.1K/Linear music cuts playing next to 32K/3.2:1 compressed commercial files.

DETERMINING NEEDS

As you integrate a digital media system, look at it in the context of your specific needs.

Will it integrate with my current processes?
The success of a digital storage system is often decided by how it's received by your staff. If the production department is going to have to learn a whole new way of doing their job, it's unlikely they will embrace the new system. Even the best tool is no good if no one uses it. ***The attitude with which the system is introduced is as vital to the overall success of the project as the technical factors.***

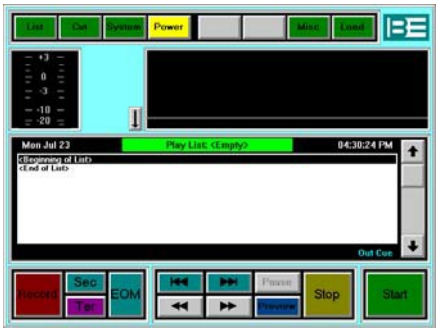
How can I convert my current audio inventory?
You've invested a lot of money in albums, CD's and carts. If you're going to record into the AudioVAULT from analog sources in real-time, it's suggested one or two people handle the project to maintain some consistency in levels and tones. Your AudioVAULT can convert CD tracks into digital files with an automatic process, but there will still be some manual trimming involved.

How can the system save me money?
Any tool should make a task easier. Increasing efficiency or sharing resources can save you money. Look at the features of the system and evaluate how they can be phased in over time. Start by replicating your current processes, but do so with the big picture in mind. Planning up front will make things easier down the road.

What help resources will be available?
Broadcast Electronics will be around for the life of your system. This is a long-term relationship we've entered into. We're here to help you achieve success.

WILL IT INTEGRATE WITH MY CURRENT PROCESSES?

A lot of time and work has gone into making the AudioVAULT software reflect the way radio stations work. Our software interface was designed to look like the kind of equipment your staff is already used to.our production screen for example has buttons for **Record**, and **Fast Forward**, and **Secondary** and **Tertiary** tones. By keeping things familiar, your staff can start using the tool right away without having to learn a brand new way to do their jobs. Once they get the basics down, they can start using the advanced



features of the software to do things they can't do with traditional media, like non-destructive editing, automated playback, and remote control of external equipment.

Our primary on-air screen, AVAir, was designed to look and feel like the cart decks most operators are familiar with. Operation is drag-and-drop.each element is represented in configurable **tabs** that can be easily sorted. Once the operator finds the element he's looking for, he can drag it into one of the available **decks** and play it.

Once they get the basics down, AVAir has advanced features that allow the operation to be automated. Voice tracks can be inserted into the schedule, which can run in an unattended mode.

Each component has been carefully designed to help reduce the amount of time your staff will have to spend on each task, giving them an opportunity to accomplish more. The system's strong automation capabilities also allow the AudioVAULT to shoulder some of the workload as well.

HOW CAN I CONVERT MY CURRENT AUDIO INVENTORY?

Your AudioVAULT has the ability to import standard 16-bit linear or MPEG-compressed WAV files. There are many applications that can create WAV files from CD Audio discs (CD Rippers). Those WAV files can be automatically imported into the VaultXPRESS, and can even be compressed as they are imported. If you're currently using another automation product, and it's capable of exporting inventory as WAV files, those files can be imported into the AudioVAULT.

This doesn't just apply to existing inventory.it can apply to new production as well. Your production staff can use popular multi-track editors to create WAV audio files. Those WAV files can be imported directly into the AudioVAULT system without going through an audio console. Not only do you save time by not having to dub something to tape, your end product sounds better since you are doing a digital transfer.

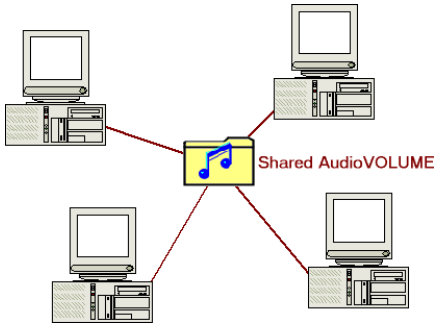
Easy to use production tools make it simple to record in analog or digital audio sources too, with full control over naming, and post-production gain adjustment.

CAN THE SYSTEM GROW WITH MY STATION?

AudioVAULT is a modular system that can expand from a single workstation to multiple computers and audio cards handling multiple stations. We specifically designed it to be scalable to fit any budget or situation. Adding additional components or workstations later as your needs change is very easy with AudioVAULT.

CAN THE SYSTEM SAVE ME MONEY?

We've already looked as some of the ways VaultXPRESS can save you money by allowing your staff to be more efficient. You can also save money by sharing resources.



We're developing technologies to make responsible use of the Internet. We built our AVExplorer product to take advantage of FTP (**file transfer protocol**) to move files from one location to another. What kind of files? To FTP, all files are the same. Whether they are music schedules, voice tracks, or

word documents, they can be distributed with AVExplorer.

AVExplorer is an FTP package with the added ability of being able to talk to your AudioVAULT. It makes sharing audio files with other AudioVAULT stations a drag and drop operation. VaultXPRESS took the compatibility issue a step farther and added support for the BWF/Broadcast Wave and up and coming Cart chunks.

IS THE VENDOR EXPERIENCED AND ABLE TO SUPPORT MY SYSTEM?

Broadcast Electronics has been an industry leader from the beginning. We are constantly working on developing a better product, enhancing the software with customer-requested features. We also use the most advanced development tools to deliver a more stable product. As an AudioVAULT customer, you will receive free upgrades as they become available.

ABOUT BROADCAST ELECTRONICS

Broadcast Electronics' experience with digital systems goes back more than a decade. We've released products including **Format Sentry**, the **CORE**, **Control-16**, **AV90**, **AV100**, and most recently **Vault**^{2}. As we've helped develop practical digital automation technology, we've maintained our core philosophy of helping our customers provide a better product, while doing more with less.

In 1993, Broadcast Electronics introduced the **AV100 card**. With its dual dedicated fast SCSI bus and on-card processing, the AV100 card became the rock-solid foundation for the **AudioVAULT software**. In an era of 286 and 386 based personal computers, it was necessary to off-load digital signal processing and analog digital conversion from the CPU to the dedicated processors on the AV100 card.

As personal computing technology caught up with the innovations of the AV100 hardware, we were able explore other ways of delivering the performance AudioVAULT users had come to expect. Storage devices became faster, smaller and more affordable. CPUs developed the power to support demanding multi-media applications. The need for the specialized architecture faded as the rest of the computing world caught up.

With the dawn of a new millennium, we introduced **Vault**^{2}. Capable of supporting hardware including cards manufactured by Digigram and Creative Labs, this solution combines the proven stability of the AudioVAULT software with the convenience and affordability of off-the-shelf hardware. By reducing the expense associated with proprietary hardware, Vault^2 makes it even easier for everyone to enjoy the benefits of owning an AudioVAULT.

Even with the addition of a new hardware platform, Broadcast Electronics has made a serious commitment to supporting the AV100 users. The strength and stability of the AV100 hardware still has a place in the world of broadcast technology. As we develop AudioVAULT software, new releases will include support for AV100 customers as well as Vault^2 users.

COMPONENTS OF AN AUDIOVAULT SYSTEM

We've already identified some of the key hardware components of any AudioVAULT system:

- At least one computer
- Sound cards
- Storage device

The other key components involve moving information and audio from one place to another.audio cabling and network cabling.

Audio cabling is specific to the individual AV100 and Vault^2 platforms, and will be addressed separately in this manual. Network cabling however, is treated similarly regardless of platform.

NETWORK BASICS

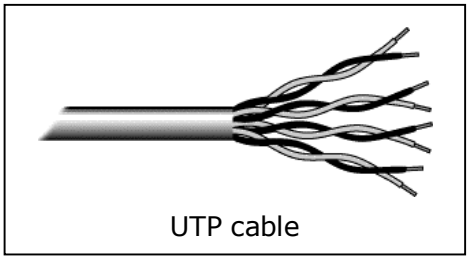
AudioVAULT computers are connected by standard Microsoft network components and off-the-shelf network hardware. The AudioVAULT system, while it relies heavily on the network, adds no special network components.

This manual covers some of the basics of networks in general, focusing on implementation in an AudioVAULT environment, including the following topics:

- General network terminology and architecture
- Network hardware
- Protocols
- TCP/IP integration

In information technology, a **network** is a series of points or **nodes** interconnected by communication paths.

Networks can be characterized in terms of **spatial distance** as local area networks (**LAN**), metropolitan area networks (**MAN**), and wide area networks (**WAN**). They can also be described in terms of **topology**, or physical layout. Common network topologies are **bus**, **ring**, and **star**. Another key descriptor of networks is the functional technology, the most common being **token ring** and **Ethernet**.


UTP cable

When discussing AudioVAULT networks, we deal primarily with **Ethernet**. The most popular forms of Ethernet networks are **10Base2**, **10/100BaseT**, and **10/100BaseF**.

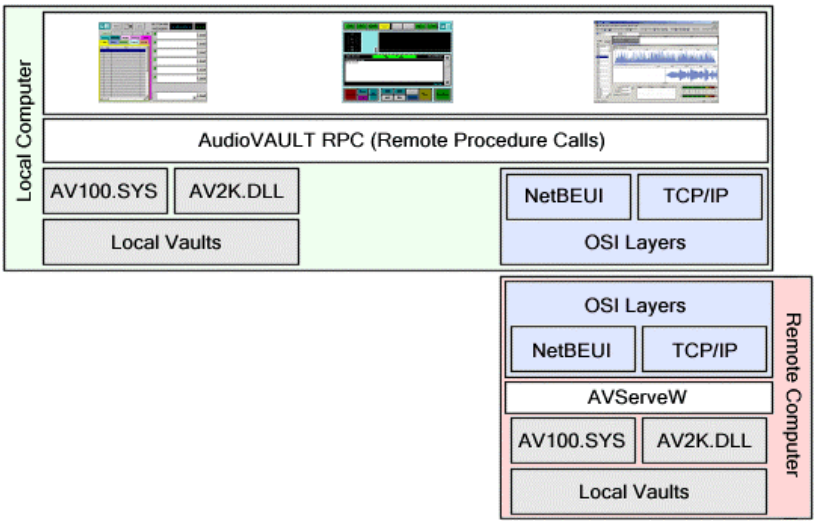
10Base2 uses a single coaxial cable to connect all workstations together in a buss configuration, and does not require a hub. **10/100BaseT** uses unshielded twisted pair (**UTP**) cable, connecting all nodes through a central hub. **10/100BaseF** uses fiber optics which, though expensive, can travel long distances and through electrically noisy areas.

LAYERS OF NETWORKING

The OSI, or **Open System Interconnection**, model defines a networking framework for implementing protocols in seven layers.

Layer	Function	
Application	This is the layer applications speak to.	
Presentation	This layer is involved in formatting data for the purpose of display or printing. An example is **HTTP**.	
Session	This layer establishes, manages and terminates connections between applications. An example is **NetBIOS**.	
Transport	This layer provides transparent transfer of data between end systems and is responsible for end-to-end error recovery and flow control, ensuring complete data transfer.	
Network	This layer provides to the upper layers a means of transmitting packets over the network to a specified host.	
Data Link	At this layer, data packets are encoded and decoded into bits. The data link layer is divided into two sub-layers:	The Media Access Control or **MAC** sub-layer controls how a computer on the network gains access to the data and permission to transmit it.
		The Logical Link Control or **LLC** layer controls frame synchronization, flow control and error checking.
Physical	This layer conveys the bit stream at the electrical and mechanical level.	

In one way or another, AudioVAULT administrators will deal with components from most of the seven layers.



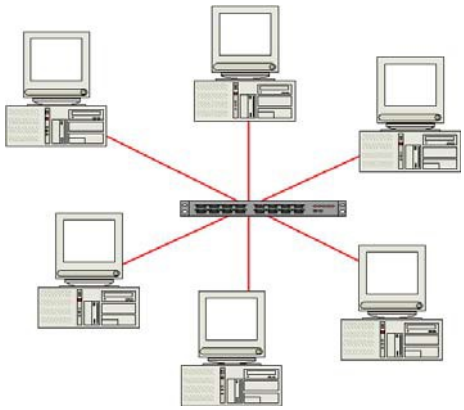
LET'S GET PHYSICAL

Imagine the computers on your network as a bunch of loud people in an un-moderated meeting room. Only one person can talk at a time, because communication consists of standing up and yelling at the top of your lungs. People are allowed to start communicating whenever there is silence in the room.

If two people stand up and start yelling at the same time, they wind up garbling each other's attempt at communication, an event known as a **collision**. In the event of a collision, the two offending parties sit back down for a semi-random period of time then one of them stands up

and starts yelling again. As the number of talkers and the amount of stuff they talk about increases, the likelihood of collisions occurring increases geometrically.

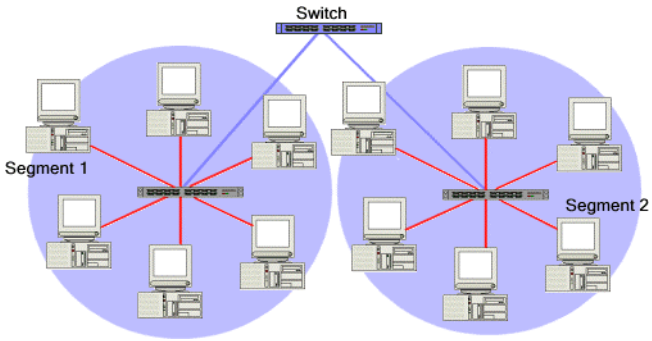
This huge meeting room is like a network **hub**. In data communications, a hub is a place of convergence where data arrives from one or more directions and is forwarded out in one or more other directions. In an Ethernet network, each workstation or server is located at the end-point of a cable connected to the hub.



Networks with many workstations generally are considered overloaded if the segment utilization exceeds 30-40%. If the collision light on your hubs is lit more often than not, you probably need to segment your network. A typical hub has somewhere between eight and 48 ports. If we need more computers on our network, we can just add more hubs and connect them together. A single LAN could have multiple hubs.

WHAT IS A SWITCH?

A switch is a network device that separates multiple segments on a network, but is smart enough to know if a particular packet needs to be sent to the other side. Think of our large meeting hall. If we split the room in two with a divider that has a single door, the two rooms would be quieter, and the chances of talking over the top of someone else would be reduced. By putting someone in that door that could relay information to the other room as needed, communication would be maintained, but overall each individual room would work better.



The time a switch takes to figure out where to forward a data unit is called its latency. The price paid for having the flexibility that switches provide in a network is this latency.

HOW DO WE CONNECT OVER LONG DISTANCE?

In telecommunications networks, a **Bridge** is a product that connects a local area network to another local area network of the same type.

In some ways, bridges operate like switches. Both learn which addresses are on which network and develop a **learning table** so that subsequent messages can be forwarded to the right network. Although bridges and switches share most relevant attributes, several distinctions differentiate these technologies. Most significantly, switches are much faster.

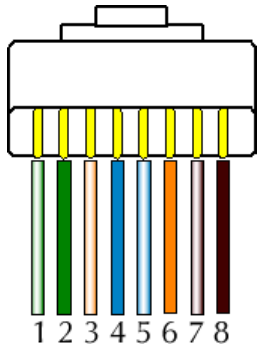
A bridge works at the data-link level of a network, copying a data frame from one network to the next network along the communications path. Bridges can be grouped into two main categories: local or remote. Local bridges provide a direct connection between multiple LAN segments in the same area. Remote bridges connect multiple LAN segments in different areas, usually over telecommunications lines.

EIA/TIA 586 WIRING SPECIFICATION

Hubs and switches and bridges all serve one purpose.physically connecting multiple computers. Another part of the connection equation is network cable. It's recommended you invest in high-quality Category 5 cable. Shielded and unshielded cable is available, although shielded cable is often unnecessary in all but the most extreme RF environments.

Once you've invested in good cable, invest in good connectors. Pay special attention to the lock tab and make sure it is sturdy and clicks solidly into the socket. When wiring, use a good crimp tool designed specifically for RJ-45 connectors.

If you hold the RJ-45 connector facing you (as if you were going to plug it into your mouth) with the lock tab on the top, then the pins are numbered 1 to 8 from left to right.



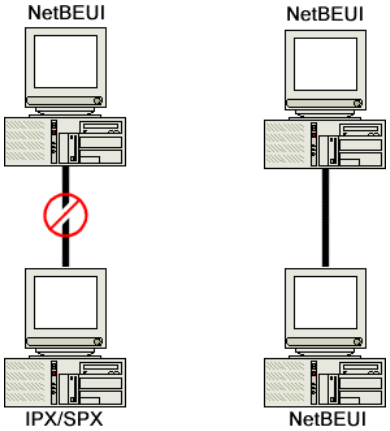
Color Code	Pin	Function
White-Green	**1**	**TX+ (output)**
Green	**2**	**TX - (output)**
White-Orange	**3**	**RCV+ (input)**
Blue	4	Reserved
White-Blue	5	Reserved
Orange	**6**	**RCV - (input)**
White-Brown	7	Reserved
Brown	8	Reserved

Network cable/installation is not a place to skimp on quality! The network is only as good as the wiring.

It is strongly recommended that you have a 100Mbps network tested and qualified by a trained network technician. Simply testing a cable for continuity does not measure other areas that are important in a high-speed network, like Near-end Crosstalk (NEXT), line noise, and split pairs.

COMMUNICATING WITH PACKETS

To communicate over a network, computers send **packets** or **datagrams** of information to each other. Each packet can contain about a thousand bytes of information. To send a message that is longer than a thousand bytes, the computer breaks it down into packet-sized chunks, puts a sequence number on each chunk, and then transmits one chunk in each packet. The computer on the other end receives one packet at a time and uses the sequence information to put all the chunks back together into a single message.



The network isn't concerned with the type of messages being transmitted. The messages could be text, pictures, digitized sounds, live video, or AudioVAULT commands. To the network, everything is just another packet, and every packet is just another chunk of information. The computers at either end handle the breakdown, reassembly, and proper handling of files.

Just like when you carry on a conversation on the phone, both parties must be speaking to same language to have a meaningful exchange. In network terms, this language is called a **protocol**. Both computers must be configured to use the same protocol in order to communicate.

The two protocols used with the AudioVAULT system are **NetBEUI** and **TCP/IP**.

PACKET DESTINATIONS AND ADDRESS RESOLUTION

Every computer has a unique **Media Access Control** or **MAC address**, but no one sends a packet to a MAC address. There's an intermediate step of **address resolution**.

Under **NetBEUI** (**NetB**IOS **E**xtended **U**ser **I**nterface), NetBIOS converts computer names to MAC addresses and stores the information in a **browse list**. AudioVAULT also uses the HostName value in the INI of the client and server computers to create a name-address table (the remote session table) of open connections or **sessions** with two computers so they don't have to resolve the name each time they want to send a packet.

In most cases, computers send packets intended for a specific recipient. With a hub, every single computer on the LAN receives each packet. After receiving a packet, each computer checks to see if it is the intended recipient. If the address in the packet doesn't match the computers own address, it ignores the packet. When a packet is intended for all computers (as with AVTime), it is broadcast **without** a specific MAC address, so all computers receive and work with the packet.

NetBEUI's major drawback is that it is not very routable.it is hard to connect multiple sites across a wan. NetBEUI actually provides higher data throughput than TCP/IP, however the performance difference does lessen with faster networks and processors. With slower machines common in many AudioVAULT networks, NFServers operating over NetBEUI perform 50-60% better than NFServers using TCP/IP connections.

TCP/IP offers some advantages over NetBEUI. For one, it is the closest thing that the computer world has to a universal language. It is also routable, meaning it's easier to connect multiple segments over a wide area network or the Internet.

There are drawbacks however. There is a slight cost in performance, as more resources are needed to support the underlying mechanism of the drivers, etc. But with PCs being as fast as they are, the impact is negligible. TCP/IP networks are also more complicated to configure and administer than their NetBEUI counterparts. You must configure each node with at least a **host name**, an **address**, a **subnet mask**, and a **default gateway**.

HOST NAME

This property is based on the computer's **network name**. Valid characters in a TCP/IP host name are 0-9, A-Z, a period and a hyphen. By default, TCP/IP setup will set your host name to your computer name, replacing illegal characters with a hyphen.

ADDRESSES: NETWORKS AND HOSTS

An IP address is a 32-bit number that uniquely identifies a host (computer or other device, such as a printer or router) on a TCP/IP network. Reading binary, a computer sees a typical address as **11000000010100011110111000100**.

This number may be hard for us to make sense of, so we divide it into four parts of eight binary digits known as **octets**. Now we see **11000000.10101000.01111011.10000100**.

Converting the binary to decimal gives us the address format we're most comfortable with.**192.168.123.132**. The decimal numbers separated by periods are the octets converted from binary to decimal notation.

As TCP/IP operates over wide area networks (**WANs**) and collections of networks, the routers

that pass packets of data between networks do not know the exact location of a host for which a packet of information is destined. Routers only know what network the host is a member of and use information stored in their route table to determine how to get the packet to the destination host's network. After the packet is delivered to the destination's network, the packet is delivered to the appropriate host.

For this process to work, an IP address has two parts. The first part of an IP address is used as a network address, the last part as a host address. If you take the example 192.168.123.132 and divide it into these two parts you get the following:

192.	168.	123.		Network address
			132	Host address

OR

192.	168.	123.		Network address
0.	0.	0.	132	Host address

SUBNET MASK

The second item, which is required for TCP/IP to work, is the **subnet mask**. The subnet mask is used by the TCP/IP protocol to determine whether a host is on the local subnet or on a remote network. A **subnet** is a portion of a network that shares a common address component. On TCP/IP networks, subnets are defined as all devices whose IP addresses have the same prefix. For example, all devices with IP addresses that start with 100.100.100. would be part of the same subnet.
In TCP/IP, the parts of the IP address that are used as the network and host addresses are not fixed, so the network and host addresses above cannot be determined unless you have more information. In our example, we don't know if 192.168.123.132 is divided like this:

192.	168.	123.		Network address
			132	Host address

Or like this:

192.	168.			Network address
		123.	132	Host address

This information is supplied in another 32-bit number called a **subnet mask**. A common subnet mask value is 255.255.255.0. Converted into binary, this equals:

11111111.11111111.11111111.00000000

Lining up the IP address and the subnet mask together, the network and host portions of the address can be separated:

255.	255.	255.	0
11111111.	11111111.	11111111.	00000000
192.	168.	123.	132
11000000.	10101000.	1111011.	10000100

In this case, the first three octets are the network address, with the last octet is the host address.

Almost all decimal subnet masks convert to binary numbers that are all ones on the left and all zeros on the right. Some other common subnet masks are:

255.	255.	255.	224
11111111.	11111111.	11111111.	11100000

255.	255.	254.	0
11111111.	11111111.	11111110.	00000000

Internet RFC 1878 describes the common subnets and subnet masks that can be used on TCP/IP networks.

Decimal	Binary	Max Addresses
128.0.0.0	10000000.00000000.00000000.00000000	2,048,000,000
192.0.0.0	11000000.00000000.00000000.00000000	1,024,000,000
224.0.0.0	11100000.00000000.00000000.00000000	512,000,000
240.0.0.0	11110000.00000000.00000000.00000000	256,000,000
248.0.0.0	11111000.00000000.00000000.00000000	128,000,000
252.0.0.0	11111100.00000000.00000000.00000000	64,000,000
254.0.0.0	11111110.00000000.00000000.00000000	32,000,000
255.0.0.0	11111111.00000000.00000000.00000000	16,000,000
255.128.0.0	11111111.10000000.00000000.00000000	8,000,000
255.192.0.0	11111111.11000000.00000000.00000000	4,000,000
255.224.0.0	11111111.11100000.00000000.00000000	2,000,000
255.240.0.0	11111111.11110000.00000000.00000000	1,024,000
255.248.0.0	11111111.11111000.00000000.00000000	512,000
255.252.0.0	11111111.11111100.00000000.00000000	256,000
255.254.0.0	11111111.11111110.00000000.00000000	128,000
255.255.0.0	11111111.11111111.00000000.00000000	64,000
255.255.128.0	11111111.11111111.10000000.00000000	32,000
255.255.192.0	11111111.11111111.11000000.00000000	16,000
255.255.224.0	11111111.11111111.11100000.00000000	8,000
225.255.240.0	11111111.11111111.11110000.00000000	4,000
225.255.248.0	11111111.11111111.11111000.00000000	2,000
255.255.252.0	11111111.11111111.11111100.00000000	1,000
255.255.254.0	11111111.11111111.11111110.00000000	512
255.255.255.0	11111111.11111111.11111111.00000000	256
255.255.255.128	11111111.11111111.11111111.10000000	128
255.255.255.192	11111111.11111111.11111111.11000000	64
255.255.255.224	11111111.11111111.11111111.11100000	32
255.255.255.240	11111111.11111111.11111111.11110000	16
255.255.255.248	11111111.11111111.11111111.11111000	8
255.255.255.252	11111111.11111111.11111111.11111100	4
255.255.255.254	11111111.11111111.11111111.11111110	2
255.255.255.255	11111111.11111111.11111111.11111111	1

NETWORK CLASSES

Allocated IP addresses are divided into **classes**. The most common of these are classes **A**, **B**, and **C**. Each of the address classes has a different default subnet mask. You can identify the class of an IP address by looking at its first octet.

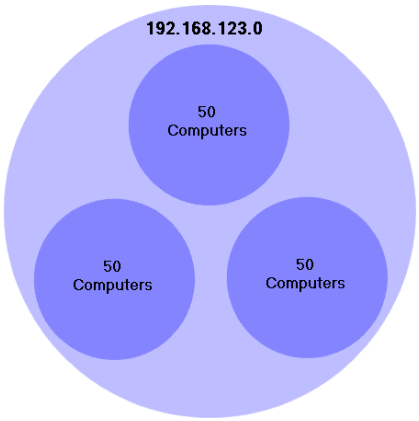
Class A networks use a default subnet mask of **255.0.0.0** and have **0-126** as their first octet.

Class B networks use a default subnet mask of **255.255.0.0** and have **128-191** as their first octet.

Class C networks use a default subnet mask of **255.255.255.0** and have **192-223** as their first octet.

SUBNETTING

A Class A, B, or C TCP/IP network can be further divided, or **subnetted**, by a system administrator. This becomes necessary as you reconcile the logical address scheme of the Internet (the abstract world of IP addresses and subnets) with the physical networks in use by the real world.



A system administrator who is allocated a block of IP addresses may be administering networks that are not organized in a way that easily fits these addresses. For example, you have a wide area network with 150 hosts on three networks (in different cities) that are connected by a TCP/IP router. Each of these three networks has 50 hosts. You are allocated the class C network **192.168.123.0**.

This means that you can use addresses between **192.168.123.1** to **192.168.123.254** for your 150 hosts. Two addresses that cannot be used in this example are **192.168.123.0** and **192.168.123.255** because binary addresses with a host portion of all ones and all zeros are invalid. The zero address is invalid because it is used to specify a network without specifying a host. The **255** address (in binary notation, a host address of all ones) is used to broadcast a message to every host on a network.

You should now be able to give legitimate IP addresses to 254 hosts. This works fine if all 150 computers are on a single network. However, your 150 computers are on three separate physical networks. We need a way to identify what are local and remote networks. Instead of requesting additional address blocks for each network, we can divide the network into subnets, allowing us to use the single block of addresses on multiple physical networks.

Subnet mask	Network Address	Host Address
255.255.255.0	11111111.11111111.11111111.	00000000

In this case, you divide your network into four **subnets** by using a subnet mask that makes the network address larger and the possible range of host addresses smaller. In other words, you are 'borrowing' some of the bits usually used for the host address, and using them for the network portion of the address. The first two digits of the last octet become part of the network addresses, while the last 6 binary digits can be used for host addresses.

Subnet mask	Network Address	Host Address
255.255.255.192	11111111.11111111.11111111.11	000000

The subnet mask 255.255.255.192 gives you four networks of 62 hosts each. Using a subnet mask of 255.255.255.192, your 192.168.123.0 network then becomes the four networks 192.168.123.0, 192.168.123.64, 192.168.123.128 and 192.168.123.192.

Subnetwork	Network Address	Host Address	Subnetwork Ranges
192.168.123.0	11111111.11111111.11111111.00	00000	192.168.123.1-62
192.168.123.64	11111111.11111111.11111111.01	00000	192.168.123.65-126

192.168.123.128	11111111.11111111.11111111.10 00000	192.168.123.129-190
192.168.123.192	11111111.11111111.11111111.11 00000	192.168.123.193-254

Remember binary host addresses with all ones or all zeros are invalid, so you cannot use addresses with the last octet of 0, 63, 64, 127, 128, 191, 192, or 255.

You can see how this works by looking at two host addresses, **192.168.123.71** and **192.168.123.133**. If you used the default Class C subnet mask of **255.255.255.0**, both addresses are on the **192.168.123.0** network.

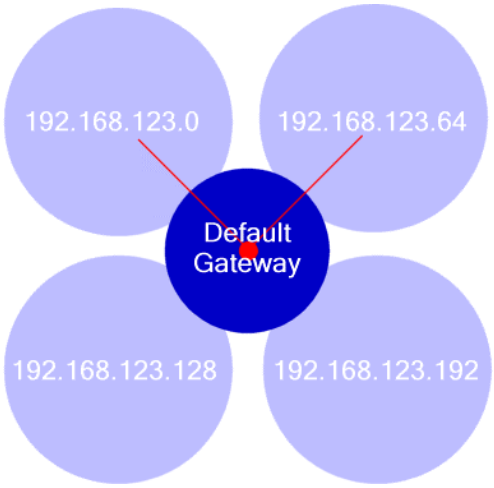
Address	Network Address	Host Address	Network
192.168.123.71	11000000.10101000.01111011.	1000111	192.168.123.0
192.168.123.133	11000000.10101000.01111011.	0000101	192.168.123.0

However, if you use the subnet mask of **255.255.255.192**, they are on different networks; **192.168.123.71** is on the **192.168.123.64** network, **192.168.123.133** is on the **192.168.123.128** network.

Address	Network Address	Host Address	Network
192.168.123.71	11000000.10101000.01111011.01	00111	192.168.123.64
192.168.123.133	11000000.10101000.01111011.10	00101	192.168.123.128

DEFAULT GATEWAYS

If a TCP/IP computer needs to communicate with a host on a remote network, it will usually communicate through a device called a **router**. In TCP/IP terms, a router that links multiple networks is called a **default gateway**.



When a computer tries to communicate with another device using TCP/IP, it performs a comparison process using the defined subnet mask and the destination IP address versus the subnet mask and its own IP address. The result of this comparison tells the computer whether the destination is a local host or a remote host. The computer resolves and compares the network address of the two values.if they are the same the destination computer is on the local network. If they are different, the destination computer is on a remote network.

If the result of this process determines the destination to be a local host, then the computer will simply send the packet on the local subnet. If the result of the comparison determines the destination to be a remote host, then the computer will forward the packet to the **default gateway** defined in its TCP/IP properties. It is then the responsibility of the gateway to forward the packet on to the correct network.

SOCKET TO ME

In client-server architecture, we're often dealing with a many-to-one relationship. Many AudioVAULT workstations will be talking to one server. It's also likely that both the client and the server will be performing their own tasks even as they respond to the requests of the remote computer. How can we keep track of who wants what?

Each network-accessible application that runs on a computer is called a **service**. If more than one network client wants to use the service, it doesn't make much sense to start multiple copies of the same service. Instead, that service is made available on a **port**.

In programming, a **port** is a logical connection place and specifically, using TCP/IP, the way a client program specifies a particular server program on a computer in a network. Some applications that use TCP/IP such as HTTP have ports with pre-assigned numbers.

Service	Port
Ping	7
Systat	11
NetStat	15
Telnet	23
SMTP	25
Whois	43
Finger	79
HTTP	80
POP	110
NNTP	119

These are known as **well-known ports** that have been assigned by the **Internet Assigned Numbers Authority (IANA)**. Other application processes are given port numbers dynamically for each connection. When a service initially is started, it is said to **bind** to its designated port number. As any client program wants to use that server, it also must request to bind to the designated port number.

Port numbers are from 0 to 65536. The well-known ports, ports 0 to 1024, are reserved for use by certain privileged services. There are also **registered** ports are numbered from 1024 through 49151. The remaining ports, referred to as **dynamic ports** or **private ports**, are numbered from 49152 through 65535.

Now we have a way of keeping track of everything coming in and going out. We can track **who** is making a request by tracking their **IP address**, and we can keep track of the service they're using by tracking the **port**. These numbers together are called a **socket**. A ***socket*** is a network communications endpoint. The analogy is to a wire (the network data connection) being plugged into a socket.

Both the sending and receiving machines have sockets. Because the IP address is unique across the network, and the port numbers are unique to the individual machine, the socket numbers are also unique. This enables a process to talk to another process across the network, based entirely on the **socket** number.

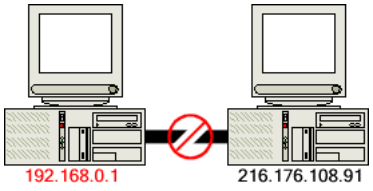
Sockets come in two primary flavors. An ***active socket*** is connected to a remote active socket via an open data connection. Closing the connection destroys the active sockets at each endpoint. A ***passive socket*** is not connected, but rather awaits an incoming connection, which will spawn a new active socket.

INTERFACING WITH THE INTERNET

If the network is not connected to the Internet, you aren't technically limited to the range of addresses you use. There are some standards you should adhere to, however. There is a range of **non-routable addresses** for each of the three classes of IP addresses used for internal networks:

- Range 1 is Class A - 10.0.0.1 through 10.255.255.254
- Range 2 is Class B - 172.16.0.1 through 172.31.255.254
- Range 3 is Class C - 192.168.0.1 through 192.168.255.254

Although each range is in a different class, you are not required to use any particular range for your internal network. It is a good practice though, because it greatly diminishes the chance of an IP address conflict. Using these non-routable addresses can cause problems however when you also have computers on the network configured with "real" addresses.



For example, a computer with an address of **192.168.0.1** cannot communicate with a computer at **216.176.108.91**.

For these two computers to be able to talk with each other, we use a process called **Network Address Translation** or **NAT**. This process translates an IP address used within one network to a different IP address known within another network. One network is designated the **inside** network and the other is the **outside**. Many routers are capable of NAT. Software-based solutions are also available.

FIREWALLS

A **firewall** is a computer, hub, or router configured specifically to stop unwanted outside traffic from accessing your internal network. A firewall computer includes at least **two** network cards. One card is connected to the outside world; the other is connected to your internal network. The firewall then acts as a single point of access.

The internal network is generally configured to use non-routable IP addresses. So how does a computer with a non-routable IP address access the Internet? Remember that the firewall has one NIC with access to the Internet and uses an IP address obtained from the ISP. The firewall uses **IP masquerading** (very similar to **NAT**) to make the outside world think that traffic from your internal network is coming from the firewall computer's IP address. Internally, each computer uses its native non-routable address. When a user accesses the Internet however, all traffic between the local computer and the ISP goes through the firewall computer, but all the ISP sees is the firewall computer's IP address.

In addition, almost all firewall products offer IP address filtering. These filters work by examining the header of the IP packet and making pass/fail decisions based on the source and destination IP addresses.

DHCP AND WINS

Short for *Dynamic Host Configuration Protocol,* a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. In some systems, the device's IP address can even change while it is still connected. DHCP also supports a mix of static and dynamic IP addresses.

Dynamic addressing simplifies network administration because the software keeps track of IP addresses rather than requiring an administrator to manage the task. This means that a new computer can be added to a network without the hassle of manually assigning it a unique IP address.

Another popular Windows option is **WINS**, or Windows Internet Name Service. When you try to attach to a host using a host name or UNC (**\\pjackson** for example) your computer must be able to convert the name "pjackson" into an IP address such as 204.53.22.82. For a long time, people on a Microsoft TCP/IP networks could either rely on broadcasts or construct a static name resolution table, **lmhosts**. **WINS** is simply a database program that keeps track of which NetBIOS names map to which IP addresses. Windows 2000 removes the need for WINS; instead it uses the standard TCP/IP nameserver protocols.

TROUBLESHOOTING

TCP/IP network problems are often caused by incorrect configuration of the three main entries in a computer's TCP/IP properties. By understanding how errors in TCP/IP configuration affect network operations, you can solve many common TCP/IP problems.

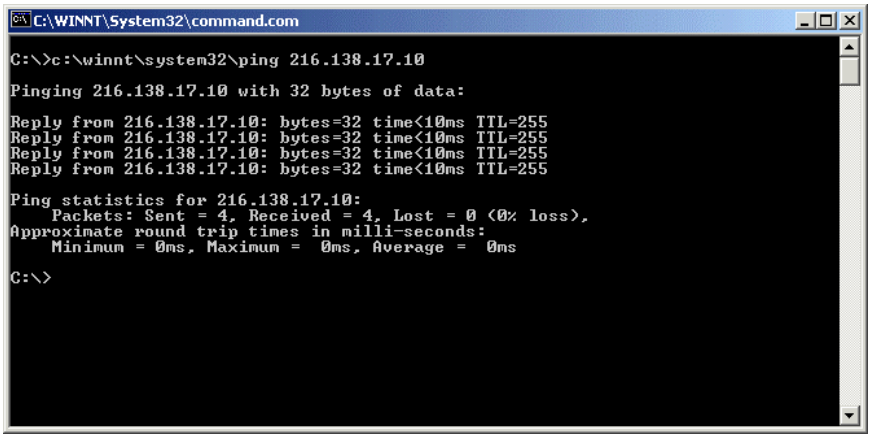
TCP/IP UTILITIES

A number of useful utilities for configuring or troubleshooting TCP/IP connections are included with the Microsoft TCP/IP suite. For details on these utilities search Windows Help for the **Command Reference** page.

Utility	Function
PING	Verifies configurations and tests connectivity
TRACERT	Displays the path a packet takes to a destination host
PATHPING	A route tracing tool that combines features of the **ping** and **tracert** commands
FINGER	Retrieves system information from a remote computer that supports the TCP/IP FINGER service
ARP	Displays cache of locally resolved IP addresses to MAC (media access control) addresses
IPCONFIG	Displays the current TCP/IP configuration
NBTSTAT	Displays a list of NetBIOS computer names that have been resolved to IP addresses
NETSTAT	Displays the TCP/IP protocol session information
ROUTE	Displays or modifies the local routing table
HOSTNAME	Returns the local computers host name for authentication by the RCP, RSH, and REXEC utilities

TESTING BASIC CONNECTIVITY

The **ping** command tests whether a remote host can be reached from your computer. This simple function is extremely useful for testing the network connection, independent of the application in which the original problem was detected. **ping** allows you to determine whether further testing should be directed toward the network connection (the lower layers) or the application (the upper layers).



If **ping** shows that packets can travel to the remote system and back, the user's problem is probably in the software configuration. If packets can't make the round-trip, the problem is probably with the network connection itself.

From the user's computer, ping the remote computer using either the **computer name** or **IP address**. If you receive a reply, the problem is probably related to software. If you don't receive a reply, pay close attention to any error messages. The error messages displayed by **ping** are helpful guides for planning further testing. The details of the messages may vary, but there are only a few basic types of errors:

unknown host
The remote host's name cannot be resolved by name service into an IP address. The name servers could be at fault (either your local server or the remote system's server), the name could be incorrect, or something could be wrong with the network between your system and the remote server. If you know the remote host's IP address, try to ping that. If you can reach the host using its IP address, the problem is with name service.

network unreachable
The local system does not have a route to the remote system. If the numeric IP address was used on the **ping** command line, re-enter the **ping** command using the host name. This

eliminates the possibility that the IP address was entered incorrectly, or that you were given the wrong address.

no answer
The remote system did not respond. Most network utilities have some version of this message. Some print the message "100% packet loss"; others print the message "Connection timed out" or the error "cannot connect." All of these errors mean the same thing. The local system has a route to the remote system, but it receives no response from the remote system to any of the packets it sends. There are many possible causes of this problem.

- The remote host may be down. Either the local or the remote host may be configured incorrectly.
- A gateway or circuit between the local host and the remote host may be down.
- The remote host may have routing problems.

The basic format of the **ping** command is **ping** destination, where destination is the host name or IP address of the remote host being tested. Use the host name or address provided by the user in the trouble report. By default the Windows NT ping command sends out four, 32 byte test packets. The sample test shows an extremely good network link with no packet loss and fast response. A small packet loss, and the round-trip times an order of magnitude higher, would not be abnormal for a connection made across a wide area network.

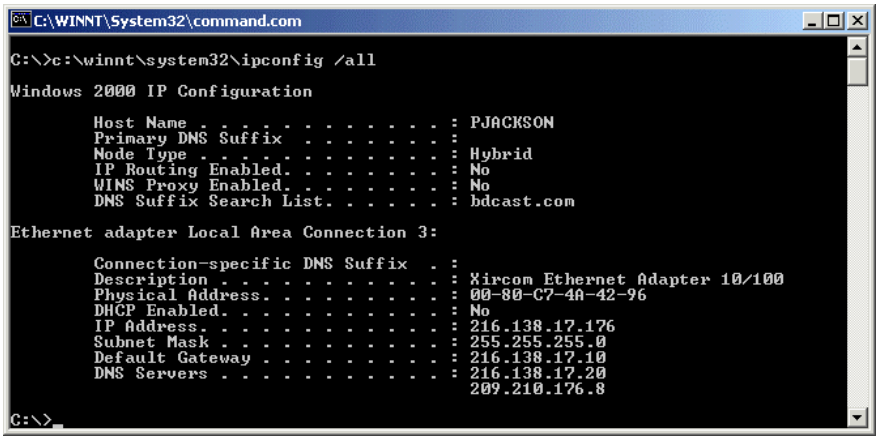
If the packet loss is high or the response time is very slow, there could be a network hardware problem. If you see these conditions when communicating great distances on a wide area network, there is nothing to worry about. TCP/IP was designed to deal with unreliable networks, and some wide area networks suffer a lot of packet loss. But if these problems are seen on a local area network, they indicate trouble.

On a local network cable segment the round-trip time should be near zero, there should be little or no packet loss, and the packets should arrive in order. If these things are not true, there is a problem with the network hardware. On an Ethernet the problem could be improper cable termination, a bad cable segment, or a bad piece of "active" hardware, such as a hub, switch or transceiver. Check the cable with a cable tester. Good hubs and switches often have built in diagnostic software that can be checked. Cheap hubs and transceivers may require the "brute force" method of disconnecting individual pieces of hardware until the problem goes away.

TROUBLESHOOTING WITH THE IPCONFIG COMMAND

ipconfig checks the network interface configuration. Use this command to verify the user's configuration if the user's system has been recently configured, or if the user's system cannot reach the remote host while other systems on the same network can.

When **ipconfig** is entered with the **/all** argument, it displays the current configuration values assigned to the interface. For example:



The **ipconfig** command displays two types of information. The first type is information about the TCP/IP configuration. The second type is about the network interface and its characteristics. Check the information for configuration errors.

The Windows **ipconfig** command clearly labels each piece of information it provides. You should know what values are correct for your network, and thus be able to quickly detect a configuration error if one has been made.

Two common interface configuration problems are **misconfigured subnet masks** and **incorrect IP addresses**. A bad subnet mask is indicated when the host can reach other hosts on its local subnet and remote hosts on distant networks, but it cannot reach hosts on other local subnets. **ipconfig** quickly reveals if a bad subnet mask is set.

An incorrectly set IP address can be a subtle problem. If the network part of the address is incorrect, every ping will fail with the "no answer" error. In this case, using **ipconfig** will reveal the incorrect address. If the host part of the address is wrong, the problem can be more difficult to detect. A small system, such as a PC that only connects out to other systems and never accepts incoming connections, can run for a long time with the wrong address without its user noticing the problem. Additionally, the system that suffers the ill effects may not be the one that is misconfigured. It is possible for someone to accidentally use your IP address on her system, and for the mistake to cause your system intermittent communications problems. This type of configuration error cannot be discovered by **ipconfig**, because the error is on a remote host.

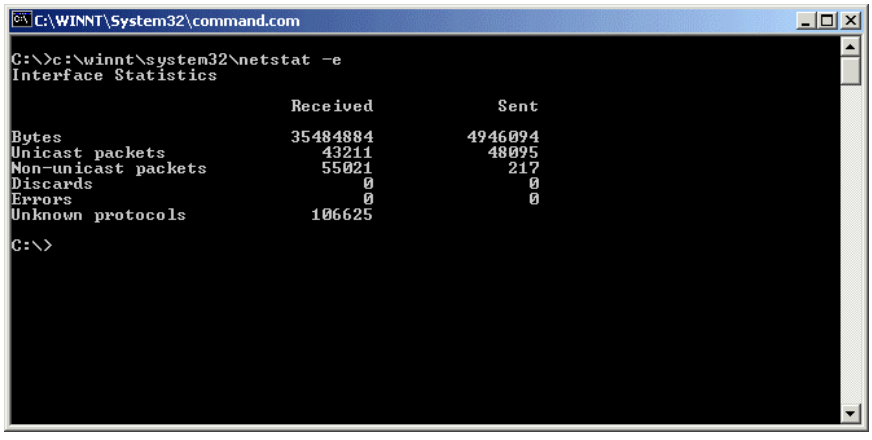
CHECKING THE INTERFACE WITH NETSTAT

If the preliminary tests lead you to suspect that the connection to the local area network is unreliable, the **netstat -e** command can provide useful information.

The command displays the total amount of traffic that this system has received from and sent to the Ethernet--in both bytes and packets. It also displays the number of packets in error.

Discards are packets that were received from the network and then discarded by the local system because they contained errors or could not be processed.

Errors are damaged packets, including packet sent from this system that were damaged in the local buffer. These errors should be close to zero. Regardless of how much traffic has passed through this interface, 100 errors in either of these fields is high. High output errors could indicate a saturated local network or a bad physical connection between the host and the network. High **received errors** could indicate that the network is saturated, the local host is overloaded, or there is a physical network problem. Tools such as the Network Monitor or a cable tester can help you determine if it is a physical network problem.



The problem may be an overloaded network. To reduce the network load, reduce the amount of traffic on the network segment. A simple way to do this is to create multiple segments out of the single segment. Each new segment has fewer hosts and, therefore, less traffic.

Section 2: AV100 System Architecture

By the end of this section, you should be familiar with the following concepts:

- The different components of an AV100-based AudioVAULT
- The function of the AV100 card
- How to install AV100 cards in a system
- Basic SCSI architecture
- How the AV100 card accesses audio files
- Audio wiring considerations

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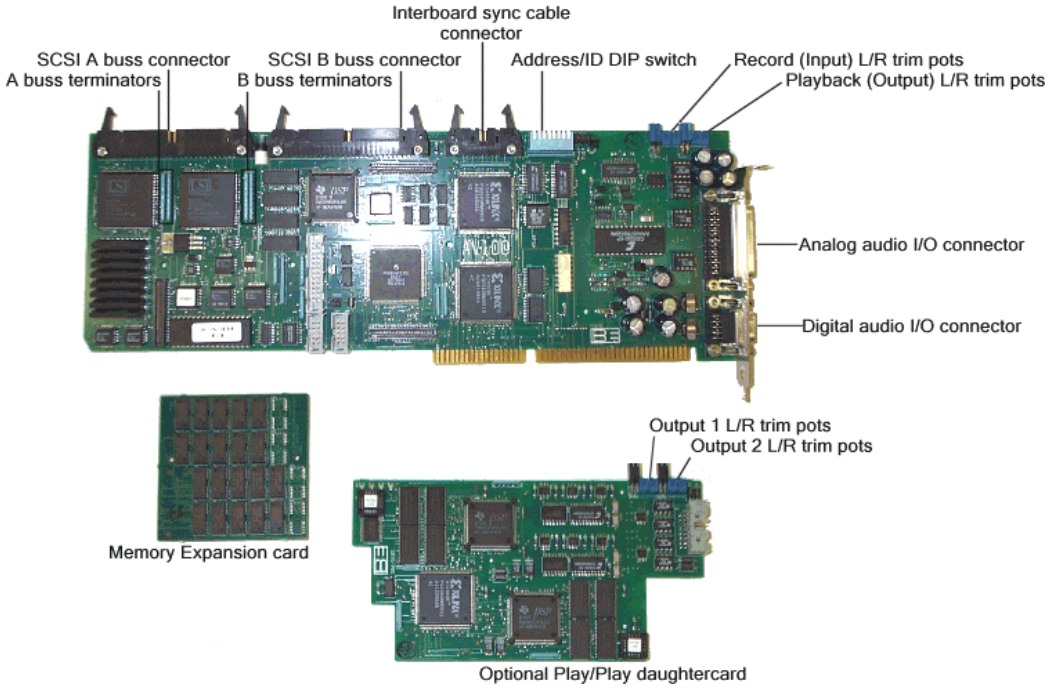
HOW DOES IT ALL WORK?

The AV100 hardware platform is centered on custom-built audio cards, but other hardware components contribute to the overall system. In this section, we'll focus on these aspects of the AV100-based AudioVAULT system:

- AV100 hardware
- Dedicated SCSI storage
- Audio cabling
- Network components

AV100 HARDWARE

All audio and data processing operations are performed by the AV100 circuit boards, which reside in your system's server or servers.



AV100 **base** cards are capable of handling a **single record or play stereo channel**. An analogy can be made with a record/play cart machine. Optional **play/play daughtercards** physically mount to the base cards, and can provide **two independent playback-only stereo channels**.

Audio **CANNOT** be overlapped using a single AV100 circuit board, so most systems have multiple AV100 boards. Typically, an on-air studio will have multiple playback channels routed from the server to separate faders on the on-air console.

COMPUTER TYPES AND HOW THEY COMMUNICATE

There are three main types of computers in a networked AV100 system

Servers contain AV100 cards. They also have access to dedicated SCSI drives to store AudioVAULT audio files.

NFServers contain AV100 cards. They also have access to dedicated SCSI drives to store AudioVAULT audio files **and** run the NFS program that is responsible for synchronizing files between multiple servers.

Workstations do not contain AV100 Cards. Instead, they access cards that reside in AudioVAULT servers via a network connection. The AudioVAULT software running on the Workstations controls the AV100 cards in the servers, telling them to record, play, pause, or perform other operations.

A local area network (***LAN***) is setup between the Workstation PCs and the AudioVAULT Server. Using the LAN, workstations **connect**, or **establish a session** with the AudioVAULT server and take control of one or more stereo audio outputs. The commands are sent over the network from the workstation to the AudioVAULT server PC for execution. Only the commands are sent to the AudioVAULT server.

Once the AVServer program receives a command, it instructs the designated AV100 card to execute the command. If playback is required, the requested item is played from the SCSI hard drive. Again, the conversion from digital to audio is processed on the AV100 card itself, and must be routed back into the studio where it can be attached to the console's input connections.

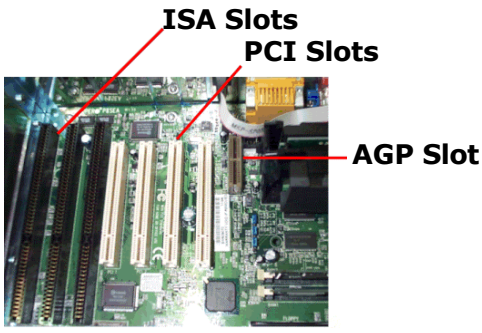
INSTALLING THE AV100 CARD

AV100 base cards are standard full-length **ISA** cards, which fit into an ISA slot in a computer. AV100 cards are **not plug-and-play** compatible. In fact, the Windows operating system knows very little about the AV100 hardware. AV100 base cards will share a single **IRQ** and use Windows **Shared Memory** regions, but otherwise operate outside of the Windows environment.

Before installing the card, be sure to remove any unnecessary terminators and attach any daughtercards.

The AV100 card should be physically installed in a free ISA slot in the AudioVAULT server while the server is turned off an unplugged. Appropriate precautions should be taken to avoid static discharge.

Once the card is installed, it needs to be added to the system configuration. Both the AudioVAULT **Setup** program and the **AVCFG** application can be used to create and add the appropriate INI and Registry settings. AudioVAULT refers to these settings to determine what cards and channels are available, and whether the card is local or in a remote computer. The card cannot be accessed without those settings, which means that Setup or AVCFG needs to be run on every computer that will use this card.both the local server and any workstation that needs access to the card.



After running Setup or AVCFG, reboot the computer with the new AV100 card. The **AVINIT** process should include the new card, and AVServer should have an entry for the new hardware. If you don't see the card in AVINIT, or you receive an error indicating the card could not be initialized, either the correct settings weren't added or a resource problem exists.

MODIFYING THE BIOS IRQ SETTING

With the advent of Plug-and-Play, much of the work surrounding assigning IRQ and other resources was handed off to the operating system. In theory, the system recognizes which resources are available to plug-and-play, or auto-configuring, devices. It does this by checking the BIOS and other settings to see what resources are available for use with plug-and-play devices. AV100 cards will share a single IRQ, **IRQ 10 by default**, but it needs to be reserved for use with **Legacy ISA** hardware.

AV100 cards can use either **IRQ 10**, **11**, **12** or **15**. Through the IRQ, the AV100 card notifies AVServer for Windows when a local AV100 has completed a pending **RPC**, or **Remote Procedure Call**. If an IRQ conflict exists, that notification can't reach AVServer, and a **communications timeout** error or a **command timed out** error will be reported by the client application. That client may also report other errors including **session number out of range**.

Through a cable called an **inter-board synchronization cable**, all AV100 cards in a computer will share a single IRQ. The cable allows IRQ sharing on a hardware level. AVServer enables IRQ sharing: the first AV100 in the Ports list is the assigned the **IRQ master**. The other AV100 cards are configured as slaves. When a slave AV100 needs to issue an interrupt to the PC, it does so by way of the inter-board sync bus/cable and the master AV100.

It is possible to assign different **IRQ**s to the different AV100 boards, but not recommended. Temporarily however, in an emergency (like a cable failure), each card's individual IRQ can be specified in the registry or SYSTEM.INI. Broadcast Electronics does not test software releases with multiple IRQs.

In addition to setting IRQ 10 to Legacy ISA in the BIOS, it may be necessary to reserve the IRQ in Windows as well.

RESERVING SHARED MEMORY ADDRESSES

AV100 cards also use Windows **Shared Memory** to pass messages between the card and the AudioVAULT software. These 16K regions need to be excluded from general Windows use using the **EmmExclude=** line in the **[386enh]** section of the Windows SYSTEM.INI.

Valid shared memory addresses for use with AV100 cards start at one of the following addresses:

C000 (through C3FF)
C400 (through C7FF)
C800 (through CBFF)
CC00 (through CFFF)
D000 (through D3FF)
D400 (through D7FF)
D800 (through DBFF)
DC00 (through DFFF)
E000 (through E3FF)
E400 (through E7FF)
E800 (through EBFF)
EC00 (through EFFF)

By default, the AudioVAULT Setup program will assign Shared Memory addresses beginning at C800 for card 1, CC00 for card 2, and so on. If those default addresses conflict with existing hardware (most notoriously video cards) it is possible to assign alternate addresses to the AV100 cards. The assignment is done solely in software and requires no jumper/DIP switch changes on the AV100 card. Shared memory regions for the specific cards are assigned in the Registry and SYSTEM.INI.

DEDICATED SCSI STORAGE

AV100 cards are attached by means of a single cable to each other and to dedicated SCSI drives. Audio files exist on the SCSI drives and each AV100 card plays the same digital file. This means the audio is recorded into the system once and can be played back simultaneously by any studio. In fact, several AV100 cards in a server PC can be playing the same piece of audio at the same time.

THE SCSI-2 STANDARD

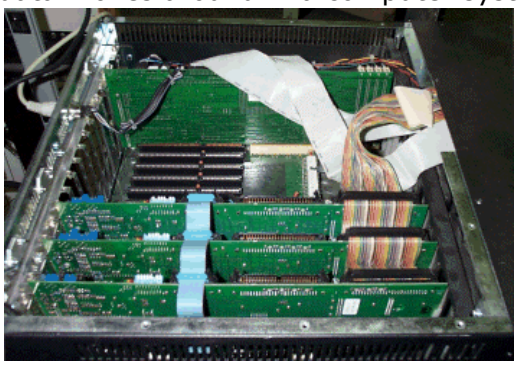
The Small Computer System Interface, or SCSI, standard is an intelligent peripheral I/O interface with a standard, device independent protocol that allows many different peripheral devices to be attached to the host's SCSI port. AV100 based systems use the single-ended Fast SCSI architecture to connect the AV100 cards to one or more SCSI storage devices. The connector on the AV100 card itself is a 50-pin connector.

The SCSI-2 standard offered significant enhancements to the original SCSI-1 specification:

- **Speed:** 8-bit regular SCSI cabling is capable of 10 MB/s transfer rates
- **Improved Cables and Connectors:** SCSI-2 defined new higher-density connections.
- **Active Termination:** Termination is an important technical consideration in setting up a SCSI bus. SCSI-2 defined the use of active termination, which provides more reliable termination of the bus.
- **Command Queuing:** One of SCSI's strengths is its ability to allow multiple outstanding requests between devices on the bus simultaneously.
- **Command Set Enhancements:** The command sets for controlling all kinds of devices were enhanced, including diagnostic capabilities and messaging.

CONNECTING CARDS AND DRIVES

All SCSI devices are connected together on a **bus**. Think of a bus as the highway on which data moves around in a computer system.



The AV100 card has two built in SCSI controllers, allowing for two separate buses. When connecting AV100 cards and drives, a 50-conductor cable connects everything together.

The SCSI-2 standard is quite specific when it comes to termination, device identification and cable length. Problems on the SCSI bus can cause an AV100 server to "lock up" or AV100 cards to quit responding, or result in audio pauses or skipping.

SCSI IDS

The SCSI standard specifies each device on a bus must have a unique ID number. Available ID numbers run 0 through 7. On the AV100 B-bus, the same rules apply, although the AudioVAULT system will see ID numbers 8 through 15. Make sure the IDs of the SCSI drives don't conflict with the IDs assigned to the AV100 cards.
Out of convention, AV100 SCSI IDs always start at 7 and work down for each additional AV100. The IDs for storage devices always start at 0 and work up for each additional device.

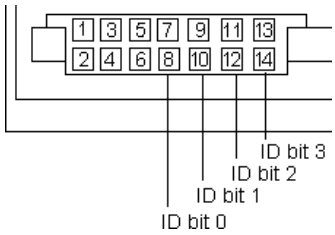
A	7	6	5	4	3	2	1	0
B	15	14	13	12	11	10	9	8

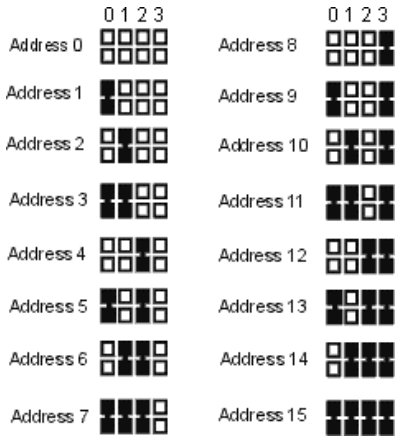
The SCSI ID on the AV100 card is set with a Dual Inline Package Switch.a small 8-position switch on the AV100 card next to the three LEDs. Each AV100 card requires a unique SCSI ID, determined by switches 1, 2, and 3. Make sure the SCSI IDs of the AV100 boards don't conflict with the IDs assigned to the SCSI drives.

1 - Bit 0 of the PCR ID selector
2 - Bit 1 of the PCR ID selector
3 - Bit 2 of the PCR ID selector

Switch 1 2 3	SCSI ID
▲ ▲ ▲	7
▼ ▲ ▲	6
▲ ▼ ▲	5
▼ ▼ ▲	4
▲ ▲ ▼	3
▼ ▲ ▼	2
▲ ▼ ▼	1
▼ ▼ ▼	0

SCSI ID on a drive or other storage device is usually a function of jumper settings. For example, many IBM drives set SCSI ID using jumpers on the J4 block:





Refer to your drive's manual or the manufacturer's web page for information on how to set the SCSI ID on your device. It's important to note that the narrow AV100 SCSI bus can only recognize or exchange data with a device in the range of 7 to 0. Many wide SCSI drives are natively capable of addresses in the 8 to 15 range (including the example above), but these are not recognized in the AV100 narrow SCSI architecture.

MAXIMUM CABLE LENGTH

Single-ended Fast SCSI may have up to a maximum of 3 meters (about 10 ft) total length. This includes not only the visible cable in the AudioVAULT server and drive chassis, but also the wiring and circuitry internal to the storage devices, connectors and any adapters. Since it's very difficult to determine the length of internal circuitry, it's recommended you use the shortest length possible.

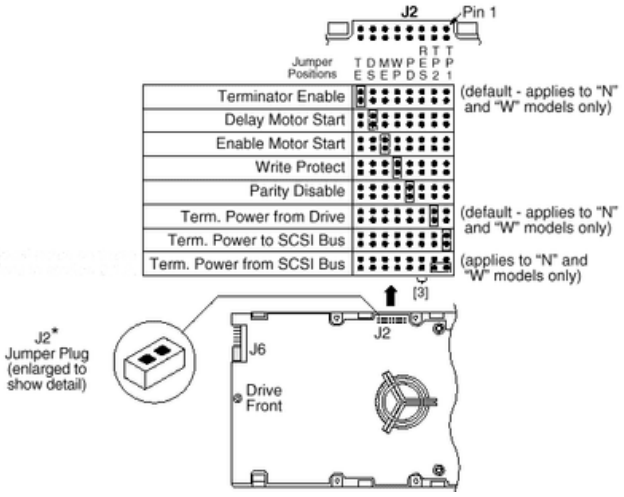
STUBS

A stub is an unterminated section of transmission line. The document that outlines the SCSI standard defines a stub as: *"Any electrical path connected to the bus that is not part of the bus path"*. Even the conductive paths on a drive's printed circuit board from the SCSI connector to the electronics is a stub. Stubs are unavoidable and should be kept to a minimum length. Stubs tend to accumulate, so peripherals should be separated from one another on the cabling.

TERMINATION

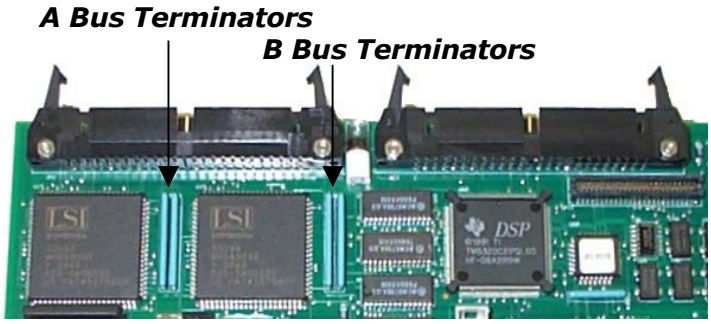
The SCSI bus passes signals between devices over cables that are basically RF transmission lines. The transmitting device, the cabling and the receiving device must all be impedance matched in order to accomplish maximum transfer of energy (signals) from end to end. If not,

upon encountering a change of impedance part of the signal well be reflected back to the transmitting device. If those reflected signals arrive at the transmitter at the transmitter after it has switched to the receive mode, it will think the reflected signal is the signal it is looking for. Not recognizing the reflected signals will cause that device to issue a SCSI re-send or perhaps even shut down the bus. Termination or terminators are used to provide a better impedance match to reduce these reflections to a minimum.



Terminators must be placed at the extreme ends of the cabling for each SCSI bus segment. There must be two, and only two, terminators for each bus segment. This means that the last connector at the end of a ribbon cable must have either a terminator or a terminated peripheral plugged into it.

The AV100 SCSI implementation expects active termination at both ends of the bus. Active single-ended terminators include a voltage regulator in addition to a resistor network. This voltage regulator increases the stability of SCSI signals by isolating them from fluctuations in the 5 volt termpower that would otherwise show up on the SCSI signals. One termination point is established on the AV100 card, and the other termination point is set either on the storage device or with an external terminator.



On the AV100 card, there are termination points for both the A bus and the B bus. Termination is provided by two Single Inline Package (SIP) resistors per bus. It's important to note that the SIPs are asymmetrical. Pin one is marked with a dot, which must be placed towards the bus connector.

The device on the other end of the bus must be terminated as well. Many storage devices have the ability to provide active termination, usually through jumper settings on the device. The setting is typically referred to as "Terminator Enable."

Many peripheral devices are also capable of providing term power. The voltage (+5 VDC) placed on the TERMPWR line(s) of the SCSI bus used to power terminators. The SCSI standard requires that the host adapter (the AV100 cards in our case) provide term power. Having more than one device on the bus providing term power does no harm and is often desirable to reduce problems of voltage "droop" caused by IR losses in long SCSI cables.

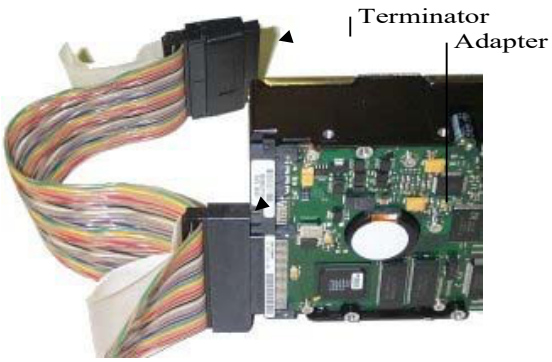
If the drive you're using is not capable of providing active termination, some other device must be placed at the physical end of the bus. If peripherals that can provide active termination are already in use, simply use them to terminate the bus by relocating one to the end of the cable. If not, you will need to use an active terminator. If possible, use electronic active instead of resistor-based active termination. Many terminators, including the one pictured below, are active pass-through terminators. This means technically they can be placed in-line with the last drive on the

physical bus. While technically correct, it is recommended they be placed at the end of the bus when possible to reduce overall stub length. The exception would be if placement at the end of the bus would mean exceeding overall maximum cable length.

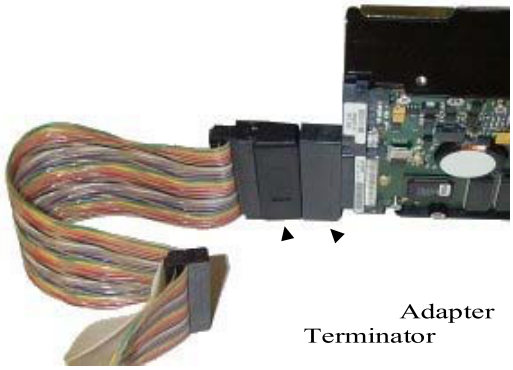
ADDING 68-PIN DEVICES

To connect a 68-pin SCSI peripheral to your AudioVAULT AV100 SCSI bus will require an adapter. Keep in mind that adding adapters to the bus increases the overall stub length. This becomes especially critical as the AV100 architecture pushes the limits of the SCSI specification. Not only are AV100 SCSI cables typically longer than conventional SCSI cables, they usually host far more devices on the bus. Everything we can do to make sure the bus is operating under "ideal" conditions will pay off in increased reliability.

When adding 68-pin devices, it is preferable to keep the stub length to a minimum by placing the drive and it's adapter on a connector rather than attaching it to a terminator as well:



Preferred



Not preferred

If you are connecting multiple wide devices to the narrow AudioVAULT SCSI bus, it is preferred that you keep the connectors and adapters to a minimum by interconnecting the wide devices with high-quality 68-conductor cable, and then adapting only once to the narrow 50-conductor AV100 cable.

AV100 SCSI buses are separate from, and totally unrelated to, the PC's hard drive--even if the PC happens to have a SCSI drive. This is how AudioVAULT is able to precisely predict and control SCSI bus bandwidth and loading. **Do not connect the AV100 SCSI bus to the PC hard drive bus!**

SERVER NAMING CONVENTIONS

Each AV100 card in a server is given a unique name, determined by the server **HostName** and the position of switches 1, 2, and 3.

In addition to unique **network** or **computer names**, each AudioVAULT computer must have a unique NetBIOS **HostName**. In the case of a server, this unique name has additional implications.it will identify the available AV100 channels on your AudioVAULT system. Common AudioVAULT server names include **PCR**, **AVR**, **AVA**, and **AVB**.

Each AV100 card within a server is referred to by server name and a **V**irtual **M**achine **I**dentifier (**VMI**). The VMI is a two-digit suffix added to the server name. The first digit identifies the base card in a server. The second digit identifies the Virtual Machine.

Assuming you have a server named AVA:

Base Card Only

AVA11	Refers to the First Virtual Machine (the base card) of the first card in the AVA server.

Base Card with P/P Daughtercard

AVA11	Refers to the First Virtual Machine (the base card) of the first card in the AVA server.
AVA12	Refers to the Second Virtual Machine (the first channel on the Daughtercard) of the first card on the AVA server.
AVA13	Refers to the Third Virtual Machine (the second channel on the Daughtercard) of the first card on the AVA server.

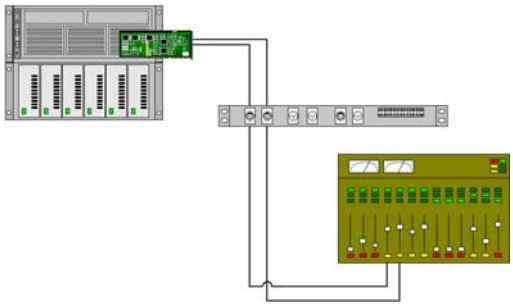
Base Card with R/P Daughtercard

AVA11	Refers to the First Virtual Machine (the base card) of the first card in the AVA server.
AVA12	Refers to the Second Virtual Machine (the Record/Play channel on the Daughtercard) of the first card on the AVA server.

Each AudioVAULT screen or AVAir deck is configured to look at a specific Machine, or channel, on the servers. Looking at your system drawing, you will see what channel each machine is configured to attach to, which will help you lay out audio cables.

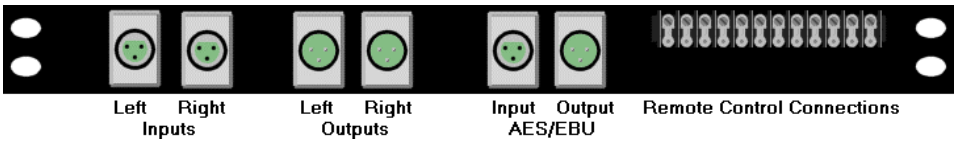
AUDIO CABLING

Audio is actually recorded and played from the AV100 cards. This means that audio cabling must be routed to and from each studio to the AV100 cards.



To make cabling easier, Broadcast Electronics offers XLR breakout panels with the appropriate connectors. Each panel will provide a faceplate with XLR connection points, 6-foot cable runs, and D connectors that physically attach to your AudioVAULT cards. Other connection schemes are available, including barrier strips and simple pigtails for use with punch blocks.

At a site using the breakout panels, for each AV100 Base card, there would be a 902-9212 Breakout Panel. The panel provides for Left and Right Analog Inputs, Left and Right Analog Inputs, and AES/EBU Inputs and Outputs.



For each Play/Play Daughtercard, there would be a 902-9213 Breakout Panel. The panel provides Left and Right Analog Outputs for both Daughtercard channels.

Breakout panels are attached to cables attached to D connectors. The connectors physically attach to the AudioVAULT cards in the servers. The cables running from the XLR connectors on the panels will run to the studios.to console inputs for playback channels, and console outputs for record channels.

CABLE PINOUTS

Audio cables interface with the AV100 Base card and Record/Play daughtercard's DB-25 connector with the following pinouts:

DB-25 Pin	Description
1	Left analog audio input +
2	Left analog audio input shield
3	Right analog audio input +
4	Chassis Ground
5	Left analog audio output +
6	Left analog audio output shield
7	Right analog audio output +
8 - 13	Reserved
14	Left analog audio input -
15	Right analog audio input shield
16	Right analog audio input -

17	Chassis ground
18	Left analog audio output -
19	Right analog audio output shield
20	Right analog audio output -
21 - 25	Reserved

The AV100 base card is also capable of handling AES/EBU digital audio through the DB-9 connection on the card:

DB-9 Pin	Description
1	RX+
2	RX Shield
3	TX+
4	Digital Ground
5	+5v, 100 milliamperes for future fiber converter
6	RX-
7	TX Shield
8	TX-
9	Digital Ground

Audio cables interface with the AV100 Play/Play Daughtercard's DB-15 connector with the following pinouts:

DB-15 Pin	Description
1	MachineID=2, Left +
2	MachineID=2, Left shield
3	MachineID=2, Right +
4	MachineID=2, Chassis ground
5	MachineID=3, Left +
6	MachineID=3, Left shield
7	MachineID=3, Right +
8	*not used*
9	MachineID=2, Left -
10	MachineID=2, Right shield
11	MachineID=2, Right -
12	MachineID=3, Chassis ground
13	MachineID=3, Left -
14	MachineID=3, Right shield
15	MachineID=3, Right -

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Section 3: AV100 Server side-applications

By the end of this section, you should be familiar with the following concepts:

- The role of AVInit
- How Drive ownership and Memory affect system performance
- The role of AVServer for Windows
- The role of AVConsole
- The role of NFServer
- The factors affecting bandwidth usage
- The options available for backup

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INTRODUCTION

Using the AV100 platform, AudioVAULT is in many respects a client-server system. Client applications like AVAir and AVRPS use resources made available by server software. The primary applications on a server are:

- AVInit
- AVServer for Windows
- NFServer

In this manual, we'll also look at other issues related to the operation of an AudioVAULT server including drive ownership, memory expansion, and bandwidth.

AVINIT

This program is responsible for booting the AV100 cards and setting their on-card clocks. In the Win95/98 environments, AVINIT is invoked via the **AUTOEXEC.BAT**. In a WinNT environment, AVINIT is invoked through a batch file called **BootAV.BAT** in the desktop startup group.

AVInit's parameters are commonly located in the [AVINIT] section of the **audiovau.ini**. Parameters can also be specified on the AVInit command line during invocation. Parameters supplied on the command line override those from the INI.

A typical [AVInit] section looks like this:

```
[AVInit]
CodeFile=C:\AUDIOVAU\Pcr.Ram
Defaults=/Load
```

All AV100 cards in a server must be booted at the same time. This is required for correct on-card clock synchronization and SCSI drive-to-AV100 ownership assignments.

AVINIT OPTIONAL PARAMETERS

Parameters may be listed in any order on the command line or in the [AVInit] section. All of options listed below which don't have an equal sign may be used in the Defaults= option such as "Defaults=/Reset/NoMount/Boot". Note that no spaces are allowed between options in the /Defaults= setting. The options are:

/Reset	Reset the boards before trying to boot them. This ensures the on-card processors and field programmable gate arrays start off in a known state. /Reset was specified on factory-built systems for the first 6 to 12 months of the product's introduction, but it is no longer recommended. If not specified, the default is /NoReset.
/NoBoot	This switch prevents loading the ram file (operating system) into the on-card microprocessor (from SCSI disk and PC's disk alike). It is used to read out exception trap data. If not specified, the default is /Boot.
/NoLoad	This switch causes the Loading phase (load PCR.RAM) to be skipped. If not specified, the default is /Load.

/NoWait	This switch allows AVInit to not wait for drive to mount. Instead, AVInit simply issues the mount command to the AV100 card and continues. The /NoWait can speed the overall boot up time of a server. The default, if not specified, is /Wait, which ensures all drives are ready by the time AVServer or NFServer start.
/Close	Close all on-card sessions (client-to-vault connections, and on-card resources such as file handles, iterator handles, etc).
/NoClose	This instructs AVInit.Exe not close any already-existing sessions. If not specified, the default is /Close, which closes open sessions (thus freeing open file handles, iterators, machine handles, etc). The /Close switch was added in AudioVAULT software v5.20, as the virtual device driver is session-based -- if a client applications aborts abnormally its session(s) are left orphaned, possibly resulting in Machine/Track Already In Use. They may be closed via: 1) rebooting the Av100 cards, or 2) AVInit /Close.
/Ports=	This lists the names of the AV100 boards actually resident. For each name, there must be a valid [PORT.xxx] section in AUDIOVAU.INI and WINDOWS must be in the path. Newer AudioVAULT lists local AV100 hardware settings in SYSTEM.INI's [AudioVAULT] section or in the system registry.
/CodeFile=	This is the drive, path, and file name of PCR.RAM. It defaults to "PCR.RAM". In rare cases it may be necessary to use an alternative PCR.RAM file for debugging or for testing. /CodeFile=C:\AUDIOVAU\PCRDB.RAM, for example, allows for the original PCR.RAM file to be unchanged during the test. Always include a fully qualified DOS drive:\path\filename.
/NoMount	
/MountGroup=	This option is only allowed in the [AVInit] section of AUDIOVAU.INI, and allows some drives to not get mounted. <csdgl> is a comma-separated drive group list. The drive number may be the drive's ID (0 - 6, 8 - 14), -1 (all drives), -2 (all drives on the SCSI A bus), or -3 (all drives on the B SCSI bus). <csdlg> defaults to -1 if not specified.
/Configuration=	This switch instructs AVInit.Exe to use an alternative section to [AVInit]. This can be used, for example, to provide a main and a backup boot configuration. If not specified, the default is /Configuration=AVInit.
/?	This switch shows all of the options which AVInit.Exe supports. Most of the switches may be negated by adding "No" just after the slash (i.e., /NoReset).

AVINIT PHASES

When AVInit runs, it performs several different phases:

1. Resetting...
This phase resets the on card MPU, DSP, and Xilinx processors to their initial power up states. This phase is skipped if the AV100 is already in the reset state, unless the /Reset option is used to explicitly force the state.

2. PROM = xxx
This phase simply reads and displays the version of the AV100 boot-up PROM program.

3. Loading...
This phase transfers the codefile (typically PCR.RAM) from the PC's disk to the AV100. PCR.RAM is the card's operating system (MPU program, DSP program, and FPGA configurations). If the AV100 FastBoots, this phase is not displayed. If the /Load command

line option is used (its default, by the way), and if the code file doesn't exist on the SCSI drive(s), then an error is displayed (NO TARGET DEVICE) and the RAM file is downloaded from the PC's disk.

4. Starting...
The Starting phase begins execution of the codefile that was just loaded.

5. RAM = xxx
The RAM phase simply displays the version of the AV100 operating system (codefile) now executing. If the AV100 FastBoots, this phase may not display for every AV100.

6. Setting Time...
This phase sets the AV100 on-card clocks to the server's DOS time. AV100 files are time stamped via their on-card clock.

For OnLINE systems, an NFServer will ensure that all AV100s have the same time reference (for AV100 file time stamping).

7. Initializing...
This phase activates/deactivates shared memory and issues a SCSI probe. The probe results are used to determine ownership of the SCSI storage devices. This phase takes several seconds, as ample time must be allowed for even the slowest SCSI devices to respond to the probe--in effect every AV100 is asking what other SCSI devices are attached to a SCSI bus (disk drives, tape drives, and AV100s alike). The debug console log file shows the following for each AV100:

04:22:46 AVR2: 7 owns device 0
04:22:46 AVR2: 6 owns device 1
04:22:46 AVR2: 5 owns device 8

Note that the AV100s only probe SCSI bus A for other AV100 boards. For this reason there must be a SCSI cable on the A bus, but not necessarily on the B bus.

If an AV100 card stops responding at this phase (7019: AV100 COMMUNICATIONS TIMEOUT), then there is probably a SCSI bus error; check termination, stubs, cable connections, resistor SIP polarity, etc.

8. Mounting Drives...
The "Mounting Drives..." phase will mount the SCSI drives. The duration of this portion is directly related to the number of files, the number of drives, the drive sizes, and the number of AV100 cards. In extreme cases, this phase can take a few minutes (63 gigabyte RAID 5 with 7000 files, for example).

THE AUDIOVAULT HIGH PERFORMANCE FILE SYSTEM

The AudioVAULT High Performance File System (HPFS) was designed and written by Broadcast Electronics, and offers reliability and performance well beyond "standard" file systems. One advantage is that there exists sufficient redundant information on the FS to facilitate recoverability in the event of a failed disk block. This is achieved by keeping critical data in at least two places. For example, every allocation unit on the disk has a header containing:

- Block type (cut, list, directory, etc)
- Previous block # in the file's chain
- Next block # in the file's chain
- File name
- Category
- Duration
- Trim Points
- Description

If the disk's directory were to somehow become damaged it can be regenerated by reading the information stored in the allocation blocks.

The FS uses two allocation unit sizes: 32k bytes and 4k bytes. The larger is used for audio, while the smaller is used for headers, lists, and data files. Those sizes were carefully chosen to minimize disk seeking and fragmentation, and therefore data access time. As the HPFS controls fragmentation, users don't need to defragment AudioVAULT SCSI drives.

AV100 boards have on-card ram buffers for disk caching. They allow large blocks of data to be read with a single SCSI read (or write) command to prevent the boards from having to make many small-sized disk-to-card transfers. This buffering also allows other AV100s to read its blocks while others are playing from cache.

FILE SYSTEM CHECKER (FSCK)

When a drive is first mounted (made available for use) the FS Checker task runs. Its job in life is to validate the integrity of the drive's data and automatically fixes any errors. FSCK runs in phases so that healthy systems are usable quickly from power up. The phases are:

- Check Directory--A quick test which ensures the directory isn't damaged (about 15 seconds/disk). This must complete before the drive is usable.
- Quick file check--Ensure that each file in the directory exists.
- Check all free blocks--Spot check blocks thought to be free.
- Check all blocks--Check every block of every file.
- Full file check--Check every block on the disk (in use, or not).

The FS prevents writing to any file not yet checked, ensuring writing to a damaged file can't cause additional FS damage. If a write is attempted on a file not yet checked then the checker 1) stops where it was, 2) explicitly checks the file, and 3) resumes where it left off. Only then may the file be accessed.

DRIVE OWNERSHIP AND MEMORY EXPANSION

The AudioVAULT HPFS uses "ownership" rules to ensure that a given SCSI drive's data block is not modified by multiple AV100 boards simultaneously. When the server is booted via AVInit the cards ask what devices are on the SCSI busses, and because the AV100 itself is a SCSI device, the cards can learn of each other's existence. Likewise, each card gets a list of attached SCSI drives.

Next, each disk drive is assigned to the "next" card, in round-robin fashion: PCR1 gets a drive, PCR2 gets the next drive, PCR3 gets the next, etc. Once ownership is established, file accesses are performed by first asking the owner card for permission. Once granted, the card that requested access can work directly with the SCSI drive.

For playback, non-owner cards get the file's FFB (first file block) from an owner card, and then accesses the drive directly to play the cut on its own. For recording, the non-owner continuously requests chunks of free blocks from the owner. Once it has a list of blocks, the non-owner then writes to those blocks. At the end of the record, the non-owner reports "returns" to the owner card the allocated blocks that were not used.

Card-to-drive assignments can be viewed in the debug console log file; each AV100 reports something like:

```
04:22:46 AVR2: 7 owns device 0
04:22:46 AVR2: 6 owns device 1
04:22:46 AVR2: 5 owns device 8
04:22:46 AVR2: 7 owns device 9
```

The round-robin assignments also help distribute the overhead of a managing a drive. Also, the drive's directory is cached into the owner card's RAM. The directory is loaded from SCSI drive to on-card RAM when the drive is mounted.

OWNERSHIP AND SCSI TAPE MACHINES

SCSI Tape drives are not "owned" by any single card, which means that SCSI tape machines have no impact disk-to card ownership.

AV100 MEMORY EXPANSION CARDS

Optional Memory Expansion cards piggyback to a Revision 5 AV100 card to increase the total on card RAM by 4MB (BE part number 904-9203) or 12 MB (BE part number 904-9204), while the base AV100 has 4MB itself.

The extra RAM is used to hold large SCSI drive's directories. Whether additional memory is needed depends on the number of disk drives, the size of the drives, and the number of AV100 (main) boards in the server as well as the version of AudioVAULT software in use. Memory Expansion cards are held in place with two 2-56x3/4" nylon screws, nylon hex nuts, and 1/4" round spacers, or nylon stand-offs. PC-style SIMM packages are incompatible and may not be substituted.

HOW MUCH ON-CARD MEMORY DO I NEED?

Non-owner cards do NOT require additional memory. Only owner cards store their disk's directories in on card RAM. Every owner card that exceeds the specified number of files for the base RAM requires a memory expansion board.

There are two on-card in-RAM file system data structures:

1) A "disk block in use bit", which requires 30.5K bytes of RAM per gigabyte of disk space.
2) The SCSI disk's directory, which uses about 250 bytes per file.

For NFServer systems, there are always a number of delete records, each taking another 120 bytes. Therefore NFServer systems have an effective directory entry size of about 300 bytes per user file--an average considering that there are about one third as many delete record files as there are user files. Although the number of files per gigabyte of disk space will vary based on stereo/mono, compression ratio, sample rate, and file length, a good rule-of-thumb is 1000 user files per gigabyte. So the RAM space required for non-NFServer systems is:

$$\frac{(30{,}500\text{ bytes})}{(\text{GB disk space})} + \frac{(1000\text{ user files})}{(\text{GB disk space})} * \frac{(250\text{ bytes})}{(\text{file})}$$

which reduces down to about:

$$\frac{(150{,}000\text{ bytes})}{(\text{GB disk space})}$$

The RAM space required for NFServer systems is about:

$$\frac{(30{,}500\text{ bytes})}{(\text{GB disk space})} + \frac{(1000\text{ user files})}{(\text{GB disk space})} * \frac{(250\text{ bytes})}{(\text{file})}$$

which reduces down to about:

$$\frac{(230{,}000\text{ bytes})}{(\text{GB disk space})}$$

Music libraries tend to use less RAM because the files are larger-than-average (3 to 4 minutes)--there may be only 300 files per GB of disk space. On the other hand, there are systems which use higher-than normal compression and/or mono, or have many short files (i.e., time announce libraries) that require a 4MB RAM expansion board with only 1 or 2 GB of disk space. Again, these are only estimates--actual mileage may vary. The best calculations use the number of customer files, but because that is often unknown or difficult to estimate these per gigabyte estimates are used.

RUNNING OUT OF ON-CARD RAM

If the AV100 runs out of RAM, the card will "exception trap". This basically shuts down all on-card operations, which prevents accidental file system damage. A safe "lower limit" is about 1,000,000 bytes free per AV100. The amount of free RAM may be displayed via the Debug Console, and is logged daily in the Daily Dump in the Console Log.

AUDIOVAULT STORAGE SIZE LIMITATIONS

SCSI itself is good for terabytes. But due to AV100's directory mechanism, terabytes would never work with AV. Remember that a given AV100 card owns each SCSI DRIVE (or RAID), and that the card is responsible for storing the disk's directory for speedy searches.

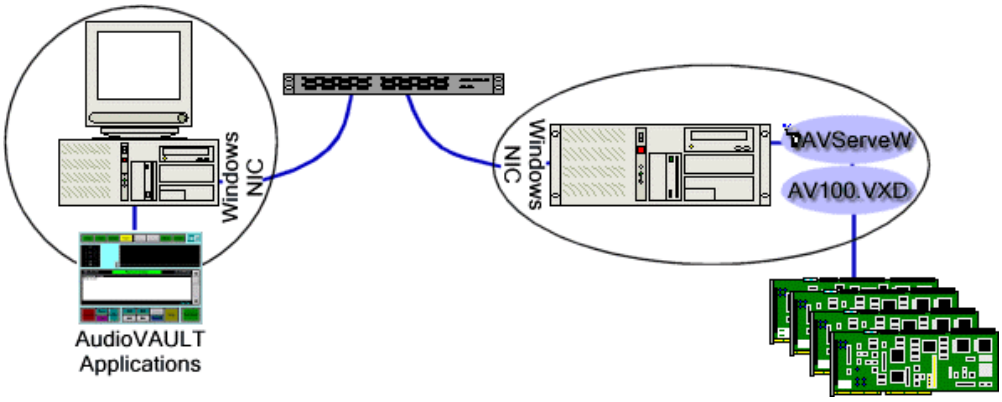
Because the largest AV100 memory card is 12MB, and because each file (and a possibly existing rename/delete NFServer record) is about 200 bytes, you are limited to a directory of about 24000 entries. Also if the disk is "too" big the file system checker will take FOREVER to complete, which is certainly not going to work well long term.

Taking all that into account, any one Av100's storage capacity is limited to about 70 to 100 gigabytes, depending on Sample Rate and Compression Ratio.

AVSERVER FOR WINDOWS

Simply put, AVServer for Windows allows workstations to access AV100 cards over a network.

AVServeW uses the AV100 Virtual Device Driver (AV100.VXD) to communicate with the local AV100 cards.

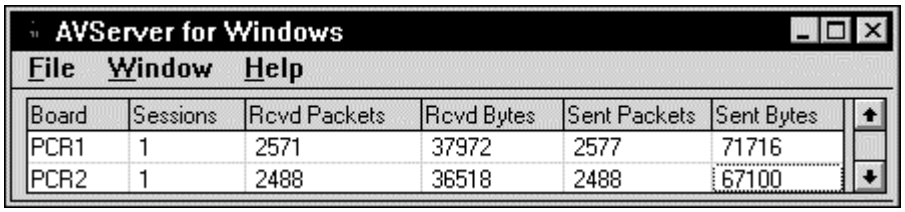


AVServeW is the component that takes AudioVAULT commands received over the network, creates sessions with AudioVAULT cards, and passes the commands to the respective AV100 cards.

AudioVAULT applications including AUDIOVAU, AVFixUp, and AVMaint can also talk to the cards through the Device Driver as long as those applications are running on the same machine that holds the AV100 cards. AVServer for Windows is supported under Win95, Win98 and WinNT.

AVSERVEW USER INTERFACE

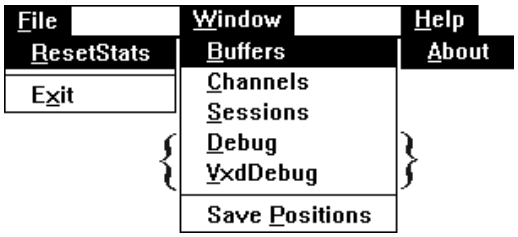
The grid shows general information relating to the amount of network activity for each local AV100. Statistics are refreshed every few seconds. The fields are:



Board	The network name of the local AV100
Sessions	The current number of network connections to that AV100
Rcvd Packets	The number of network packets that have been received by AVServer for Windows (sent by Client Applications, and forwarded to the respective local AV100) since AVServer for Windows was started (or since the last ResetStats)
Rcvd Bytes	The number of 8-bit bytes constituting Rcvd Packets
Sent Packets	The number of network packets that have been returned by AVServer for Windows to the Client Applications since AVServer for Windows was started (or since the last ResetStats).
Sent Bytes	The number of 8-bit bytes constituting Sent Packets

AVSERVEW MENU

The menu allows access to viewing diagnostics, exiting the program, and viewing on-line help.



ResetStats	Selecting this option resets the running statistics back to 0. It can be used when measuring traffic (ResetStats, wait for 60 seconds, and view the number of packets processed during that period of time) or when the on-screen statistics grow ridiculously large. Use of ResetStats is not required.
Exit	Exits AVServer for Windows. If there are any network sessions open, a Shutdown Dialog can be configured.
Buffers	Displays the Buffer Status Window.
Channels	Displays the Channel Status Window.
Sessions	Displays the Session Status Window.
Debug	Displays the Debug Window. This Menu Item is visible only if [AVServeW] Debug=1 or greater.
VxdDebug	Displays the Virtual Device Driver Debug Window. This Menu Item is visible only if [AVServeW] Debug=1 or greater.
Save Positions	Saves the top and left position of the windows for subsequent restarts.
About	Shows the software version of AVServer for Windows and of the AV100 Virtual Device Driver/VXD.

AVSERVEW CONFIGURATION

Default AVServer for Windows parameters are setup when the AudioVAULT Software Suite is installed, so modifications are rarely required.

AVSERVEW TROUBLESHOOTING TIPS

If you see an error message that says "**Could not initialize port <Vault#>**," here are some avenues to explore:

- It might be that AVServeW could not register the name on the network. Ideally, NetBEUI should be the only protocol on the computer. If another protocol is installed (TCP/IP for AVExplorer, for example) make sure NetBEUI is the default protocol (LANA 0). Go to:

  My Computer I Control Panel I Network I NetBEUI Properties I Advanced

  Check "Set this protocol to the default protocol."

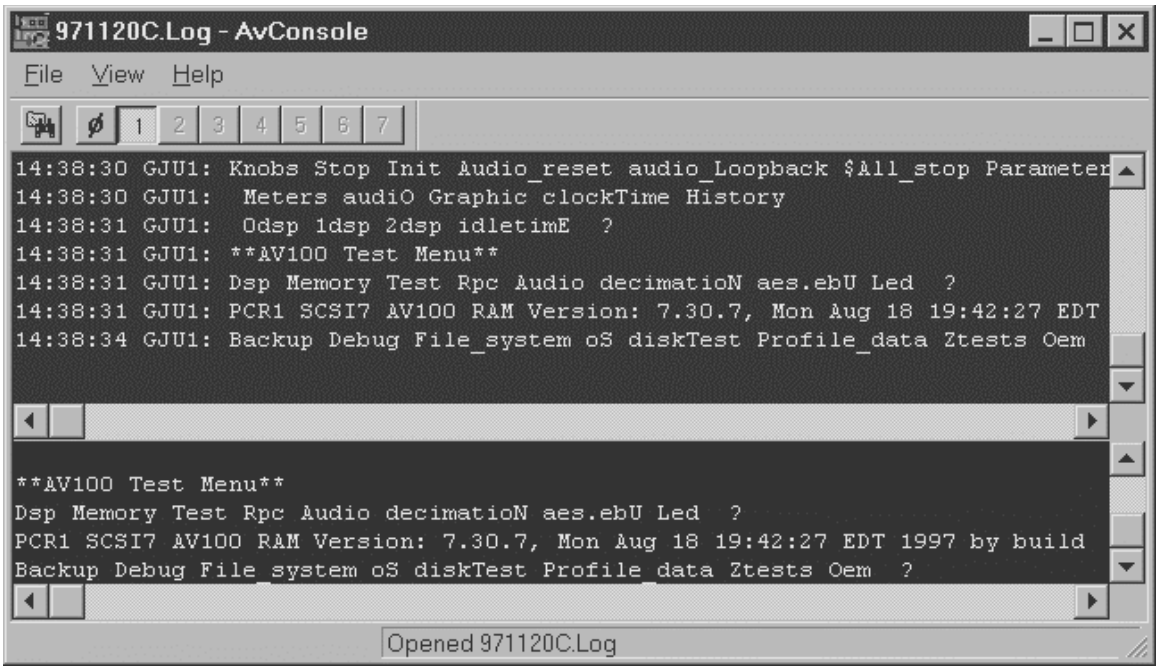
- This error will pop up if ports are missing from the system.ini file.

- Make sure the Virtual Device Driver (AV100.VXD) is loaded. The [386enh] section of the SYSTEM.INI file must contain "Device=c:\audiovau\AV100.VXD"

- Make sure the reference AV100 card is booted and working properly. Check for IRQ and/or Shared Memory conflicts.

AVCONSOLE FOR WINDOWS

AVConsole is the application responsible for logging AV100 Card and SCSI bus activity. AVConsole also provides a means of accessing each AV100 card's SCSI controller, allowing you to perform tasks like DAT Backup, Drive maintenance, and Disk-To-Disk copies.



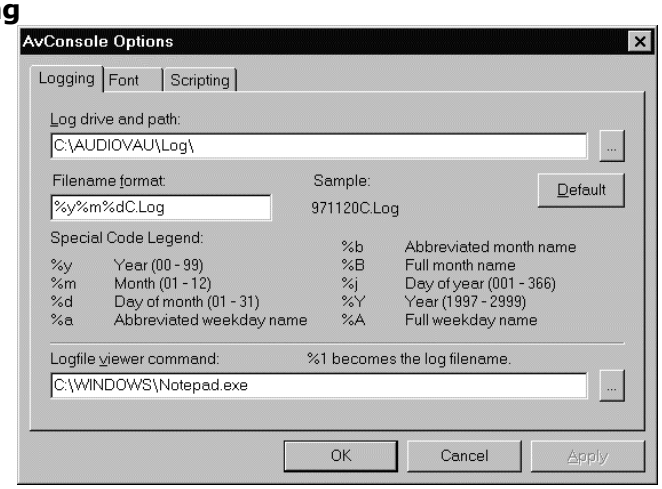
- 32-bit/multi-threaded for efficient CPU usage and responsiveness.
- 25 lines of scroll-back buffer for each AV100 and for the combined view.
- Logs are opened with share access -- you can copy logs with AVConsole running.
- VIEW TODAY'S button instantly pops the current log into PFE32.
- Built-in configuration dialog sporting logging, ports, font, and startup scripting -- no hand editing of INI files.
- Persistent data stored in registry, including window size, position, etc.
- Automatically detects local Ports list from either the registry or SYSTEM.INI.
- Reasonable defaults for all settings -- will run right "out of the box". The application even automatically creates the log file path if needed.
- Built-in startup script editor.
- Can run on any PC on the LAN -- you no longer have to run AVConsole on the Server.

AVCONSOLE TOOLBAR

- The icon with a folder & binoculars will pop today's daily log into PFE32, or an alternate viewer you have specified. (The icon is disabled if the viewer is blank on the Options-Logging dialog.)
- The 0/NIL icon closes the active AV100 console.
- The 1 - 7 icons open the corresponding AV100 console. Icons for non-existing AV100 cards are disabled. Icons for non-operational AV100 ports are disabled.

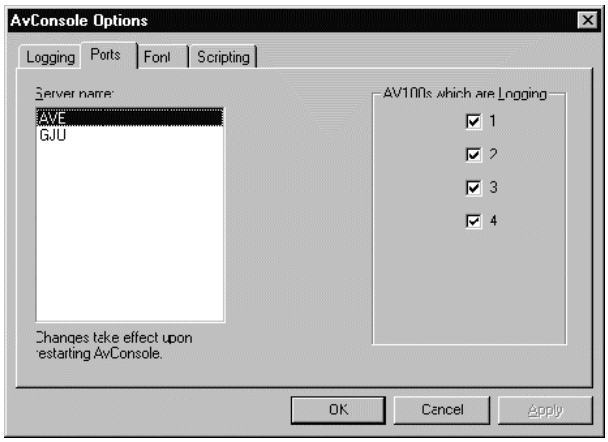
AVCONSOLE OPTIONS DIALOGS

View-Options-Logging



Log drive and path	The drive and path for the daily log files. A local hard drive is recommend so that a downed network won't stop AvConsole's logging function. The ... button lets you browse for a folder.
Filename format	This defines the log file name. You must use date percent codes if the logs are to be named uniquely for each day. The default is %y%m%dC.Log, where %y is the 2-digit year, %m is the 2-digit month-of-the-year, and %d is the 2-digit day-of-the-month.
Sample:	This shows how the currently defined Filename format will appear. It is updated when you change the format.
Default	This button configures the drive/path and filename format to Broadcast Electronics' default.
Special Code Legend:	This lists common percent codes that can be used in the Filename format field.
Log file viewer command:, ...	This specifies the name of the application to use for viewing today's log file, and defaults to C:\AUDIOVAU\PFE32.EXE. By default the day's log name is appended onto the end before launching the viewer. Alternatively, you can embed %1 in the viewer command; %1 will be replaced with the full log path/filename when the viewer is launched.

View-Options-Ports

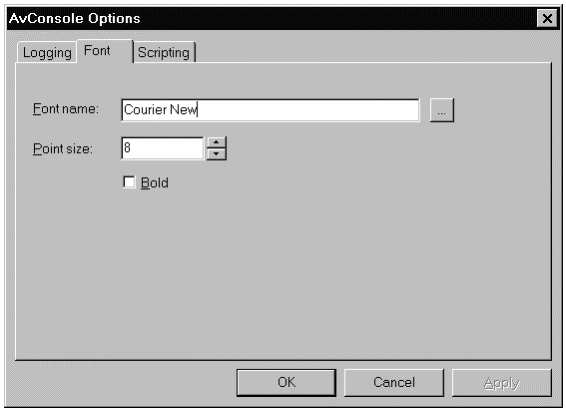


Server Name:	This list shows all configured vaults on the PC; these have one or more [Vault.xxx] sections in AUDIOVAU.INI and contain Type=AV100 and Port=xxxx. If not previously selected, the local PC's name is the default selection (if there are local AV100s).
AV100s which are Logging	There is one check box for each port that is configured on the PC (per the above rule). If checked, that AV100's console output goes to the blue/combined view and to the log file. Otherwise, the output simply goes to that port's view (black window on the bottom).

Usually you want all ports to log (which is the default), but if a board is down for maintenance or it is reporting the same message over and over, you may want to temporarily disable that port's logging.

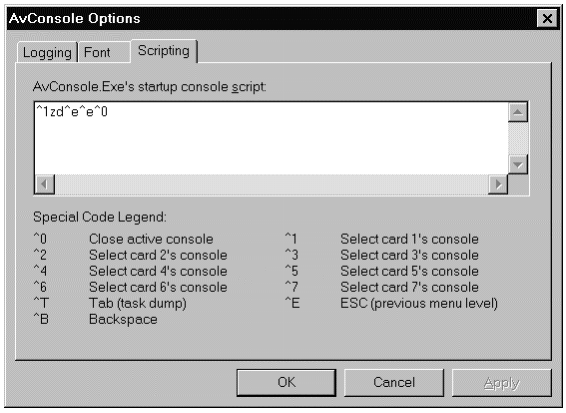
If a port is designated to NOT log, each day's log file starts with a note to that effect as a reminder. Changes take effect upon click "OK." Regardless of the logging state, the port's console (SCSI Controller) is available for use.

View-Options-Font



Font name:, …	The name of the font used in the blue/black console views. The ... button shows the common font chooser dialog. The chooser only lists fixed-pitch non-italic fonts.
Point size:	The size of the font used on the blue/black console views. Some non-native/stock point sizes don't appear correctly.
Bold	The weight of the font used on the blue/black terminal views.

View-Options-Scripting



AvConsole.Exe's startup console script	This script is a list of console commands to issue when AVConsole is started.
Special Code Legend:	This lists the special codes supported by the script.

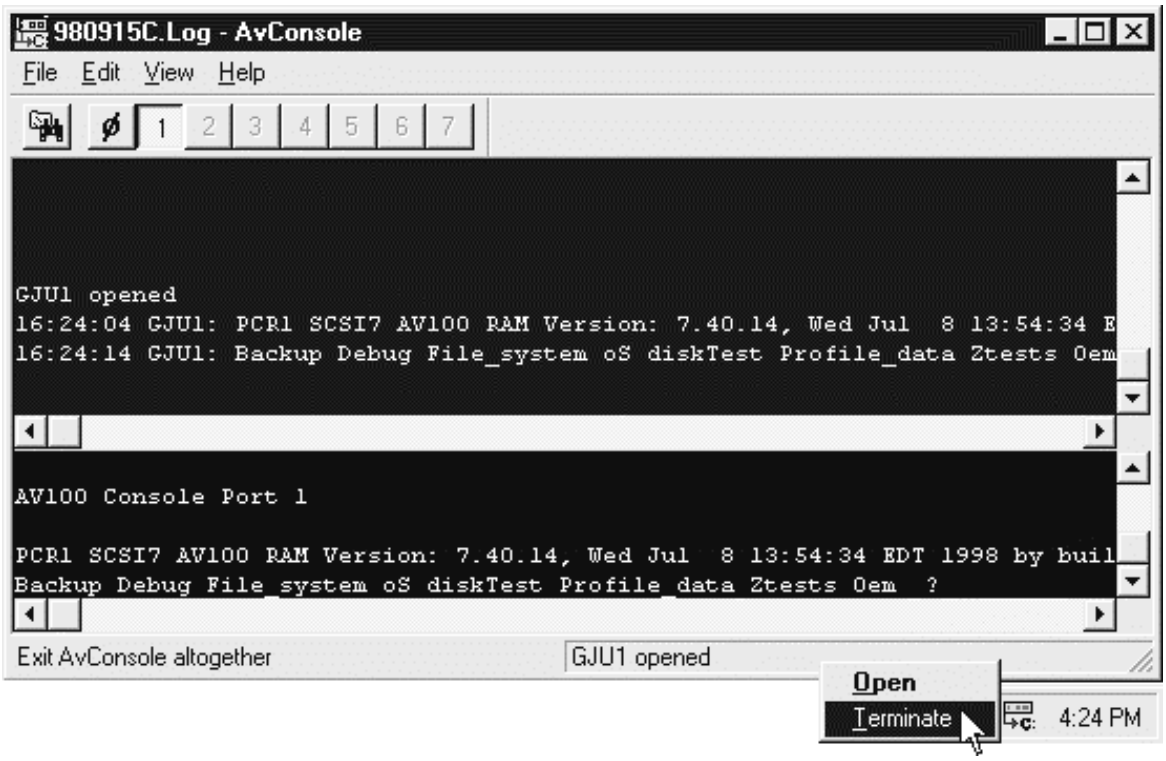
Startup Scripting could be used for example, to increase the AV100's debug level when trying to resolve field problems. The script function is also used by Broadcast Electronics automated SCSI disk test procedure. The beginning of the script must connect to a console before issuing commands (using A1 - A7), while the end of the script should disconnect the active console (using A0). The script has no length limit, but is generally kept to 10 or 20 characters.

AVCONSOLE APPLICATION INSTANCES

Currently, only one instance of AVConsole may be running at a given time per AudioVAULT server.

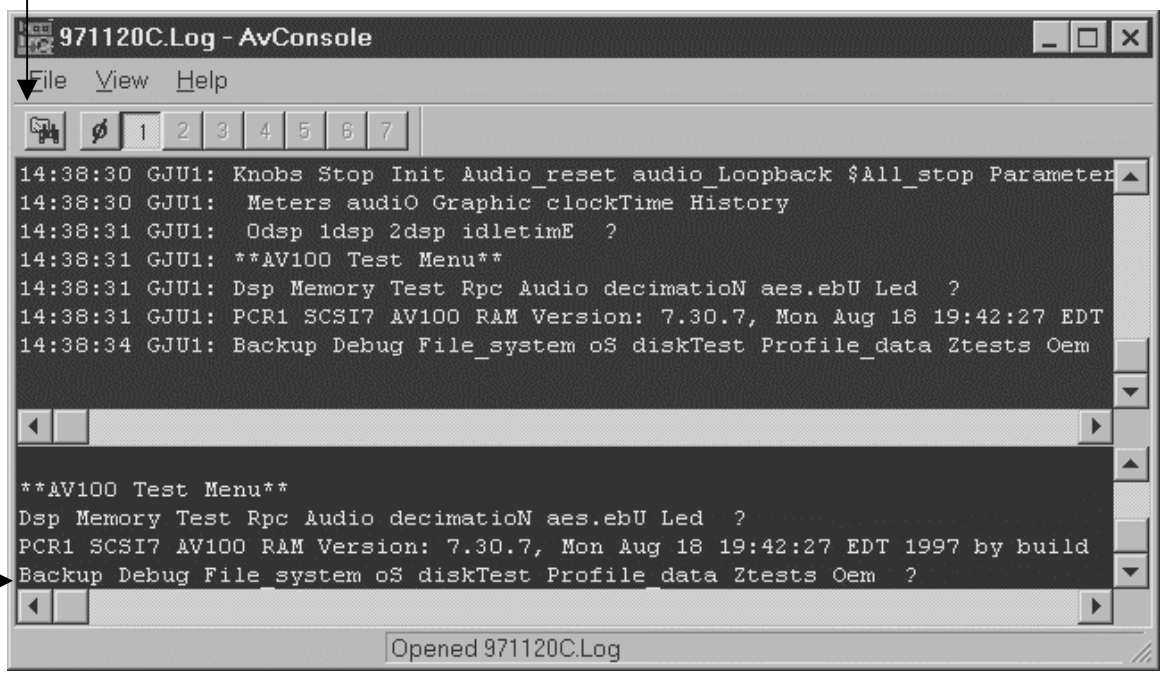
SHUTTING DOWN AVCONSOLE

Each AVConsole instance adds an icon to the system tool tray. This is used to show the application after it has been "closed' (tool tray iconized). Double click the icon to open/show AVConsole, or right-click the icon and select "Terminate" to close AVConsole.



COMMON AVCONSOLE TASKS

The common tasks that are performed with AVConsole apply to either the AV100 card itself or your SCSI drives. To perform these tasks, you have to specify an AV100 card by clicking on one of the toolbar buttons.



Once you select a card (or port), hit the "/" key to bring up the AVConsole menu. Select a menu option by typing the capitalized letter. ESC will back up a level.

AVCONSOLE MENU OPTIONS

Backup

Abort	Stop processing the current SCSI tape command. If the tape was being written to, all tape data is probably lost/corrupt.
de**B**ug	Enter the Debug menu.
Create	Start backing up the file to tape.
Directory	Show the tape's directory partition.
Eject_mag	Eject the magazine of the SCSI tape changed, if present.
Format	Create the directory's partition on the tape.
Restore	Actually restore the file from tape to disk.
Unload_tape	Pop the tape out of the tape machine, if present.

Debug

reset_**A**	Reset the A SCSI bus.
reset_**B**	Reset the B SCSI bus.
Close_session	Close the specified client session. Specifying "0" closes ALL sessions, and all files open on that vault.
Dump_scsi	Show the last few SCSI commands issued by this AV100 to a disk, tape, or AV100 device.

rr_m**E**nu	Change the debug console's menu processing to round-robin.
lo**G**_sense	Read SCSI log data from the specified SCSI device. A programmer's manual for that device is probably needed to decode the displayed data.
Handle_info	Display information about the specified file handle.
Iterate_test	Scan for AudioVAULT files with wildcard and attribute filtering.
debug_**L**evel	Enable/disable various debugging modes.
mode_se**N**se	Read SCSI mode data from the specified SCSI device.
Open_file_handles	Show what file handles are currently in use.
menu_**P**riority	Toggles the debug console's menu between high- and low-priority processing. Use TAB to display current priority (low=bottom of task dump, high=top of task dump).
Sessions	Show what sessions currently exist.
Tape	Enter the SCSI DAT diagnostics menu.
Rpc_debug	Enter the Remote Procedure Call Debug Menu.

File_system

Create	Create an AudioVAULT file system on the specified SCSI disk.
Fsck	Stop the file system checker right now. It may take a minute to actually stop checking.
Mount	Mount the specified SCSI drive, if not yet mounted. It takes a few minutes to initiate.
u**N**mount	Unmount the specified SCSI drive, if not yet unmounted.
mount_**A**ll	Mount all unmounted SCSI disk drives.
Unmount_all	Unmount all mounted SCSI drives.
Info	Display information about the specified SCSI drive, such as capacity.
f**O**rmat_status	Show how far along the SCSI disk format is.
Pack_directory	Squeeze the empty spaces (deleted files) from the directory. The freed-up disk blocks will later be found by the file system checker, and moved to the free list.
Disable_full_check	If issued before mounting the specified SCSI drive, the file system checker skips the last phase of the check. Also, no file system repairs are made.
Sync	Enter the SYNC sub-menu
Remove_directory	Delete the directory of files on the specified unmounted SCSI disk. When the drive is next mounted the file system check will find the file headers and reconstruct the directory (that part may take many hours for a big/full disk).
forma**T**_disk	Low level format the SCSI disk. Do not interrupt the format once started, or the drive will report a capacity of 0 until re-formatted.
Block_info	Show low-level file system header information about the specified disk block (and specified disk drive).
dis**K**_copy	Copy the specified source SCSI disk to the specified destination disk, both starting at block 0 and incrementing until the end of either is reached. The destination must be unmounted. If source disk's capacity is bigger, data is lost. If the source disk's capacity is smaller, then create a

	file system on the destination disk before the disk-to-disk copy.
d**E**lete_files	Delete the specified files from the AudioVAULT file system. This *is* case-sensitive. Wildcards are supported.
List_files	Display files. Wildcards are supported. This *is* case-sensitive.
re**Z**ero_params	Instruct the SCSI drive to perform a thermal recalibration periodically, or when the SCSI buss if idle.
toggle_**W**rite	Make the specified disk drive read-only. This is always disabled upon card bootup.
X_free_list_info	Show what blocks are free/unused on the specified SCSI drive.
G_bus_timeout	Define an AMD SCSI CONTROLLER DEFECT timeout. Some AMD controllers with some combination of SCSI drives timeout; this s/w works around that issue.

o**S**

Used by development only. No practical field applications.

disk**T**est

Used by development only. No practical field applications.

Profile_data

Used by development only. No practical field applications.

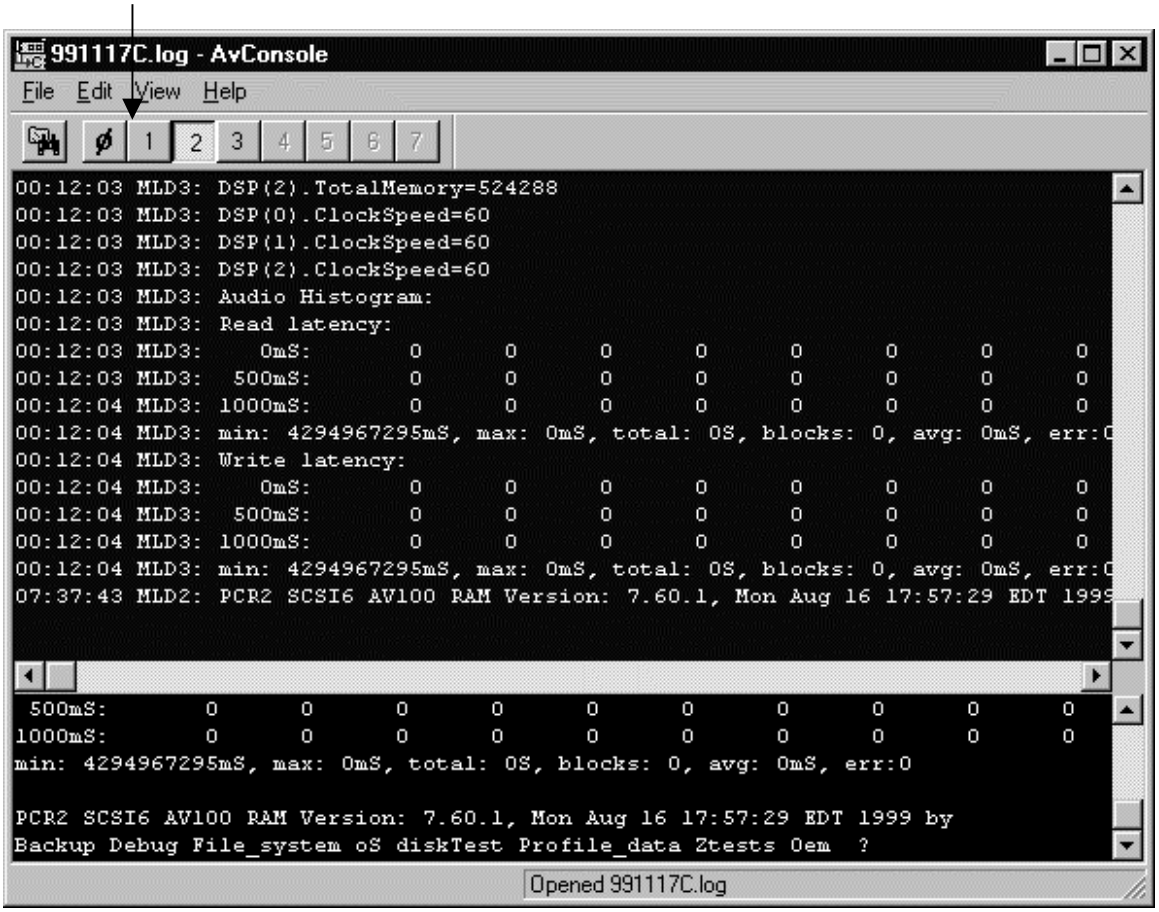
Ztests

Used by development only. No practical field applications.

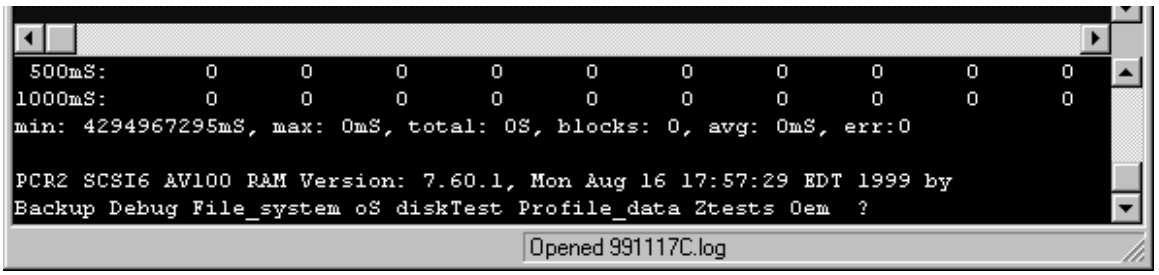
CARD SESSION DUMP/CLOSING A SPECIFIED SESSION

Sometimes, a session gets "locked" open, resulting in errors like "Machine Track Already in Use." Recovery options include rebooting the server, exiting and restarting AVServeW, or simply closing the specific session that is locked open.

1. Go to the server hosting the locked card. For example, if the production screen attached to MLD21 is reporting the error, go to the MLD server's Debug console.
2. Open MLD21 by clicking on the "2" on the toolbar.

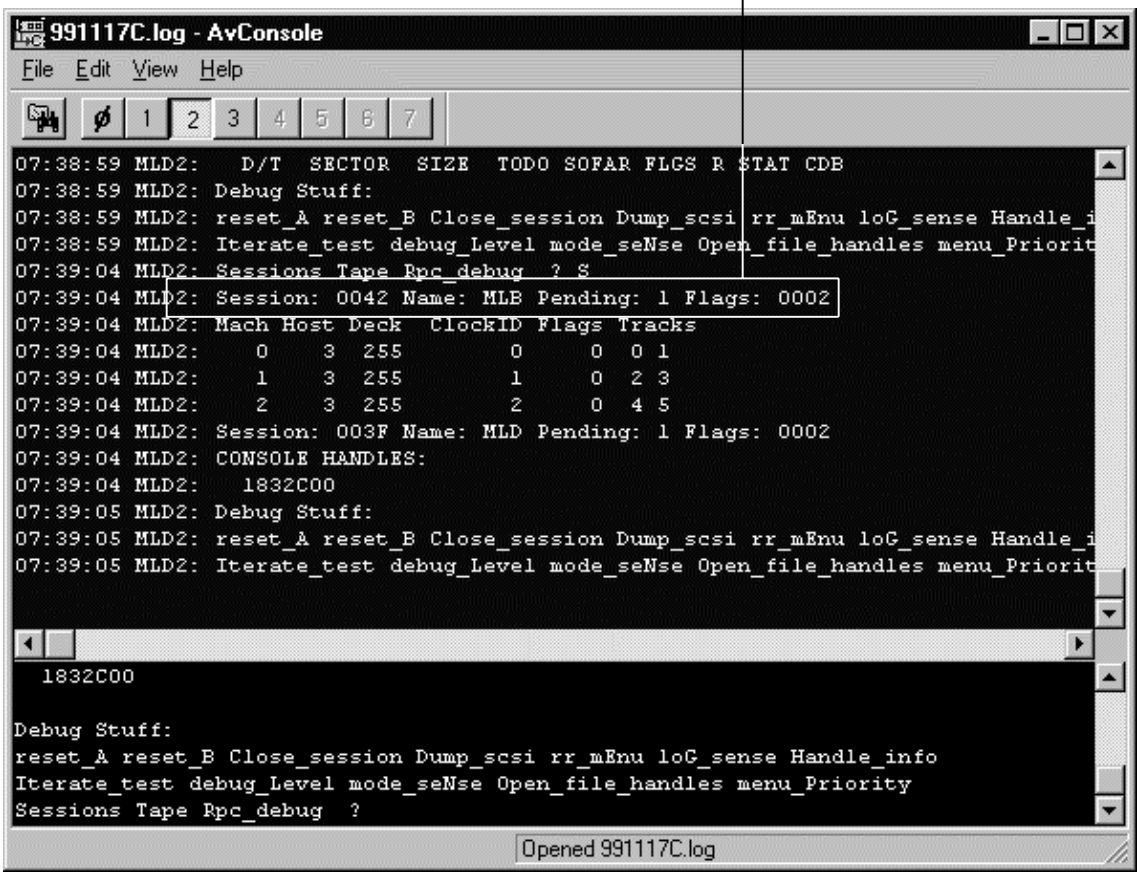


3. Hit the "/" key on the keyboard. This will open the main menu.

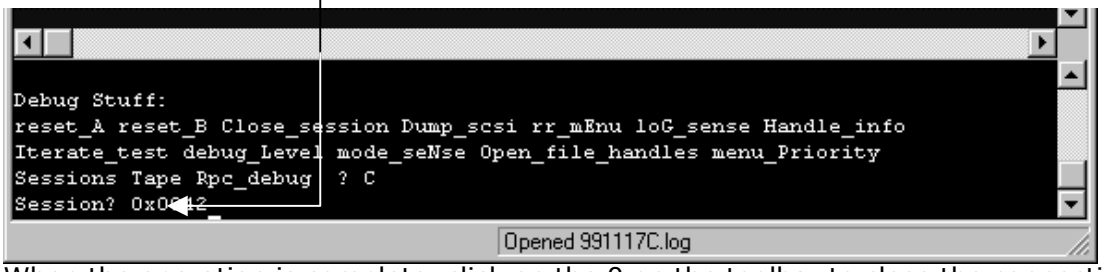


4. Hit the "D" on the keyboard. This will open the Debug menu.

5. Hit the "S" on the keyboard to get a list of open Sessions. In addition to the Session number, they will list the HostName of the machine that established the Session. One of them will be our errant Production room.



6. In this example, MLB has opened a Session called 0042. Doing a little detective work, I've discovered this is the one that should be closed. To close that Session, hit "C" on the key to **C**lose_session.
7. When the screen prompts you for the Session number, type 0x followed by the four character Session number. That's ZERO followed by a little "x" and the four character Session number. Hit "Enter" to close the session.



8. When the operation is complete, click on the 0 on the toolbar to close the connection to the card.

DISK-TO-DISK COPY

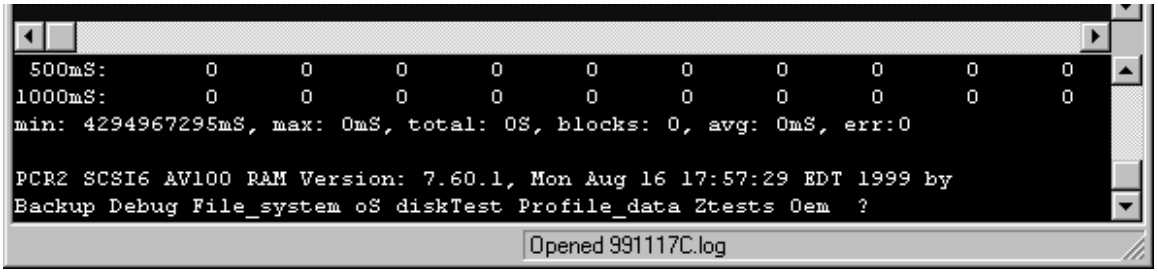
1. Prepare the new drive for installation, double checking termination and SCSI ID. Remember that this drive will have to co-exist in the system with the existing hardware.
2. In the server's AUDIOVAU.INI, find the [AVINIT] section. On the Defaults= line, add a /NoMount switch.

```
[AVInit]
CodeFile=C:\AUDIOVAU\Pcr.Ram
Defaults=/Load/NoMount
```

3. Shut down server applications and shut down the server. Power down the SCSI Drive Chassis as well.
4. Install the new drive.
5. Double check to make sure all connectors are seated and all cables are snug.
6. Power up the drive chassis and then the server. It should go through the boot process normally, except NO DRIVES WILL MOUNT.

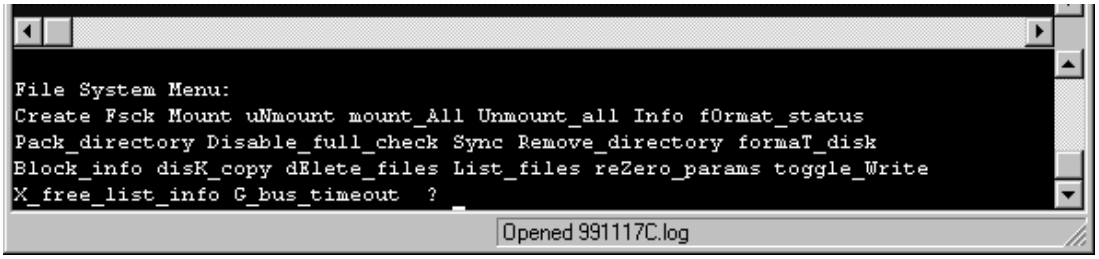
If the system hangs during the INITIALIZATION phase, there's probably a cable or termination problem. Both ends of the SCSI bus should be terminated...with the 2 sets of terminating resistors on the AV100 card at one end of the cable, and by the drive jumpers on the other end of the cable. Power everything down and double-check the SCSI ID of the new drive, the termination settings on the new drive, and reseat all cable connections.

7. Go into AVMaint and attach to a Vault. Click on DISK, then FORMAT. On the left-hand side of the screen, you should see a list of drives. You should see all of the drives listed by SCSI ID.
8. One by one, highlight the old drives and click the MOUNT button. Mount all drives except the replacement drive. At this point, all files are accessible and the studios can access inventory as normal.
9. At the server's DEBUG console, attach to a card. Type "/" to get the main menu.



10. Type "F" to get to the **F**ile_system menu.

11. Type "K" to perform a dis**K**_copy.



12. Enter the SCSI ID of the Source Device and hit ENTER.
13. Enter the SCSI ID of the Destination Device and hit ENTER.
14. You'll see activity on both drives as the copy progresses. Once the activity on the new drive stops, you're done! Expect this to take several hours.
15. While the copy is being performed, remove the /NoMount switch from the INI. After the copy is complete, remove the old drive, reassign SCSI ID's and adjust Termination as necessary. Reconnect all cables and reboot the server.

If your Source Device is smaller in capacity than the Destination Device, the File System Checker will have to adjust the free list. Until that process is complete, the Destination Device will act as if it is of the smaller capacity. For example, if you copy a 4gig drive to a 36gig drive, the 36gig will appear to the system as a 4gig drive until the FSCK completes rewriting the free list.

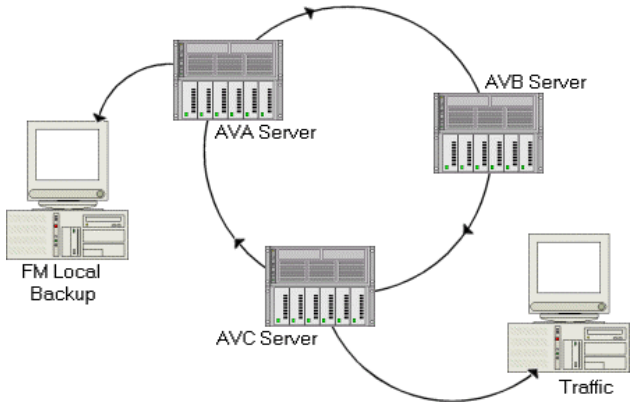
NETWORK FILE SERVER

NFS, or Network File Server is the application that copies files over the Ethernet network to other storage volumes. Network file transfer in an AudioVAULT system network is achieved by the NFServer program, which runs on one or more computers on the network. Each NFServer program is responsible for copying and deleting files between itself and other AV100 servers based on parameters in each NFServer's AUDIOVAU.INI file, the Class property of the file being transferred, and the file's TLM (Time Last Modified) information.

Through NFS, system configurations can be easily derived to suit any customer's application. NFS system components are modular so that configurations and scaling are nearly unlimited.

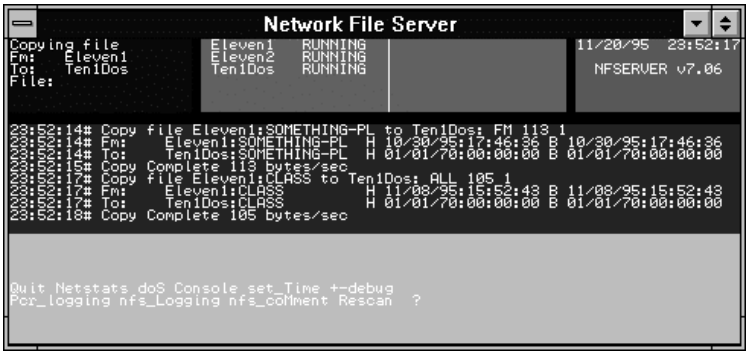
A *server* is defined as a computer that provides storage for AudioVAULT files. NFS gains access to AudioVAULT inventory by an Ethernet connection between servers.

In AV100 systems, NFS gains access to the dedicated SCSI drives through an AV100 card. NFS establishes a session through AVServer and uses the SCSI controller on the AV100 card to access the file system and its inventory.



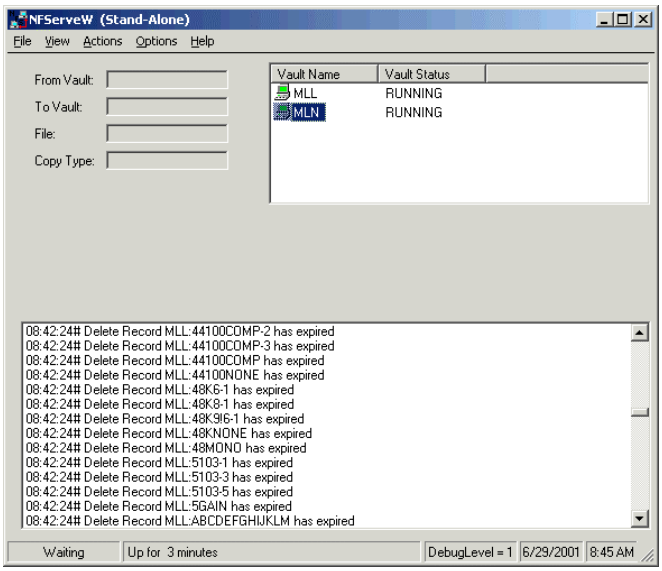
NFS--USER INTERFACE

The user interface for NFServer consists of a set of screen windows displaying the status and activity of the system. Pre-8.x AudioVAULT versions also included a simple command pane, allowing users to type single letter commands to control the display windows, shell out to DOS and terminate NFServer.



Area	Purpose
Upper Left	Action pane with Vault and File information. Regarding file transfers, **To** is the destination server, while **Fm** is the source server.
Upper Center	Vault status panes. This shows the status of Vaults in the NFServer Scan List or Time Export List.
Upper Right	Time and program version pane.
Middle	NFS log pane.
Lower	NFS command input pane.

With version 8.x, NFS was re-written as the 32-bit NFServeW (NFServer for Windows.) In addition to being completely new under the hood, the user interface looks more like a Windows application.



Area	Purpose
Upper Left	Vault and File information. Regarding file transfers, **To** is the destination server, while **From** is the source server.
Upper Right	Vault status panes. This shows the status of Vaults in the NFServer Scan List or Time Export List.
Lower	NFS activity log pane.

DETERMINING WHICH FILES COPY

NFS maintains synchronous volumes by comparing directories and looking for new information. When NFS finds a new file, it checks a series of rules to determine what action to take. There are two primary factors that determine whether a file is copied: the file's class property and when the file was created or modified.

When a new file is encountered, NFS first checks to see if it should have the file. It checks its local directory to see if a file of the same name exists. If no file exists on the local machine, it checks the file's class property. It validates the file's class against the copy rules defined in the local machine's **audiovau.ini** file.

If a file exists locally with the same name, NFS compares that local file to the file on the other server to see which one is newer, or most recently modified. If the local file is newer, NFS ignores the other file. If the file on the other server has a more recent modified time, it next looks at class and copy rules.

CLASS AND COPY RULES

When a file is created, it is given a class, which determines how the file should be propagated on an NFS-equipped system. The classes are user definable, and may be something like **AM**, **FM**, or **ALL**. AudioVAULT makes it possible to associate a class with each category so that selecting the category automatically sets a default class. Each file may belong to only one class. There are two fundamental philosophies of class names:

- File type (COM, MUS, and ALL)
- Destination server or server-group (AM, FM, and ALL)

Each AudioVAULT system should use one or the other, but to use both may lead to confusion down the road. **A given system should have no more than about 10 classes** to reduce confusion. If your configuration has more, you should consider rethinking the system's class naming scheme.

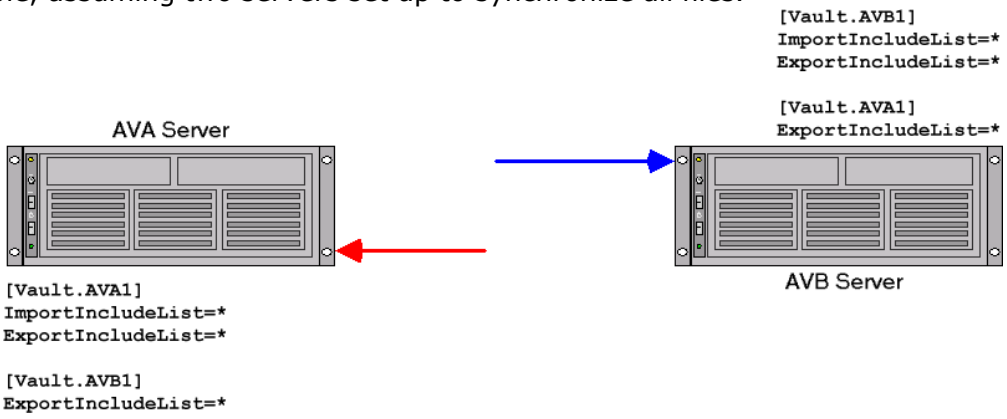
DEFINING CLASSES TO COPY

For a file to transfer, its class must be included in the destination server's **ImportIncludeList** statement **and** the **ExportIncludeList** statement of the source server. These statements either contain a comma-separated list of classes that can be copied or a wildcard like *****.

Entry	Action
Missing ImportIncludeList	Import nothing
ImportIncludeList=	Import nothing
ImportIncludeList=*	Import everything
ImportIncludeList=<list>	Specified classes

Missing ExportIncludeList	Export nothing
ExportIncludeList=	Export nothing
ExportIncludeList=*	Export everything
ExportIncludeList=<list>	Specified classes

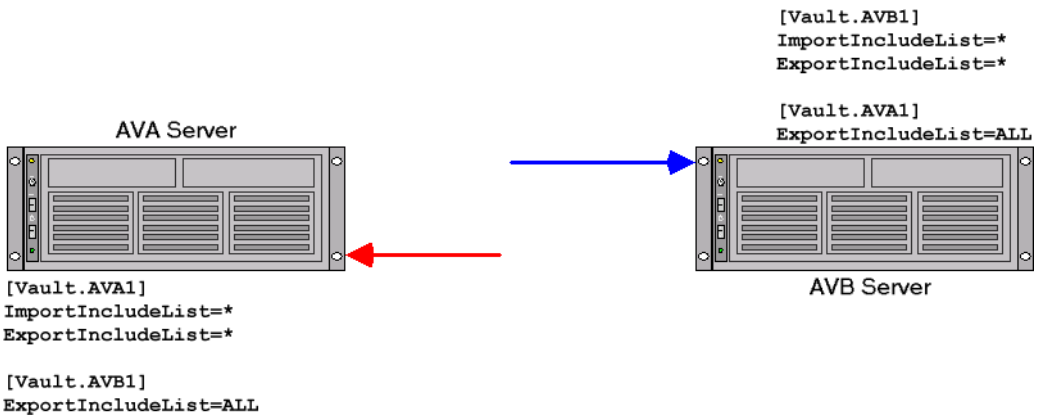
For example, assuming two servers set up to synchronize all files.



When the NFS running on the AVA server encounters a new file on AVB, it checks to see if it **should** have it by checking for local files of the same name and comparing modified time information. If it should have the file, it checks the copy rules to see if it **can** have it. NFS looks in its **audiovau.ini** file, and sees that it can **import any** class and **export any** class. It then looks in its local audiovau.ini file to see what AVB is allowed to do. In this example, AVA sees that AVB can **export any** class. Based on the copy rules shown above, AVA can copy any class from AVB to itself, but cannot copy any files to AVB.

The AVB server also has copy rules in its local **audiovau.ini** file, and goes through the same process when it encounters a new file. In this example, AVB sees that AVA can **export any** class. Based on the copy rules shown above, AVB can copy any class from AVA to itself, but cannot copy any files to AVA.

If we only wanted to synchronize **some** files, but not all files, we could define our copy rules a little differently.



When the NFS running on the AVA server encounters a new file on AVB, it checks to see if it **should** have it by checking for local files of the same name and comparing modified time information. If it should have the file, it checks the copy rules to see if it **can** have it. NFS looks in its **audiovau.ini** file, and sees that it can **import any** class and **export any** class. It then looks in its local audiovau.ini file to see what AVB is allowed to do. In this example, AVA sees that AVB can **export only** files with a class of **ALL**. Based on the copy rules shown above, AVA can copy only files with a class of **ALL** from AVB to itself, but cannot copy any files to AVB.

The AVB server also has copy rules in its local **audiovau.ini** file, and goes through the same process when it encounters a new file. In this example, AVB sees that AVA can **export only** files with a class of **ALL**. Based on the copy rules shown above, AVB can copy only files with a class of **ALL** from AVA to itself, but cannot copy any files to AVA.

THE EXCEPTION TO THE RULE

NFServer promotes a **flat file system** concept across the network.

Existing files with identical names will be updated regardless of copy rules. This ensures that a file with a given name is the same everywhere it occurs. **SyncAllFiles=NO** overrides this behavior.

DELETIONS

NFS only scans directories for new files. So what happens when we delete a file? If NFS is only looking for additions, how does it see a deletion?

When a file is deleted from a server, a new file is created called a **delete record**. Delete records have the same class information as the original file, and are recognized and copied by NFS. When a new delete record is copied over, the file is immediately removed from the directory, and then its data blocks are zeroed out by a background **deleter task**. Delete records exist on a server for a duration specified in the **audiovau.ini** file. If not specified, the default is 168 hours, or one week. After that duration, the delete record expires, and produces lines in the NFS log like this:

```
01:01:21# Delete Record AVB1:288 has expired
01:01:25# Delete Record AVB1:127 has expired
01:01:29# Delete Record AVB1:134 has expired
```

It is possible to delete a file without creating a delete record, and in some cases it's actually advantageous to do so. An example would be in the case of a corrupt or damaged file. Using an AudioVAULT utility called AVFixUp, a damaged file can be identified. On the AVFixUp screen, there is a UseNFS checkbox.

If UseNFS is checked, any time you delete a file with AVFixUp, you create a delete record, and that file is deleted off the other servers too...the delete becomes global. If UseNFS is **not** checked, any time you delete a file with AVFixUp, you do NOT create a delete record. The delete is local, and since there's not a delete record, NFS copies the file (a presumably good copy of the file) back from one of the other servers.

SINGLE FILE TRANSFER TRANSACTIONS

NFS can only copy a single file at a time. When the NFS software first establishes a session, all files on the first server are compared to all files on the second, and so on. This is called **full file scan**. Full file scans occur when first starting NFS, when a connection is restored after being lost, and each day at the server's **ForceScanTime**. If a file that needs to be copied is encountered during this scan, NFS suspends the scan and copies it. When the copy is complete, it resumes it scan through the directory. During this process, if new production is added, NFS would either have to encounter it as part of the scan, or if NFS had already scanned that server, wait for NFS to complete the full file scan.

Once a successful full file scan has completed, from then on NFS only requests a list of files that have changed since the last full scan. This process is called a **what's new** iteration. An iteration in which no files have changed may only take a few tens of milliseconds. An iteration in which even a single file changed will take longer.

As we talk about file transfer between AV100 servers, there are limitations that keep file transfer fairly slow by today's standards. Maximum transfer speeds in an AV100 system are generally well below 180,000 bytes per second, as they are limited by the capacity of the SCSI bus itself and the AV100-to-NIC throughput. The speed of transfers in a Vault2 system are tied more closely to the capacity of the Ethernet connection, with 100Mbps connections capable of transferring data (in theory) at 104,857,600 bytes per second.

Transfer time of an audio file will depend on its size, which is determined by a file's attributes. Whether a file is mono or stereo, and the file's sample and compression rates will impact its size. For example, a linear stereo file sampled at 48K will require about 192,000 bytes of disk space per second of audio. If an AV100 NFS can transfer at a maximum speed of 180,000 bytes per second, that file will transfer slower than real-time. A stereo file sampled at 32K and compressed to 4:1 requires only 32,000 bytes per second. With a transfer rate of 180,000 bytes per second, a 5:00 file will transfer in about a minute.

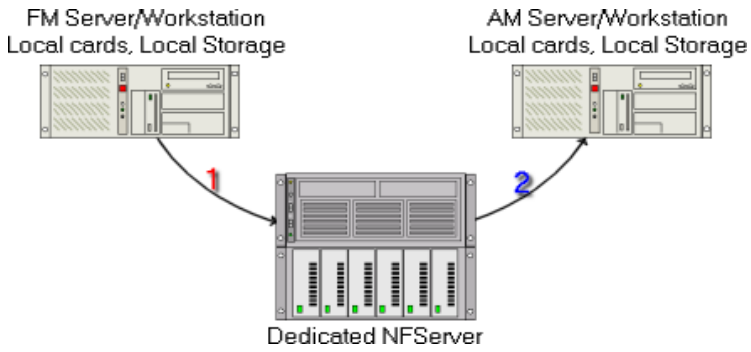
It is important to note these are mathematical calculations. First, NFS has to discover through its scan that the file needs to be copied. Then, NFS must complete any other transfers that are queued. Once the transfer begins, factors of network efficiency and system activity can impact transfer speed. There is no guaranteed file transfer throughput, **especially** when a full scan is in progress. It is the system designer's responsibility to ensure that files from one server are not immediately needed on another server. Expecting those files to be immediately available is unrealistic. In cases where immediate file access is required, the file **must** be recorded to the same server it will be played back from.

MULTIPLE FILE TRANSFER SERVERS

Larger AudioVAULT systems can have multiple instances of NFS, and in many cases this arrangement is advantageous. This is one of the ways that we can overcome the limitation of "one transfer at a time." While the NFS on server AVA is copying a file to itself, the NFS on AVB can be copying a file to itself. To achieve maximum efficiency, we establish the rule that when there is more than one instance of NFS installed, it never copies to another NFS. This way, we eliminate the chance that more than one server is copying the same file at the same time, which would negate the advantage of having more than one NFS running!

INTEGRATING NON-NFSERVERS

To copy files from any non-NFServer to any another non-NFServer, the files must first be copied to an NFServer - a "double hop" in effect, is required. The file must be copied from Server 1 to an NFServer, and then from that NFServer to Server 2.



When a file is transferred by the NFS, the file is copied, not moved. In the example above, the file originally recorded on the FM Server and transferred through the NFServer to the AM Server would exist on all three machines.

USING THE /NOACTION SWITCH

This command line switch places NFServer into a debug/diagnostic mode.

The switch is extremely useful when making changes in NFS configurations. Using the **/NoAction** switch, you can verify the modified copy rules are correct. NFS processes each file according to time last modified and copy rule information, and write a log of what it **would have** done, but doesn't actually copy any files.

After NFServer's operation has been verified by carefully examining its log file, the **/NoAction** switch would be removed and NFServer could be restarted in action mode.

DESIGNING AROUND BANDWIDTH ISSUES

There is no guaranteed file transfer throughput, **especially** when a full scan is in progress. It is the system designer's responsibility to ensure that files from one server are not immediately needed on another server. Expecting those files to be immediately available is unrealistic. In cases where immediate file access is required, the record AV100 and the playback AV100 must be in the same server.

BANDWIDTH ISSUES

The number of simultaneous playback/recordings that can be supported depends upon a number of factors:

1) The quality of the audio files
2) The speed of the SCSI disk
3) The speed of the SCSI bus
4) The AudioVAULT File System overhead
5) Other disk-related activities at the time
6) Normal cuts vs. network feed play-while-record cuts
7) The on-air playlist, as it relates to number of overlapping events that are scheduled, etc.
8) The number of SCSI disks.

There is no easy way around this issue, so buckle up and get ready. And if any AudioVAULT competitor claims otherwise then beware.

AUDIO QUALITY

The quality of the cut is defined by its sample rate, compression ratio and stereo/mono attributes. AudioVAULT allows the customer to choose this rate on a cut-by-cut basis, so knowledge of the system is needed to determine this information. AudioVAULT cuts can range from 48KHz uncompressed stereo to 22050Hz 16:1 mono. All possible quality settings are listed in the help file under MPEG2-Compression Tables.

For each Sample/Compression Rate combination, there is a corresponding BytesPerSecond setting; this specifies how much disk space the cut uses for each second of audio. The help file topic ***BytesPerSecond*** lists all possible values for all possible audio qualities. The BytesPerSecond value is the most important attribute when calculating maximum number of playback channels because the data must be read from the SCSI disk and buffered, transferred to the DSP and out of the AV100 card with no pauses in the data stream for everything to work correctly.

48000		Bytes/sec	Bytes/Min	Bytes/Hour
2	1.00:1	192,000	11,520,000	691,200,000
2	4.00:1	48,000	2,880,000	172,800,000
2	4.80:1	40,000	2,400,000	144,000,000
2	6.00:1	32,000	1,920,000	115,200,000
2	6.86:1	28,000	1,680,000	100,800,000
2	8.00:1	24,000	1,440,000	86,400,000
2	9.60:1	20,000	1,200,000	72,000,000
2	12.00:1	16,000	960,000	57,600,000
2	16.00:1	12,000	720,000	43,200,000
2	24.00:1	8,000	480,000	28,800,000
1	1.00:1	96,000	5,760,000	345,600,000
1	4.00:1	24,000	1,440,000	86,400,000
1	4.80:1	20,000	1,200,000	72,000,000
1	6.00:1	16,000	960,000	57,600,000
1	6.86:1	14,000	840,000	50,400,000
1	8.00:1	12,000	720,000	43,200,000
1	9.60:1	10,000	600,000	36,000,000
1	12.00:1	8,000	480,000	28,800,000
1	16.00:1	6,000	360,000	21,600,000
1	24.00:1	4,000	240,000	14,400,000

44100		Bytes/sec	Bytes/Min	Bytes/Hour
2	1.00:1	176,400	10,584,000	635,040,000
2	3.68:1	47,935	2,876,087	172,565,217
2	4.41:1	40,000	2,400,000	144,000,000
2	5.51:1	32,015	1,920,871	115,252,269
2	6.30:1	28,000	1,680,000	100,800,000
2	7.35:1	24,000	1,440,000	86,400,000
2	8.82:1	20,000	1,200,000	72,000,000
2	11.03:1	15,993	959,565	57,573,889
2	12.60:1	14,000	840,000	50,400,000
2	14.70:1	12,000	720,000	43,200,000
2	22.05:1	8,000	480,000	28,800,000
1	1.00:1	88,200	5,292,000	317,520,000
1	3.68:1	23,967	1,438,043	86,282,609
1	4.41:1	20,000	1,200,000	72,000,000
1	5.51:1	16,007	960,436	57,626,134
1	6.30:1	14,000	840,000	50,400,000
1	7.35:1	12,000	720,000	43,200,000
1	8.82:1	10,000	600,000	36,000,000
1	11.03:1	7,996	479,782	28,786,945
1	12.60:1	7,000	420,000	25,200,000
1	14.70:1	6,000	360,000	21,600,000
1	22.05:1	4,000	240,000	14,400,000

32000		Bytes/sec	Bytes/Min	Bytes/Hour
2	1.00:1	128,000	7,680,000	460,800,000
2	2.67:1	47,940	2,876,404	172,584,270
2	3.20:1	40,000	2,400,000	144,000,000
2	4.00:1	32,000	1,920,000	115,200,000
2	4.57:1	28,009	1,680,525	100,831,510
2	5.33:1	24,015	1,440,901	86,454,034
2	6.40:1	20,000	1,200,000	72,000,000
2	8.00:1	16,000	960,000	57,600,000
2	9.14:1	14,004	840,263	50,415,755
2	10.67:1	11,996	719,775	43,186,504
2	16.00:1	8,000	480,000	28,800,000
1	1.00:1	64,000	3,840,000	230,400,000
1	2.67:1	23,970	1,438,202	86,292,135
1	3.20:1	20,000	1,200,000	72,000,000
1	4.00:1	16,000	960,000	57,600,000
1	4.57:1	14,004	840,263	50,415,755
1	5.33:1	12,008	720,450	43,227,017
1	6.40:1	10,000	600,000	36,000,000
1	8.00:1	8,000	480,000	28,800,000
1	9.14:1	7,002	420,131	25,207,877
1	10.67:1	5,998	359,888	21,593,252
1	16.00:1	4,000	240,000	14,400,000

26000		Bytes/sec	Bytes/Min	Bytes/Hour
2	1.00:1	104,000	6,240,000	374,400,000
2	2.67:1	38,951	2,337,079	140,224,719
2	3.20:1	32,500	1,950,000	117,000,000
2	4.00:1	26,000	1,560,000	93,600,000
2	4.57:1	22,757	1,365,427	81,925,602
2	5.33:1	19,512	1,170,732	70,243,902
2	6.40:1	16,250	975,000	58,500,000
2	8.00:1	13,000	780,000	46,800,000
2	9.14:1	11,379	682,713	40,962,801

2	10.67:1	9,747	584,817	35,089,035
2	16.00:1	6,500	390,000	23,400,000
1	1.00:1	52,000	3,120,000	187,200,000
1	2.67:1	19,476	1,168,539	70,112,360
1	3.20:1	16,250	975,000	58,500,000
1	4.00:1	13,000	780,000	46,800,000
1	4.57:1	11,379	682,713	40,962,801
1	5.33:1	9,756	585,366	35,121,951
1	6.40:1	8,125	487,500	29,250,000
1	8.00:1	6,500	390,000	23,400,000
1	9.14:1	5,689	341,357	20,481,400
1	10.67:1	4,873	292,409	17,544,517
1	16.00:1	3,250	195,000	11,700,000

22050		Bytes/sec	Bytes/Min	Bytes/Hour
2	1.00:1	88,200	5,292,000	317,520,000
2	2.67:1	33,034	1,982,022	118,921,348
2	3.20:1	27,563	1,653,750	99,225,000
2	4.00:1	22,050	1,323,000	79,380,000
2	4.57:1	19,300	1,157,987	69,479,212
2	5.33:1	16,548	992,871	59,572,233
2	6.40:1	13,781	826,875	49,612,500
2	8.00:1	11,025	661,500	39,690,000
2	9.14:1	9,650	578,993	34,739,606
2	10.67:1	8,266	495,970	29,758,201
2	16.00:1	5,513	330,750	19,845,000
1	1.00:1	44,100	2,646,000	158,760,000
1	2.67:1	16,517	991,011	59,460,674
1	3.20:1	13,781	826,875	49,612,500
1	4.00:1	11,025	661,500	39,690,000
1	4.57:1	9,650	578,993	34,739,606
1	5.33:1	8,274	496,435	29,786,116
1	6.40:1	6,891	413,438	24,806,250
1	8.00:1	5,513	330,750	19,845,000
1	9.14:1	4,825	289,497	17,369,803
1	10.67:1	4,133	247,985	14,879,100
1	16.00:1	2,756	165,375	9,922,500

For AudioVAULT systems using a mixture of qualities, the question becomes more complex. For example, if a given AudioVAULT system is serving two stations, one AM and one FM, and if the AM uses medium-to-low quality cuts while the FM uses high-to-medium quality cuts then you must calculate an average of the two. The situation become more difficult when a given station uses a mixture of qualities; if the FM spots are medium quality and the FM music is high quality then you have to consider either an average or a worst-case **BytesPerSecond** value.

In general, you should always use worst case figures if you can not tolerate any throughput-related audio dropouts and use average if an occasion drop out is acceptable. It's a probability game, and difficult to calculate, but it's the best we can do given the requirements and the flexibility of the system.

SCSI DRIVE FACTORS

SCSI disks, due to the mechanical nature of the platters and heads, have a limit to which data can be transferred. This data rate is lower for random reads/writes and higher for sequential reads/writes. All SCSI disks that have been qualified for use on the AudioVAULT have undergone a suite of tests that measure the disk throughput capability. These numbers are

published in the AudioVAULT help file under Qualified SCSI Drives. For example, the IBM UltraStar 18XP (measured) an average transfer rate of 1,015,000 bytes per second. Don't go by the drive's spec sheet or salesperson's spiel because they don't consider the application under which the drive will be used.

Each AudioVAULT SCSI bus (the A and the B) can transfer about 3,000,000 bytes per second. The AV100 cards communicating to each other use about 10% of that available bandwidth.

The AudioVAULT card's have a file system that is responsible for allocating blocks, chaining blocks together for large files, deleting files, etc. This file system has a throughput of about 800,000 bytes per second. Blocks are allocated during recording, not during playback, and so Production sites which record a lot present a higher level-of-importance than on-air sites which (mainly) play. This restriction comes into play when designing systems with uncompressed audio, such as 48KHz 1:1 stereo and when using dual-play daughter cards; the base card and its daughter can add up to as much as 576000 bytes per second, plus NFServer, etc.

The AudioVAULT system is multi-user and performs many functions, such as file searching, recording, deleting old files, copying files, playing, etc. All of these activities that are not playing or recording take away from the maximum number of playback channels that are possible. Unfortunately this aspect of the disk bandwidth is also very difficult to calculating in to the number of playback channels that are supported. After all, who knows what each user is doing at any one instant? Copying a file uses about 100,000 bytes per second (limited by AV100 to NIC communication limits); this includes NFServer, AvImpExp, AvExplorer, and Cut Save As. NFServer is a little different in that it is unmanned and always running, where as AvImpExp, AvExplorer, and Cut Save As are manned; if the person at the workstation is using this function then they are most likely NOT also recording/playing.

As for functions such as searching for files, the best way to account for the bandwidth used is to simply apply a general statement like 10% of the available bandwidth will be used for misc. functions.

When the server boots up and the SCSI drives are mounted, the on-card file system checks the integrity of the disk's data. This is called fsck (File System CheckKer), and can use about 30% of the available bandwidth. Since there is no telling when a server will have to be repaired, you may want to set aside said percentage.

PLAY-WHILE-RECORD

Play-while-record cuts are about twice as expensive than regular cuts of the same quality. This is because the recorded audio must be passed from he recording AV100 card to the AV100 that owns the disk drive that the cut resides via the SCSI bus. Use them only when needed and consider their bandwidth requirements if they must be used.

If the playlist/schedule commonly overlaps one song to the next by 5 to 10 seconds, then you should consider that as two channels. If there are times when there are 3 or 4 audio events playing from the same schedule then those too need be considered. It is tempting to factor probability into the equation; if there are often 2 but rarely 3 simultaneous events, then isn't that really more like 2.2 channels vs. 4? The answer depends upon if you want to design the system and guarantee zero audio dropouts, or if you're willing to tolerate a drop out every now and then. It's all a probability game.

MULTIPLE SCSI DRIVES

If there are 4 disks then probability says that 1/4th of the playback channels will come from one disk at a time. But it is also possible that all audio will, sooner or later, come from a single disk. If you are designing the system for guaranteed usage, then don't play this probability

game. If an occasional audio drop out is acceptable then the game can be played -- to a reasonable degree. Never, for example, design the system assuming that each disk is handling 1/nth the data.

BANDWIDTH CALCULATION EXAMPLE

Those are the issues that need be considered when calculating the maximum number of playback channels. Now that you are confused, lets try an example.

The AudioVAULT system has four IBM UltraStar 18XP disks, and the customer will be using 32KHz 4:1 stereo. There are no play-while-record cuts. What is the guaranteed number of playback channels that can be configured?

To find out, bring up the help file and go to QUALIFIED SCSI DRIVES, then click on IBM ULTRASTAR 18XP. Note that the disks can each handle 1.015MB/s. Let's assume that 30% of the disk bandwidth is spent on overhead -- leaving us with .7105MB/s. Go to BytesPerSecond and look up 32KHz, 2 tracks (stereo), 4.00:1. Note that each audio channel uses 32,000 bytes per second. If we divide 710,500 by 32,000 we get 22.203125. In a worst case scenario, with all cuts playing back from the same SCSI drive, we could expect 22 simultaneous playbacks.

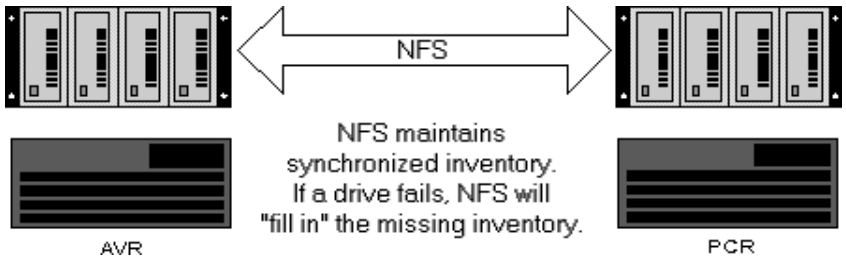
BACKUP OPTIONS

Backup of critical AudioVAULT data is of extreme importance on any system. Several options are available, including:

- Standard NFS.
- NFS using a separate server/drive set.
- SCSI DAT backup.
- RAID

STANDARD NFS

NFS systems synchronize files on multiple servers. NFS serves two purposes: it creates a copy of a file that can be accessed by workstations attached to the alternate server, and it allows that copy to be "restored" automatically in the event of a drive failure.

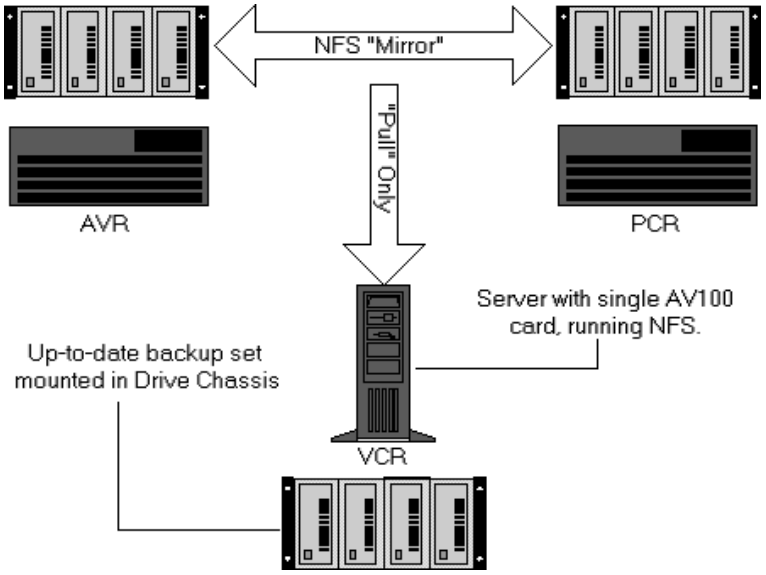


The advantage of this solution is that it is "built in" to systems running multiple servers. The same mechanism that allows all workstations access to the same files across multiple servers will act as a type of backup in the event of a drive failure. If a drive fails, NFS will know what files have been lost, and will copy them back automatically as it tries to maintain synchronized inventory pools.

The disadvantages to this are that the missing cuts will be unavailable until NFS restores them. Also, NFS automatically begins the restore process as soon as the drive drops off-line. If the drive hasn't yet been replaced, NFS will use available disk space on the remaining drives.

NFS USING A SEPARATE SERVER/DRIVE SET

Another option requiring less down time is to have a standalone server running NFS. That server would be attached to a complete drive set already mounted in a drive chassis. NFS would constantly keep the standby drive set up to date. Some call this a "VCR" server, because all it does is "record" new files.



In the event of a failure on the primary units, the entire standby drive enclosure can be installed, replacing the failed unit.

The advantage to this type of solution is reduced down time. Once a failure is diagnosed, the only down time required is the amount of time needed to down the

server, replace the hard drive enclosure, and reboot the server. Once everyone is back on the air, you can deal with the failed drive on your timetable.

The disadvantages are cost and bandwidth. An additional AV100 card is required, and it would handle NFS transfer only. You also need standby drives and a drive enclosure. From a bandwidth standpoint, the card VCR is talking to would have to be able to handle the additional traffic.

SCSI DAT BACKUP

SCSI DAT units are acceptable solutions for backup. These units attach directly to the AudioVAULT SCSI bus, and most commonly use 4GB DAT tapes.

Once a failure is diagnosed, the backup set can be restored, filling in the missing cuts.

The advantage to this solution is that the backup set is maintained away from the computer system. If something disastrous happens, your backup data is safe.

The primary disadvantages are speed and the interface. DAT backups and restores are slow, and even if you have a multi-tape changer, require many tape changes. DAT backup and restore functions are accessed through AVConsole, and the command sequence can be cryptic, particularly in a stress situation.

RAID

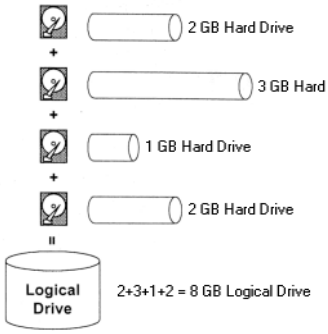
RAID (**R**edundant **A**rray of **I**nexpensive **D**evices) is another option worth considering. Using a RAID device, the AudioVAULT accesses logical drives through a RAID Controller.

Your system sees the Controller as an individual SCSI device, regardless of the number of physical disks. There are several RAID levels:

NRAID (Disk Spanning)

Minimum disks required:	1
Capacity	N
Redundancy?	No

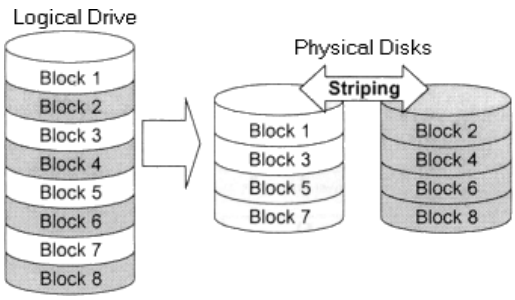
Non-RAID combines the physical capacity of one or more disks into one logical drive.



RAID 0

Minimum disks required:	2
Capacity	N
Redundancy?	No

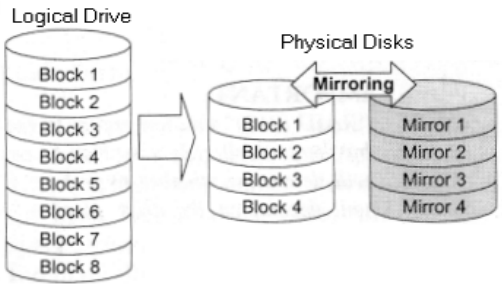
High performance, but no redundancy. Data is striped across several physical disks.



RAID 1

Minimum disks required:	2
Capacity	N/2
Redundancy?	Yes

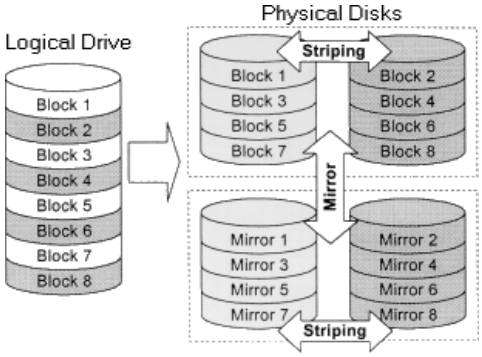
RAID 1 can only be performed with 2 hard disks. The contents of 1 disk is mirrored to the other.



RAID 0+1

Minimum disks required:	4
Capacity	N/2
Redundancy?	Yes

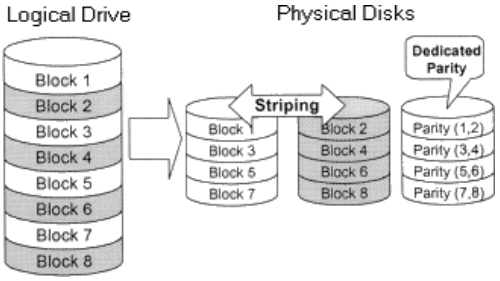
RAID 0+1 allows multiple drive failures as it provides for mirroring and striping.



RAID 3

Minimum disks required:	3
Capacity	N-1
Redundancy?	Yes

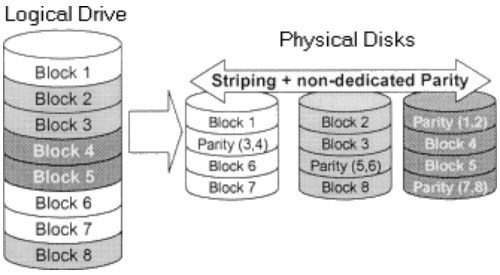
One disk is dedicated to storing parity data. If a disk fails, the controller can recover the lost data from the parity disk.



RAID 5

Minimum disks required:	3
Capacity	N-1
Redundancy?	Yes

Instead of parity data stored on a dedicated parity drive, the data is spread across the drive array. In the event of a failure, the controller can rebuild from the surviving disks.



RAID offers several advantages to the AudioVAULT user. It allows larger logical drive sizes than are normally possible with conventional disks. It also allows for automatic backup of critical data and automatic recovery if configured with a Spare Drive.

There are disadvantages, however. RAID controllers and the full complement of drives can represent a more substantial investment than a non-RAID solution. There are also issues involved with the larger logical drives. The system is not bulletproof. Even with RAID 5, failure of TWO drives will mean a loss of data.

Section 4: Vault2 System Architecture

By the end of this section, you should be familiar with the following concepts:

- Where audio originates in a Vault^2 system.
- How workstations access Vault^2 volumes.
- How to synchronize multiple volumes with NFServer.

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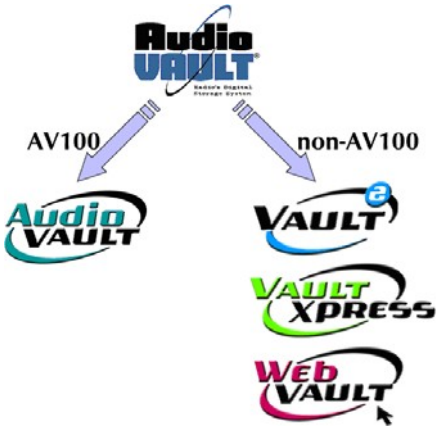
WHAT IS VAULT^2?

Vault^2 is a digital audio hard disk drive storage and retrieval system for radio broadcast stations. Vault^2 systems provide radio broadcasters digital audio recording and editing functions, storage, and playback of audio: ***music, news reports and segments, commercial announcements, themes, jingles, sound effects and programs***.

IN THE BEGINNING.

Today's AudioVAULT is a highly evolved digital automation system. Broadcast Electronics' experience with digital system goes back more than a decade. We've released products including Format Sentry, the CORE, Control-16, and the AV90.



In 1993 Broadcast Electronics introduced the AV100 card. With its dual dedicated fast SCSI bus and on-card processing, the AV100 card became the rock-solid foundation for the AudioVAULT software. In an era of 286 and 386 based personal computers, it was necessary to off-load digital signal processing and analog digital conversion from the CPU to the dedicated processors on the AV100 card.

Powerful new CPUs and other advances in technology allowed us to explore other ways of delivering the performance AudioVAULT users had come to expect. Storage devices became faster, smaller and more affordable. The need for the AV100 architecture faded as the rest of the computing world caught up.

AudioVAULT became a term used to describe the user interface found in stations around the world. Whether the component was AVRPS, AVProd, or AVAir, to own an **AudioVAULT** was to own a piece of equipment designed to be the best tool for a specific job.

We still refer to the software as **AudioVAULT**. As we developed versions of **AudioVAULT** capable of supporting non-AV100 hardware, we referred to the new platform as **Vault**^{2}.

Digigram
CREATIVE

Vault^2 is capable of supporting hardware including cards manufactured by Digigram and Creative Labs. More cards are being qualified as the **Vault**^{2} evolves, making this a solution that combines the proven stability of the **AudioVAULT** software with the convenience and affordability of off-the-shelf hardware.

To make it even easier for everyone to enjoy the benefits of owning a **Vault**^{2}, we bundled our most popular components together with all the necessary hardware and introduced **VaultXPRESS**. With **VaultXPRESS**, our customers could buy only what they needed for their particular application, but still have the same stable **AudioVAULT** software using the non-AV100 **Vault**^{2} architecture.

WHAT DOES VAULT² DO?

Vault² converts audio to digital data, stores it on computer hard drives, and provides **Dynamic Access** to your audio.

> **Dynamic Access** means:
>
> Multiple Vault² workstations can record to a single digital-audio storage volume at a given time.
>
> Multiple Vault² workstations have simultaneous access to a single piece of recorded audio.

HOW EXPANDABLE IS VAULT²?

One of the strengths of the Vault² system is its flexibility. Multiple Vault² workstations can be interconnected on a network. The WAN capability of Vault² makes the possibilities virtually endless.

HOW DOES IT ALL WORK?

The heart of any Vault² system is a professional quality sound card. Currently, cards offered by Digigram and Creative Labs are qualified for use with the Vault² system. These sound cards perform all audio conversion operations, and can be local to each workstation or hosted in a remote server.

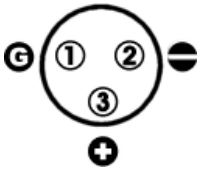
Each card is capable of handling a single record **or** multiple play stereo channels. An analogy can be made with a Record/Play cart machine. Multiple cards can be installed to provide additional stereo channels.

Audio can be overlapped using a single sound card. In fact, each stereo output can provide multiple streams. The number of simultaneous streams is limited only by processor power.

THE DIGIGRAM VX222

This versatile sound card includes balanced analog inputs and outputs, as well as digital input/output in AES/EBU or SPDIF formats. Supported sampling rates are 22.05, 32, 44.1, and 48 kHz. Although the VX222 is full duplex, offering simultaneous and independent record and playback capabilities, that capability might not be used in the Vault² architecture. For example, on an AVAir workstation, as the output of the card is summed to a single output pair, monitoring your record input would go out over the air! **Access to multiple audio cards is required to record AND play back simultaneously on the same workstation.**

Audio cables must be run between your Digigram sound card and your console. Pre-made cables with XLR connectors are provided to make this task as easy as possible. Simply attach the cable to your Digigram sound card and connect the other end to the console.



Digigram uses the European standard in their XLR connectors, so be careful!

OTHER QUALIFIED SOUND CARDS

New audio cards are being qualified for use with AudioVAULT software. Each has it's own unique capabilities.

	Stereo Inputs	Stereo Outputs	Digital Capable?	Driver
Digigram VX222	1	1	Yes	DirectX/NP
Digigram VX820	1	4	No	NP
Digigram PCX820	1	4	No	NP
Digigram PCX821	1	4	Digital only	NP
Digigram PCX822	1	4	Yes	NP
Digigram PCX924	1	1	Yes	NP
Digigram PCX440	2	2	Yes	NP
Digigram PCXPocket V3	1	1	Yes	NP
Digigram PCXPocket 440	2	2	Yes	NP
Digigram VXPocket	2	2	Yes	DirectX/NP
Creative Labs Sound Blaster Live!	1	1	Yes	DirectX

ONE PAIR, MULTIPLE STREAMS

One of the advantages of the Digigram hardware is the ability to have multiple streams on the same stereo pair. This is a significant departure from the AV100 hardware, where each stereo pair was capable of only a single **machine**, or stereo signal.

While this presents new configuration opportunities, it also presents some challenges to the system administrator. These challenges are compounded by the way the different AudioVAULT applications are capable of connecting to audio channels.

Each channel is assigned two names to accommodate these differences. There is an **AudioVAULT Machine Name**, and a **Descriptive** name. Some software applications will use the old-style machine names, while other applications can use the more descriptive names.

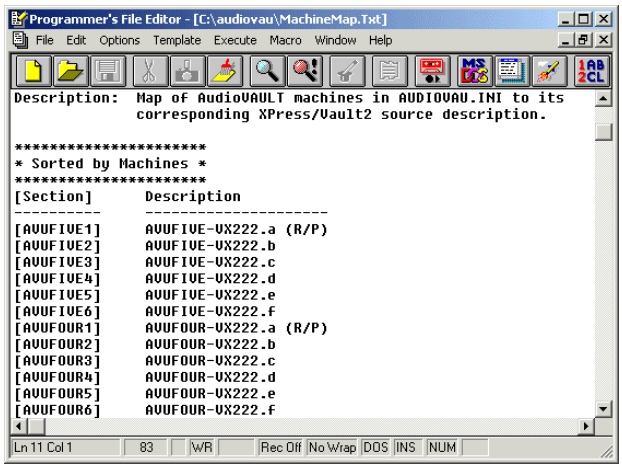
	AudioVAULT Machine Name	Descriptive Name
AVAir		✓
AVSat	✓	
Voice Tracker		✓
AVNet	✓	
AVProd		✓
AVRPS	✓	

An example of an **AudioVAULT Machine Name** is **AVA17**, while that same channel of audio may have the **Descriptive** name of **AVA-VX820 Card 1 Ch 4.a**

Descriptive names are based on the computer's **Network Name**, the name of the sound card as it appears in Windows' **Sounds and Multimedia Devices** dialog, the physical channel, and the virtual channel.

AudioVAULT Machine Names are based sequentially on the Descriptive names in a system.

The AudioVAULT Setup program creates a file called **MachineMap.Txt** (located in the c:\audiovau directory) that contains a list of available channels.



It's important to understand the relationship between physical channels and virtual channels. Physical channels can have multiple virtual channels, but in practically all cases the virtual channels must all be used by the same AudioVAULT application. If we define 6 virtual channels on **AVA-VX820 Card 1 Ch 4***,* all 6 of those would have to be used by the same application.the same AVAir for example. Even though each of those 6 channels can be controlled independently, the audio will run to the same fader on the same physical stereo pair. If we split the channels between two AVAir's, we'd have a train wreck on the air!

The AudioVAULT Setup program will give the option of defining multiple channels for each stereo pair based on the capabilities of the specific audio card. Too many simultaneous audio events on a card will result in audio problems.

There are also limits on how many simultaneous audio events can be played from a single computer. Signal processing tasks are handled by the computer's CPU. Several factors affect the maximum number of simultaneous streams on a computer, including CPU speed, the number of CPUs, and the sample rate and compression rate of the audio files. Sticking with a single sample rate and using linear files puts the least amount of strain on the CPU and can maximize performance.

CHOOSING THE RIGHT DRIVER

Many of the supported sound cards have the option of using either a **DirectX** driver or the **NP** driver developed by Digigram and Broadcast Electronics specifically for AudioVAULT. In cases where the NP driver is an option, it is the preferred choice. It's a more stable and efficient driver, and is much better suited to the AudioVAULT environment.

Do not use the NP driver available from Digigram. It is not the same driver that is available through Broadcast Electronics. The correct driver is on the AudioVAULT Setup disk. When installing a Digigram card:

- Install the card and power up the computer
- When Windows detects the card, select **Search for drivers for this device**
- Select **specify location** checkbox, de-select other checkboxes
- Browse to **D:\Utility\Drivers\DigigramDrivers\NP560f\InstFinal**
- Select the **NPWDM2.INF** file
- Windows will automatically detect the type of card
- Follow on-screen prompts, selecting **yes** when warned about the digital signature.

SHARING THE CARD WITH WAV APPLICATIONS

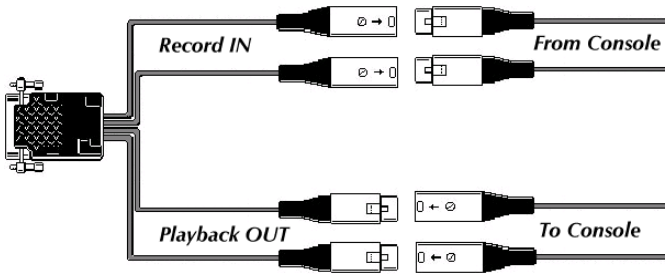
A WAV device is also available for the Digigram cards that can run on top of the NP driver. By installing the WAV device, you can use the card with WAV applications like multi-track editors.

- Install Audio Card using the NP Drivers
- Install the Wave device for the already installed Audio Card
  From **Control Panel**, choose **Add/Remove Hardware**
  Select **Add/Troubleshoot a Device**
  From the **Choose a Hardware Device** dialog, select **Add a new device**
  From the **New Hardware** dialog, select **Select the hardware from a list**
  From the **Hardware Type** dialog, select **Sound, video and game controllers**
  From the **Select a Device Driver** dialog
  Select **Have disk** button
  Browse to **npwdm2.inf** file (also used to install NP drivers for card)
  Select **Digigram Wave for NP2**
  Follow on-screen prompts, selecting **yes** when warned about the digital signature.

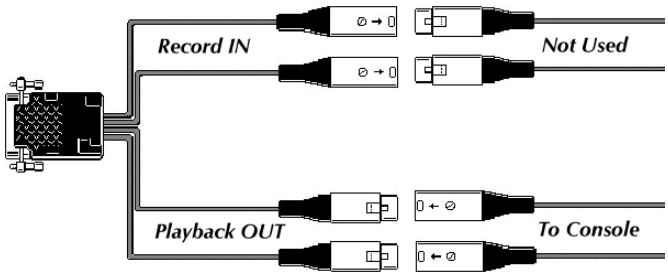
AUDIO WIRING

Depending on the type of workstation you have, the exact wiring requirements will vary. Each output of the audio card will go to a single fader on your console.

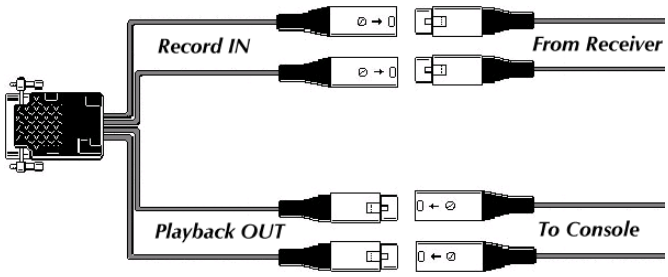
If this is a production workstation, you will have to send audio from the console to the input of the Digigram card. Connect the cable to the DB15 connector on the Digigram card, and then connect the XLR connectors to your console.



If this is an AVAir workstation, the record inputs are not used. Since the output is summed to a single fader, monitoring a record signal would go the same fader that is putting AVAir playback audio on the air. All that is required is to connect the playback output from the Digigram card to the fader on the console.



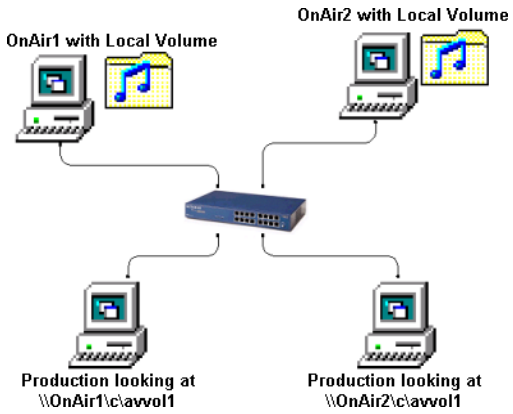
If this is a workstation that runs AVSat, we use the input of the Digigram card to control satellite audio. Vault^2 takes satellite audio from a receiver or switcher running into the card's Input, and mixes it with audio from your hard drive. This allows us to send a mixed feed from the output of the card to your console. By running the satellite audio through the Digigram card, Vault^2 is able to control the audio levels, and mix liners and other programming with the satellite feed at user-defined ratios.



If this is an AVAir workstation that also runs AVSat, we again use the input of the Digigram card to control satellite audio. This is one of the rare cases where different applications will use the same output. When using AVAir and AVSat together, both can use virtual channels on the same output pair.

SHARING VOLUMES

The Vault² System Architecture utilizes a single "pool" of audio material made available to multiple users without playback restrictions. The audio exists on an "Audio Volume" and each Vault² workstation plays that same copy. This means the audio is recorded into the system once and can be played back simultaneously by any studio. In fact, several Vault² workstations can be playing the same piece of audio at the same time.



The volume path is determined by a setting in the AV2K.INI located in the Windows directory.

[Vault]
Mount=c:\AVVOL1

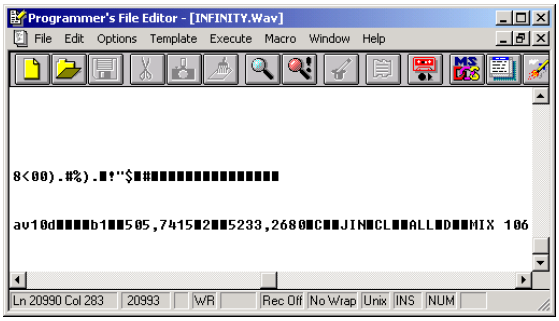
The directory referenced in the **Mount=** line is a directory on a Windows drive in a computer on your Vault² network. The drive itself can be IDE or SCSI, but the file system **MUST** be NTFS. Multiple paths can be combined into a single volume by listing each path in the **Mount=** line, separating each path with a comma.

In the illustration above, the four-workstation system uses two different volumes. An application called NFServer works in the background, making sure that each volume has the same files. When you play back a file from the production machine targeted at OnAir1, it reads and writes to that volume over a network connection.

If OnAir1 were to lose its volume, we could reconfigure the Production room to target the volume on OnAir2 by modifying the **Mount=** entry in the AV2K.INI. Once we rebooted the Production workstation, it would read and write to the alternate volume, which would have the same files as OnAir1, thanks to NFServer.

RIFF WAV FILES

Vault² audio files are stored in your NTFS audio volume as standard 16-bit Windows RIFF WAV files. The RIFF standard is quite flexible in that it supports a series of "chunks" within the file itself. One of these chunks identifies the file as a RIFF WAV file. Other chunks contain data, while can be PCM/linear or MPEG compressed. Each Vault² audio file also contains a special "AV10" chunk that stores Vault² specific information including Category and Class, trim points and description information.



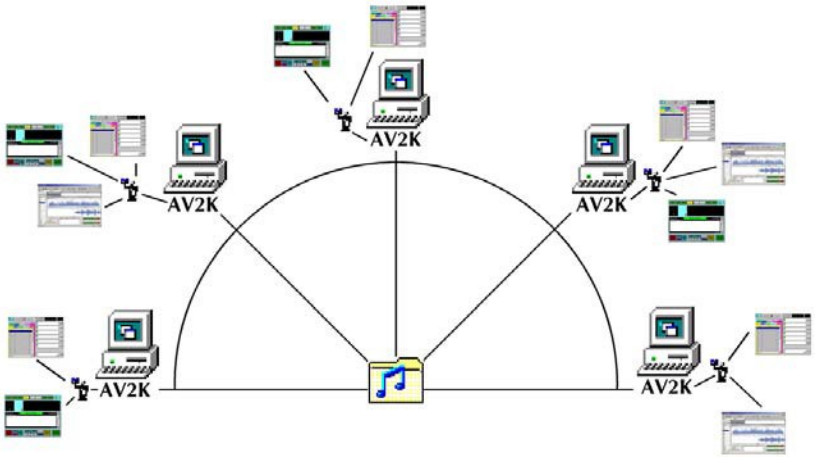
Vault² can also support the BWF/Broadcast Wave chunk and the Cart chunk. In addition to saving information within the file, the chunk architecture allows for a 100% symmetrical import to another AudioVAULT system.

THE AV2K.DLL

The AV2K.DLL is one of the primary components of the Vault² system. It controls all the information that flows between the file system and the Vault² applications.

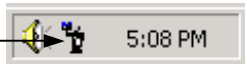
AV2K maintains correct information within the directory stored in memory on each workstation, and can assign a unique file name to new production. It does this with the knowledge of the other machines sharing the same volume. The DLL allows multiple machines to share the same audio volume.

On each workstation, interaction with the AV2K.DLL is controlled through AVServer for Windows (AVServeW), which runs as a service on each Vault[2] Workstation.



AVSERVEW USER INTERFACE

The AVServeW interface can be accessed by clicking on the AVServeW icon in the AudioVAULT Program Group. Once launched, the AVServeW icon will appear in the Windows Icon Tray. To close the User Interface, right click on the AVServeW icon and select **Terminate**.

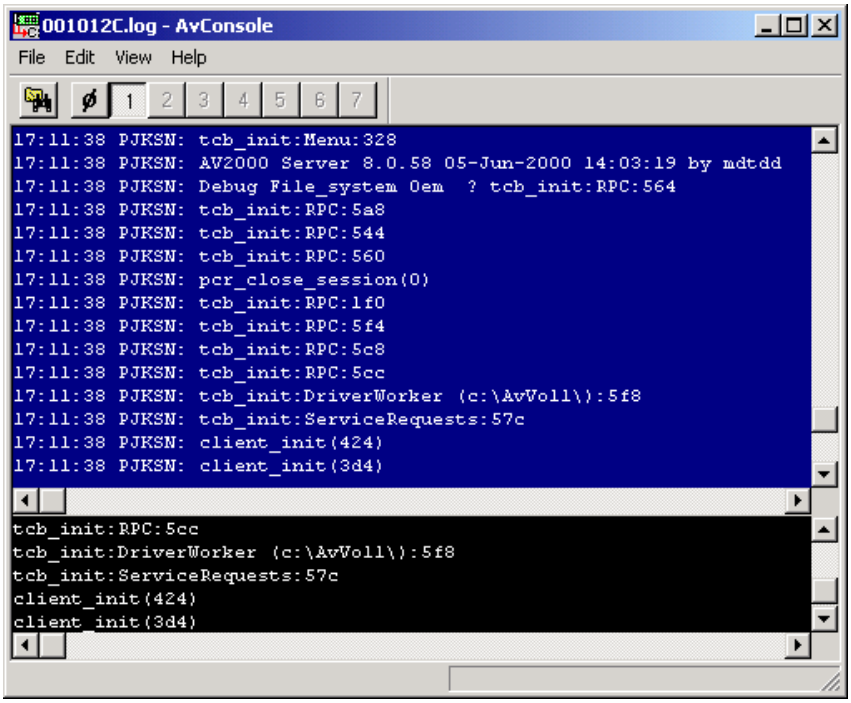


AVSERVEW CONFIGURATION

Default AVServer for Windows parameters are setup when the AudioVAULT Software Suite is installed, so modifications are rarely required.

AVCONSOLE FOR WINDOWS

AVConsole is the application responsible for logging audio card, volume and software activity.



- 32-bit/multi-threaded for efficient CPU usage and responsiveness.
- 25 lines of scroll-back buffer.
- Logs are opened with share access -- you can copy logs with AVConsole running.
- VIEW TODAY'S button instantly pops the current log into PFE32.
- Built-in configuration dialog sporting logging, ports, font, and startup scripting -- no hand editing of INI files.
- Persistent data stored in registry, including window size, position, etc.
- Automatically detects local Ports list from either the registry or SYSTEM.INI.
- Reasonable defaults for all settings -- will run right "out of the box". The application even automatically creates the log file path if needed.

AVCONSOLE APPLICATION INSTANCES

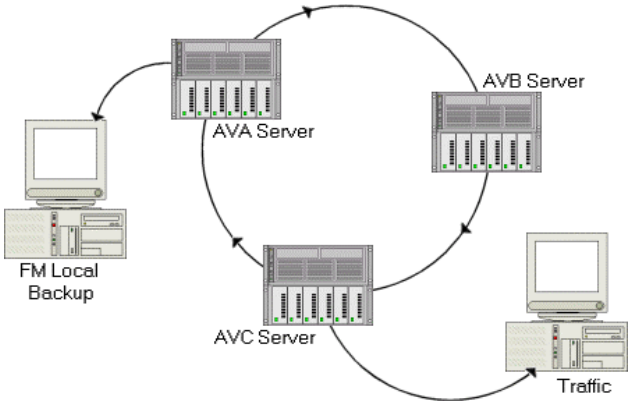
Currently, only one instance of AVConsole may be running at a given time per Vault^2 port.

SHUTTING DOWN AVCONSOLE

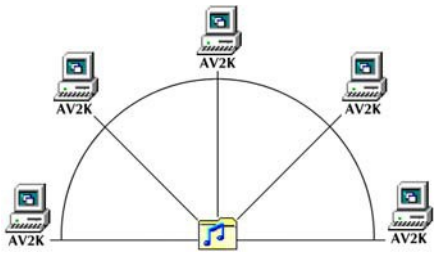
Each AVConsole instance adds an icon to the system tool tray. This is used to show the application after it has been "closed' (tool tray iconized). Double click the icon to open/show AVConsole, or right-click the icon and select "Terminate" to close AVConsole.

NFS

NFS, or Network File Server, is the application that copies files over the Ethernet network to other storage volumes. Network file transfer in an AudioVAULT system network is achieved by the NFServer program, which runs on one or more computers on the network. Each NFServer program is responsible for copying and deleting files between itself and other volumes based on parameters in each NFServer's AUDIOVAU.INI file, the Class property of the file being transferred, and the file's TLM (Time Last Modified) information.



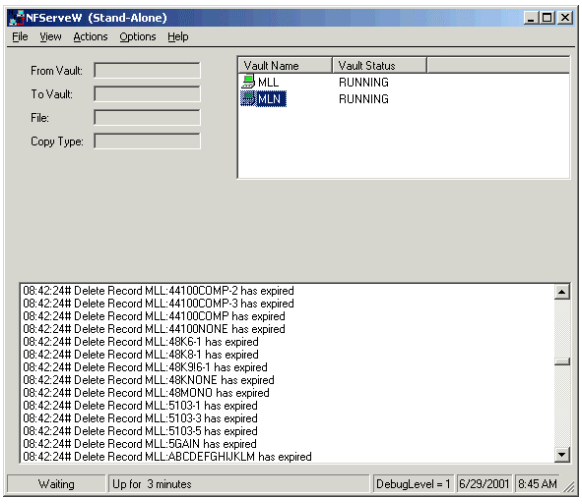
Through NFS, system configurations can be easily derived to suit any customer's application. NFS system components are modular so that configurations and scaling are nearly unlimited.



The AV2K.DLL maintains correct information within the directory stored in memory on each workstation. It does this with the knowledge of the other machines sharing the same volume. Its primary function is to allow multiple machines to share the same audio volume. In these systems, NFS gains access to the inventory by establishing a session with the AV2K.DLL itself.

NFS--USER INTERFACE

The user interface for the 32-bit NFServeW (NFServer for Windows) shows the status and activity of the system.



Area	Purpose
Upper Left	Vault and File information. Regarding file transfers, **To** is the destination server, while **From** is the source server.
Upper Right	Vault status panes. This shows the status of Vaults in the NFServer Scan List or Time Export List.
Lower	NFS activity log pane.

DETERMINING WHICH FILES COPY

NFS maintains synchronous volumes by comparing directories and looking for new information. When NFS finds a new file, it checks a series of rules to determine what action to take. There are two primary factors that determine whether a file is copied: the file's class property and when the file was created or modified.

When a new file is encountered, NFS first checks to see if it should have the file. It checks its local directory to see if a file of the same name exists. If no file exists on the local machine, it checks the file's class property. It validates the file's class against the copy rules defined in the local machine's **audiovau.ini** file.

If a file exists locally with the same name, NFS compares that local file to the file on the other server to see which one is newer, or most recently modified. If the local file is newer, NFS ignores the other file. If the file on the other server has a more recent modified time, it next looks at class and copy rules.

CLASS AND COPY RULES

When a file is created, it is given a class, which determines how the file should be propagated on an NFS-equipped system. The classes are user definable, and may be something like **AM**, **FM**, or **ALL**. AudioVAULT makes it possible to associate a class with each category so that selecting the category automatically sets a default class. Each file may belong to only one class. There are two fundamental philosophies of class names:

- File type (COM, MUS, and ALL)
- Destination server or server-group (AM, FM, and ALL)

Each AudioVAULT system should use one or the other, but to use both may lead to confusion down the road. **A given system should have no more than about 10 classes** to reduce confusion. If your configuration has more, you should consider rethinking the system's class naming scheme.

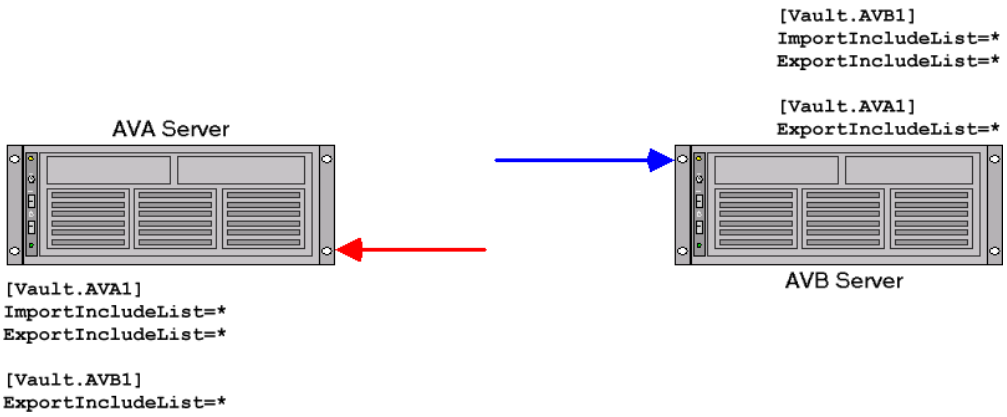
DEFINING CLASSES TO COPY

For a file to transfer, its class must be included in the destination server's **ImportIncludeList** statement **and** the **ExportIncludeList** statement of the source server. These statements either contain a comma-separated list of classes that can be copied or a wildcard like *****.

Entry	Action
Missing ImportIncludeList	Import nothing
ImportIncludeList=	Import nothing
ImportIncludeList=*	Import everything
ImportIncludeList=<list>	Specified classes

Missing ExportIncludeList	Export nothing
ExportIncludeList=	Export nothing
ExportIncludeList=*	Export everything
ExportIncludeList=<list>	Specified classes

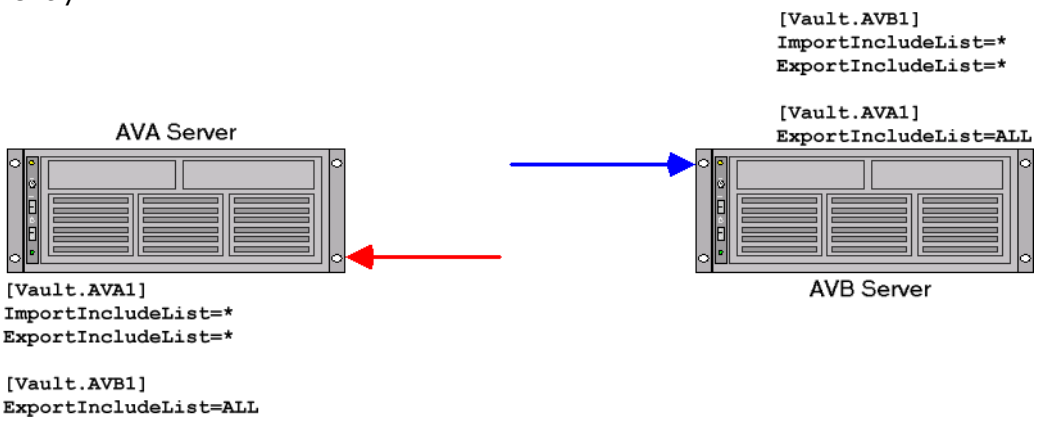
For example, assuming two servers set up to synchronize all files.



When the NFS running on the AVA server encounters a new file on AVB, it checks to see if it **should** have it by checking for local files of the same name and comparing modified time information. If it should have the file, it checks the copy rules to see if it **can** have it. NFS looks in its **audiovau.ini** file, and sees that it can **import any** class and **export any** class. It then looks in its local audiovau.ini file to see what AVB is allowed to do. In this example, AVA sees that AVB can **export any** class. Based on the copy rules shown above, AVA can copy any class from AVB to itself, but cannot copy any files to AVB.

The AVB server also has copy rules in its local **audiovau.ini** file, and goes through the same process when it encounters a new file. In this example, AVB sees that AVA can **export any** class. Based on the copy rules shown above, AVB can copy any class from AVA to itself, but cannot copy any files to AVA.

If we only wanted to synchronize **some** files, but not all files, we could define our copy rules a little differently.



When the NFS running on the AVA server encounters a new file on AVB, it checks to see if it **should** have it by checking for local files of the same name and comparing modified time information. If it should have the file, it checks the copy rules to see if it **can** have it. NFS looks in its **audiovau.ini** file, and sees that it can **import any** class and **export any** class. It then looks in its local audiovau.ini file to see what AVB is allowed to do. In this example, AVA sees that AVB can **export only** files with a class of **ALL**. Based on the copy rules shown above, AVA can copy only files with a class of **ALL** from AVB to itself, but cannot copy any files to AVB.

The AVB server also has copy rules in its local **audiovau.ini** file, and goes through the same process when it encounters a new file. In this example, AVB sees that AVA can **export only** files with a class of **ALL**. Based on the copy rules shown above, AVB can copy only files with a class of **ALL** from AVA to itself, but cannot copy any files to AVA.

THE EXCEPTION TO THE RULE

NFServer promotes a **flat file system** concept across the network.

Existing files with identical names will be updated regardless of copy rules. This ensures that a file with a given name is the same everywhere it occurs. **SyncAllFiles=NO** overrides this behavior.

DELETIONS

NFS only scans directories for new files. So what happens when we delete a file? If NFS is only looking for additions, how does it see a deletion?

When a file is deleted from a server, a new file is created called a **delete record**. Delete records have the same class information as the original file, and are recognized and copied by NFS. When a new delete record is copied over, the file is immediately removed from the directory, and then its data blocks are zeroed out by a background **deleter task**. Delete records exist on a server for a duration specified in the **audiovau.ini** file. If not specified, the default is 168 hours, or one week. After that duration, the delete record expires, and produces lines in the NFS log like this:

```
01:01:21# Delete Record AVB1:288 has expired
01:01:25# Delete Record AVB1:127 has expired
01:01:29# Delete Record AVB1:134 has expired
```

It is possible to delete a file without creating a delete record, and in some cases it's actually advantageous to do so. An example would be in the case of a corrupt or damaged file. Using an AudioVAULT utility called AVFixUp, a damaged file can be identified. On the AVFixUp screen, there is a UseNFS checkbox.

If UseNFS is checked, any time you delete a file with AVFixUp, you create a delete record, and that file is deleted off the other servers too...the delete becomes global. If UseNFS is **not** checked, any time you delete a file with AVFixUp, you do NOT create a delete record. The delete is local, and since there's not a delete record, NFS copies the file (a presumably good copy of the file) back from one of the other servers.

SINGLE FILE TRANSFER TRANSACTIONS

NFS can only copy a single file at a time. When the NFS software first establishes a session, all files on the first server are compared to all files on the second, and so on. This is called **full file scan**. Full file scans occur when first starting NFS, when a connection is restored after being lost, and each day at the server's **ForceScanTime**. If a file that needs to be copied is encountered during this scan, NFS suspends the scan and copies it. When the copy is complete, it resumes it scan through the directory. During this process, if new production is added, NFS would either have to encounter it as part of the scan, or if NFS had already scanned that server, wait for NFS to complete the full file scan.

Once a successful full file scan has completed, from then on NFS only requests a list of files that have changed since the last full scan. This process is called a **what's new** iteration. An iteration in which no files have changed may only take a few tens of milliseconds. An iteration in which even a single file changed will take longer.

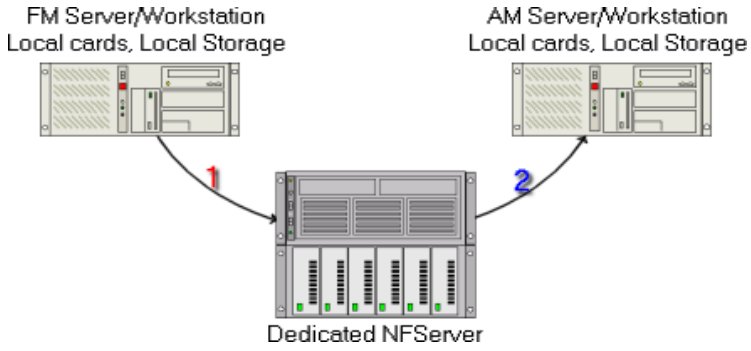
Transfer time of an audio file will depend on its size, which is determined by a file's attributes. Whether a file is mono or stereo, and the file's sample and compression rates will impact its size. First, NFS has to discover through its scan that the file needs to be copied. Then, NFS must complete any other transfers that are queued. Once the transfer begins, factors of network efficiency and system activity can impact transfer speed. There is no guaranteed file transfer throughput, **especially** when a full scan is in progress. It is the system designer's responsibility to ensure that files from one server are not immediately needed on another server. Expecting those files to be immediately available is unrealistic. In cases where immediate file access is required, the file **must** be recorded to the same server it will be played back from.

MULTIPLE FILE TRANSFER SERVERS

Larger AudioVAULT systems can have multiple instances of NFS, and in many cases this arrangement is advantageous. This is one of the ways that we can overcome the limitation of "one transfer at a time." While the NFS on server AVA is copying a file to itself, the NFS on AVB can be copying a file to itself. To achieve maximum efficiency, we establish the rule that when there is more than one instance of NFS installed, it never copies to another NFS. This way, we eliminate the chance that more than one server is copying the same file at the same time, which would negate the advantage of having more than one NFS running!

INTEGRATING NON-NFSERVERS

To copy files from any non-NFServer to any another non-NFServer, the files must first be copied to an NFServer - a "double hop" in effect, is required. The file must be copied from Server 1 to an NFServer, and then from that NFServer to Server 2.



When a file is transferred by the NFS, the file is copied, not moved. In the example above, the file originally recorded on the FM Server and transferred through the NFServer to the AM Server would exist on all three machines.

USING THE /NOACTION SWITCH

This command line switch places NFServer into a debug/diagnostic mode.

The switch is extremely useful when making changes in NFS configurations. Using the **/NoAction** switch, you can verify the modified copy rules are correct. NFS processes each file according to time last modified and copy rule information, and write a log of what it **would have** done, but doesn't actually copy any files.

After NFServer's operation has been verified by carefully examining its log file, the **/NoAction** switch would be removed and NFServer could be restarted in action mode.

THE LICENSE SERVER

To protect Vault[2] software from unauthorized use, both accidental and intentional, Broadcast Electronics has added licensing technology to AudioVAULT software. AudioVAULT uses a server-based approach to licensing, storing information about purchased features in an encrypted license file.

The license file resides on the PC running the License Manager Server. This computer will have a hardware dongle attached to its printer port that validates the license file. All clients connect to the server over a TCP/IP network connection to obtain the license file information.

The license file specifies how many instances of a software feature can be open concurrently on a system. The license file may have only 4 **tokens** for AVAir for example. When a user launches AVAir, that computer sends a **checkout request** to the License Manager. The License Manager acts like an accountant, and knows how many tokens are left in the account. If a token is available, the License Manager allows the client application to take one, and AVAir is allowed to function normally. When the user closes that instance of AVAir, the token is returned to the License Manager. Another feature that is restricted through the license file is the number of sound card channels that can be in use on the system. Adding additional hardware to the system requires a modification to the license file.

When your system was configured at Broadcast Electronics, a license file describing the options you purchased was installed. For your system to work properly, there are a few key things to remember:

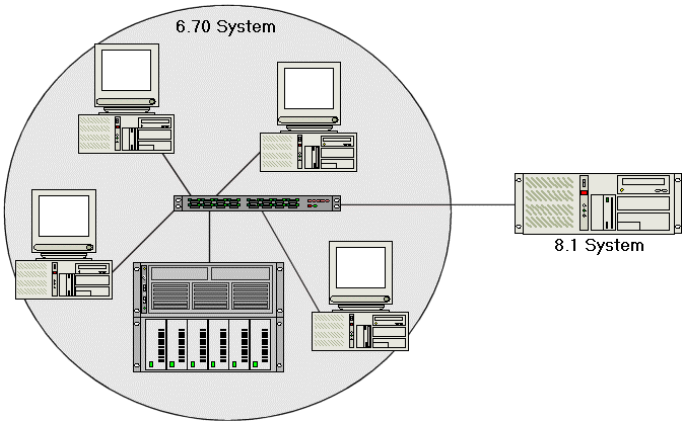
1. Don't move (or remove) the hardware dongle.
2. Don't change any computer names.

Either of these actions will result in failure of the license server. A "grace period" is built into the license server design so if there IS a failure, your system will continue to operate for 7 days while the problem is being fixed. Major changes or adding features to your system will require a new license file available through Broadcast Electronics.

INTEGRATING VAULT2 AND AV100 SYSTEMS

6.7 AV100 system adding 8.1 Vault² Computers

Broadcast Electronics recommends that all AudioVAULT computers run the same version of software. If you decide to add a Vault² computer to your existing 6.70 system, and keep the 6.70 software, there are specific issues to keep in mind.



Due to application compatibility issues in most respects, this arrangement will function like two distinct systems. The 6.70 segment of your system will likely continue to operate as it does now, without any knowledge of the other hardware. Since 6.70 doesn't involve license files, the only license issues in this case have to do with the 8.1 system itself.

The 8.1 system will be able to operate independently, and NFS files back and forth between the two segments. AV100 hardware uses dedicated SCSI drives to store audio files in a proprietary file format. Non-AV100 hardware requires access to a standard Windows NTFS volume and stores 16-bit WAV files. Only 8.1 NFS is capable of seamlessly handling the transfer between the formats and file systems. In this situation, with an older version of the software, all of the file movement between the two segments (6.70 and 8.1) would have to be handled by the 8.1 NFS.

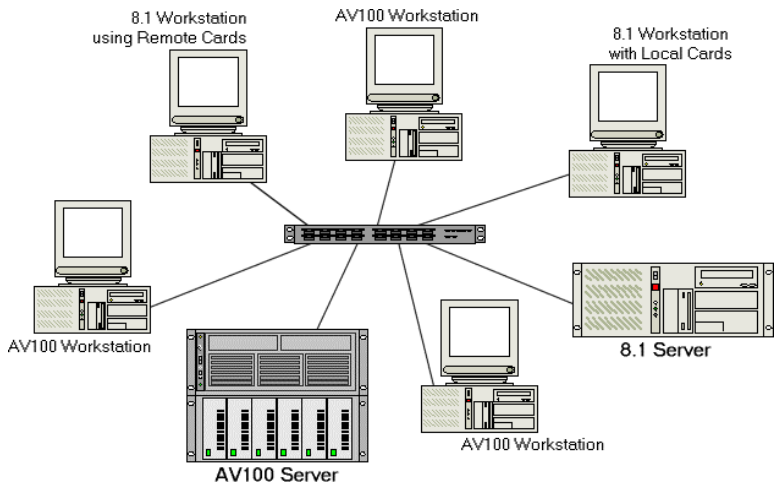
There are also compatibility issues with AVExplorer and AVScheduler. Having mixed software versions within a system requires that the two segments be kept as separate as possible.

8.1 AV100 system adding 8.1 Vault² Computers

With this arrangement, things are a little easier. Since all computers are running the same version of software, we don't have to worry about application compatibility issues. The only major remaining issues have to do with licensing and from where each machine gets its audio files.

On an AV100 computer, all applications are available, and licensing is handled by the AudioVAULT software. On a Vault2 computer, each application is purchased separately.

If a computer is purely AV100, and has no interaction with non-AV100 hardware, licensing is handled within the AudioVAULT software itself. Any computer that does interact with non-AV100 hardware must validate against a central license manager. That license file must have a sufficient number of tokens, or licenses, available for **all** applications.

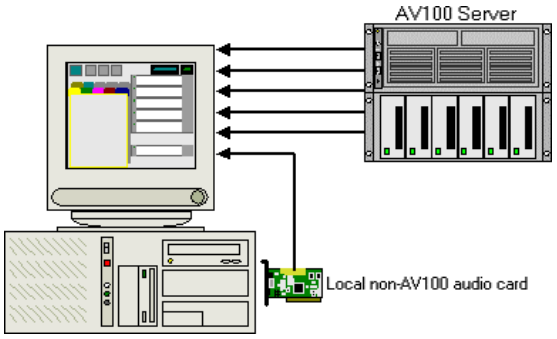


Non-AV100 soundcards must also have access to an NTFS file volume. Non-AV100 sound cards cannot access dedicated AV100 SCSI storage. They must have

access to WAV audio files on an NTFS volume. AudioVAULT's Network File Server, or NFS, can transfer files between a SCSI AV100 volume and an NTFS volume.

AV100 workstation adding local Digigram card

One example of this type of upgrade is to add a non-AV100 playback channel to AVAir for use with Quick Starts. The main playback channels would still be provided by AVAir, but the Quick Start deck would be provided by a Digigram or SoundBlaster Live! card.



In addition to running version 8.1, the workstation must meet the PC requirements for a Vault[2] workstation with local sound cards. Since this workstation now interacts with non-AV100 hardware, a license file must be available with tokens for all applications in use by this machine, including the non-AV100 hardware channel and AVAir.

Non-AV100 soundcards must also have access to an NTFS file volume. Non-AV100 sound cards cannot access dedicated AV100 SCSI storage. They must have access to WAV audio files on an NTFS volume. AudioVAULT's Network File Server, or NFS, can transfer files between a SCSI AV100 volume and an NTFS volume.

Migrating from AV100 to Vault[2]

Eliminating AV100 cards completely and replacing them with non-AV100 hardware isn't difficult, but it is obviously a major change. It will be necessary to completely remove and reinstall the AudioVAULT software. Custom **audiovau.ini** files can be saved and restored, and existing audio files can be converted to the new format.

Section 5: Installing the AudioVAULT Software

By the end of this section, you should be familiar with the issues impacting following concepts:

- PC Requirements
- License issues
- Network capability
- **AudioVOLUME** locations
- System configuration

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Broadcast Electronics offers an integrated Setup program for the latest release of the AudioVAULT software. **Setup** allows users to add and remove software components and automatically makes the necessary INI and registry changes. **Setup** can be run after the initial installation of the software, and will retain all custom settings the user has defined.

There are some important things to consider before running **Setup**.

- PC Requirements
- License issues
- Network capability
- **AudioVOLUME** locations
- System configuration

PC REQUIREMENTS

One of the most exciting enhancements is the support for non-AV100 hardware, which we refer to as VaultXPRESS and Vault2. The system requirements are a little beefier since some of the A/D and audio processing tasks have been moved to the CPU.

Operating System

Vault2 with local sound card support:
    Windows 2000
Vault2 without local sound card support:
    Windows 98SE
    Windows 2000
    Windows NT Workstation SP6
AV100:
    Windows 98SE
    Windows 2000
    Windows NT Workstation SP6

PC Requirements.CPU

Vault2 with local sound card:
    Pentium Class 500 or better
Vault2 without local sound card, Windows 2000:
    Pentium Class 300
Vault2 without local sound card, Windows 98 SE:
    Pentium Class 200
Vault2 without local sound card, Windows NT SP6:
    Pentium Class 200
AV100, Windows 2000:
    Pentium Class 500
AV100, Windows NT SP6:
    Pentium Class
AV100 with AVAir or AVProd, Windows 98 SE:
    Pentium Class 200
AV100 without AVAir or AVProd, Windows 98 SE:
    486x66

PC Requirements.RAM

VaultXPRESS/Vault2 with local sound card:
Minimum 128 MB RAM
Vault2 without local sound card support:
Minimum 64 MB RAM
AV100, Windows 2000:
Minimum 128 MB RAM
AV100, Windows NT SP6:
Minimum 32 MB RAM
AV100 with AVAir or AVProd, Windows 98 SE:
Minimum 32 MB RAM
AV100 without AVAir or AVProd, Windows 98 SE:
Minimum 16 MB RAM

These are ***minimum*** system requirements. As is the case with most software packages, a faster CPU or more RAM will increase the performance of your system.

8.1 UPGRADE PATH

If this is an upgrade, you must be at least on AudioVAULT version 6.60 and meet the OS, CPU and RAM requirements outlined above.

If this is a fresh install, you must only meet the OS, CPU and RAM requirements outlined above. It is not necessary to install a previous version of AudioVAULT if this is a fresh install.

IMPORTANT NOTE

It's important to note that this document outlines the most common configurations for AudioVAULT systems. Due to differences in how systems are configured, the steps detailed here may not be exactly what you will see when you run **Setup**.

FOR NEWSBOSS AND AIRBOSS USERS

Included on the 8.10 disc are the 4.1 versions of NewsBoss and AirBoss. If you are a licensed user, you can choose to upgrade NewsBoss software as part of the 8.10 upgrade. Leaving the NewsBoss and AirBoss options checked in the **Select Components** screen will launch the NewsBoss/AirBoss setup. The same rule applies as you go through that setup routine.it's designed to pick up existing settings, so in most cases, the answer is "just click next." After you upgrade the software, you'll have to upgrade the NewsBoss database in the NewsBoss Tools dialog.

If you choose not to upgrade NewsBoss and AirBoss right now, just unclick the NewsBoss/AirBoss options in the **Select Components** screen. This won't uninstall the programs.it just won't launch the NewsBoss setup program.

This is the only time you should **un**-check anything.if you uncheck an AudioVAULT component, setup **will** uninstall it! NewsBoss and AirBoss components are the only exceptions!

LICENSE ISSUES

Version 8.x of the AudioVAULT software deals with licensing differently in AV100, Vault^2 and mixed systems. AV100 customers will have the same access to all software components like they have always had. If you decide to add AVExplorer for example all you have to do is run **Setup**.

Vault² customers can purchase each component separately, so each component is licensed with a software license manager.

To protect our software from unauthorized use, both accidental and intentional, Broadcast Electronics has added licensing technology to AudioVAULT software. Our licenses are either handled with license files on each machine, or with a server-based license manager. The license manager reads information about purchased features from an encrypted license file on the computer running a **License Manager**. This computer will have a hardware dongle attached to its printer port that validates the license file. All clients connect to the server over a TCP/IP network connection to obtain the license file information.

If you decide you want to add components, not only do you have to run **Setup** to install the component, you will have to contact Broadcast Electronics to add the components to your license file.

Once you add a Vault² (non-AV100) workstation to your AV100 system, **all** machines and applications will have to have valid licenses. Contact Broadcast Electronics for more information.

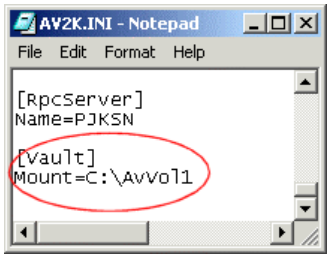
NETWORK CAPABILITY

AudioVAULT applications still rely on NetBEUI for communication between applications. When using Windows 2000, NetBEUI doesn't necessarily have to be default/LANA 0, but the LANA must be specified in the **audiovau.ini**. Windows 98 and Windows NT installations require NetBEUI to be on LANA 0.

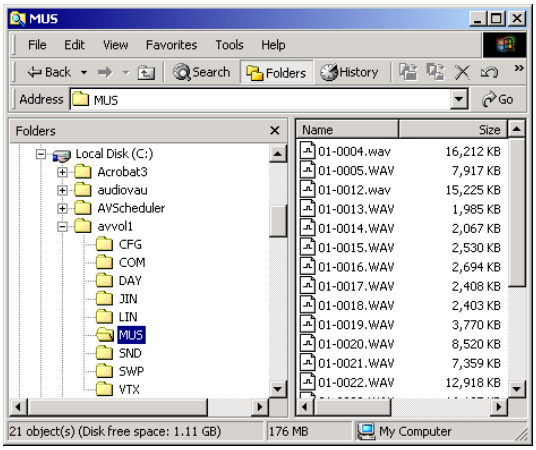
If you're running the License Manager, you must also install TCP/IP for license file validation.

AUDIOVOLUME LOCATIONS

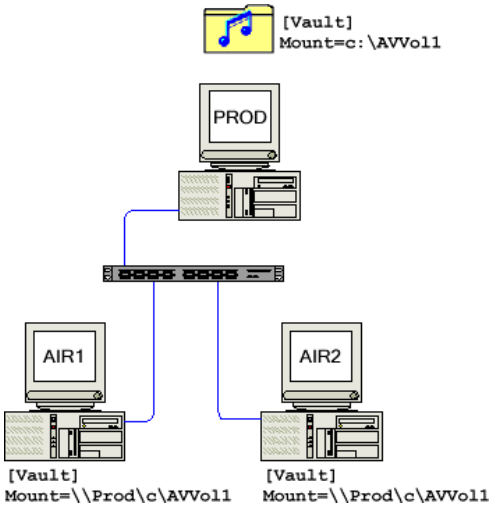
AV100 systems maintain the same dedicated SCSI architecture for storage of audio files. The Vault² system architecture also utilizes a single pool of audio material made available to multiple users without playback restrictions. The audio exists on an NTFS **AudioVOLUME** in the Windows environment.



We tell the AudioVAULT software where the **AudioVOLUME** is located on the network by defining the path to the volume. The ***path*** describes which drive and directories contain the audio files. The path is defined in the AV2K.INI located in the Windows directory. The directory referenced in the **Mount=** line is a directory on a Windows drive in a computer on your Vault² network. The path may be to a local directory, or to a directory on another computer. Setup will only write the Mount line with a volume path of **<drive>:\AvVol1**.



If you store audio files on a remote computer, you can specify the path using a ***UNC***. The ***Universal Naming Convention*** provides a common method for accessing files on a network drive without using a "mapped" drive letter. UNC names and typically appear as **\\server\volume\path**.



The example to the left uses a volume stored on the PROD machine. When you play back a file from PROD, it reads and writes that file from its own hard drive. When you play back a file from AIR1 however, it reads and writes that file from the volume on the PROD machine over a network connection.

The audio is still created at the local sound card, but the information is being read from the remote hard drive.

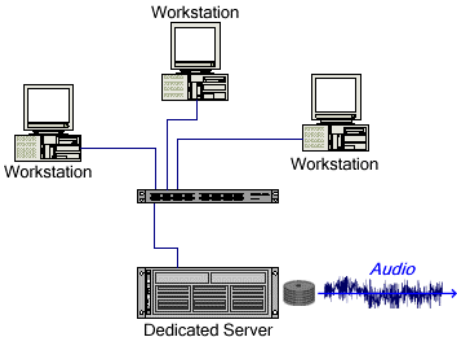
CONFIGURATION OPTIONS

One of the strengths of the AudioVAULT has been its ability to fit into practically any environment. The new generation of AudioVAULT has taken this concept to a new level. An understanding of how your system is designed, at least on a conceptual level, will help you with the installation process. **The best way to find out how your system is designed is to ask your sales representative for an up to date system drawing.**

There are as many different ways to configure an AudioVAULT system as there are radio stations. Each site will have specific needs and requirements. Here are some examples of how systems can be designed:

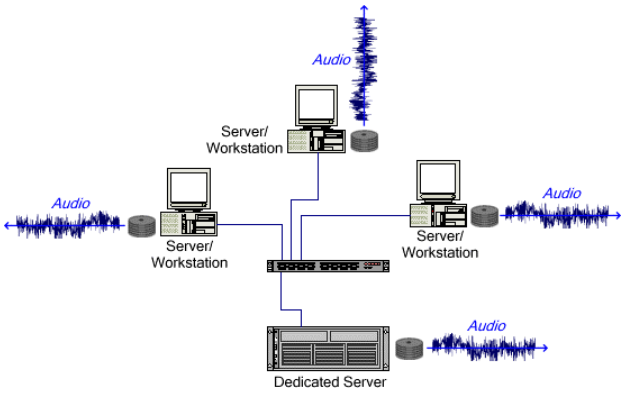
AV100 Server-based

The traditional hardware model for the AV100 hardware platform uses a server-based approach to file storage and audio distribution. Workstations running AudioVAULT applications connect to an AV100 server, in essence remote controlling the AV100 cards, which are physically connected to dedicated SCSI storage. Multiple servers could be set up, with each set of AV100 cards using their own dedicated SCSI volumes. NFServer could be implemented to maintain synchronous file volumes.



AV100 Decentralized

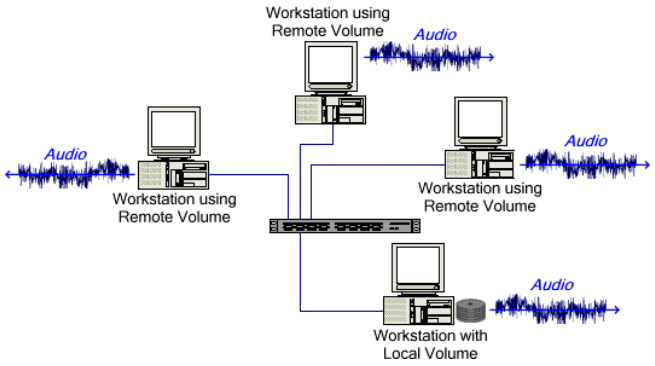
Some customers developed a decentralized approach with the AV100 hardware, creating multiple synchronized SCSI volumes using NFS and local AV100 cards.



In many ways, this most closely resembles the VaultXPRESS concept, with audio being generated at the workstations rather than at a central server.

Vault² Decentralized

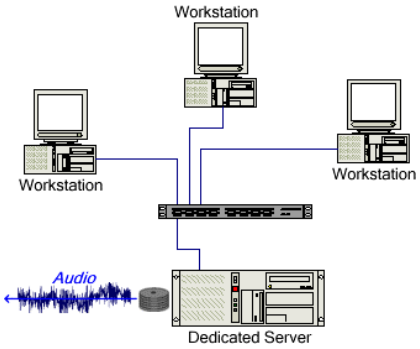
VaultXPRESS and "standard" Vault² systems take a decentralized approach when it comes to audio hardware. Instead of locating all audio cards in a central server, audio hardware is installed in the individual workstations. An ***audio volume*** is established on a central hard drive, and all workstations read from and write to that device. Multiple volumes can be established and synchronized with NFServer, providing unprecedented flexibility. Volumes can be installed on either IDE or SCSI drives, and are managed within the Windows NTFS framework.



Vault2 Server-based

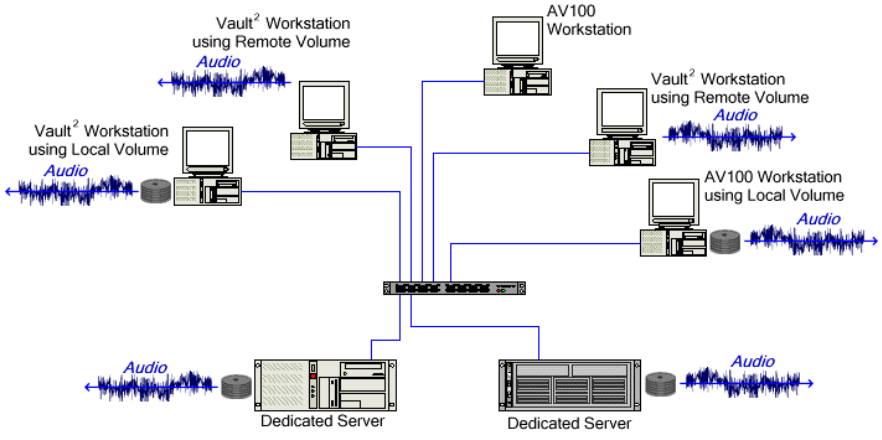
Similar to AV100 server-based systems, the Vault2 can operate in a server-based configuration as well. Multiple output sound cards can be located in a central server and connected to an IDE or SCSI volume. Audio cards are remote-controlled over a network connection, and all audio is generated at the server.

Storage options include standard IDE hard drives, SCSI drives, or any type of RAID solution.



Combination

One of the strengths of the new software and hardware platform is backwards compatibility. You can have both platforms work together, so it's easy to integrate a Vault2 into an existing AV100 system for exciting expansion possibilities. NFServer can copy files between the platforms, automatically converting between WAV and AudioVAULT format as necessary.



The underlying platform is never a concern for the operators.all management is handled by the AudioVAULT software.

MIXED STREAMS

One of the strengths of the non-AV100 hardware is the ability to provide multiple independent streams on a single stereo pair. Currently, cards offered by Digigram and Creative Labs are qualified for use with the Vault^2 system. These sound cards perform all audio conversion operations, and can be local to each workstation or hosted in a remote server.

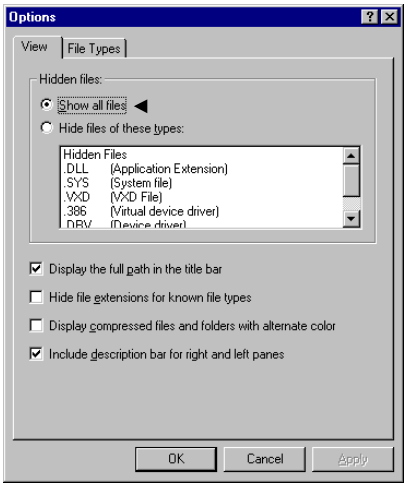
Each card is capable of handling a single record **or** multiple play stereo channels. An analogy can be made with a Record/Play cart machine. Multiple cards can be installed to provide additional stereo channels.

The number of simultaneous streams is limited only by processor power. This means that using a single VX222 card, AVAir can be configured for multiple decks, each capable of playing a different event. All of those events however, would go to the console on a single stereo pair.

You will have the option of telling Setup how many streams or **machines** will be defined for each stereo pair. Careful system design can make that an easier question to answer.

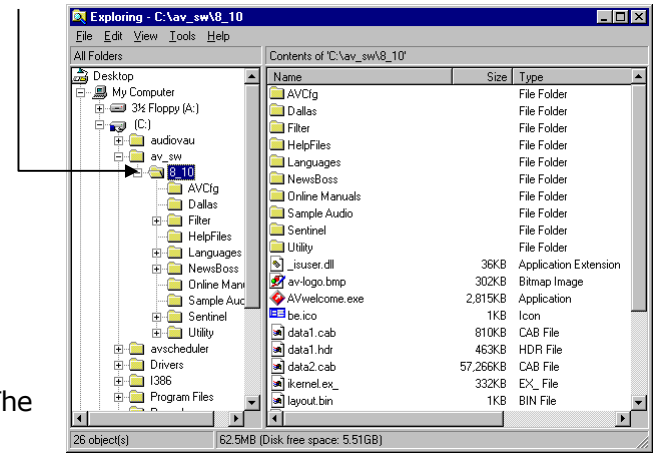
RUNNING SETUP

We recommend copying the 8.1 install files to the local hard disk. Not only does the install run slightly faster, if you need to add or change components later, you won't need to hunt down the CD-ROM. First, open Windows Explorer and verify that it's set to **Show all files**.



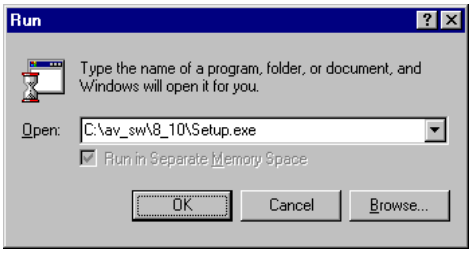
Click **ViewIOptions** on the Windows Explorer text menu and make sure the **Show all files** button is checked.

In Windows Explorer, create a **New Folder** named **8_10**. Copy the contents of the 8.10 Installation CD-ROM to the **8_10** folder.



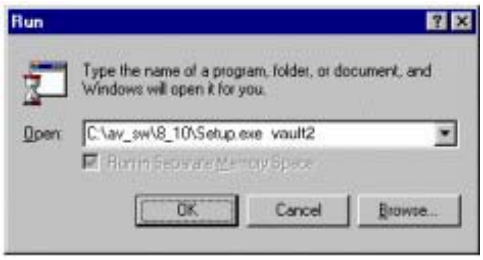
The entire CD-ROM is 338MB. If you copy everything except the **Prev_Ver** folder, it's 188MB.

Once all the files are copied, make sure all AudioVAULT applications are terminated. Then click the Windows **Start** button, click **Run**, and run **Setup.exe**.



SPECIAL INFORMATION FOR VAULT² INSTALLATIONS

If this workstation will use remote audio channels, you must run **Setup** with a **vault2** switch. Otherwise, **Setup** will only write the INI sections necessary for a data connection.

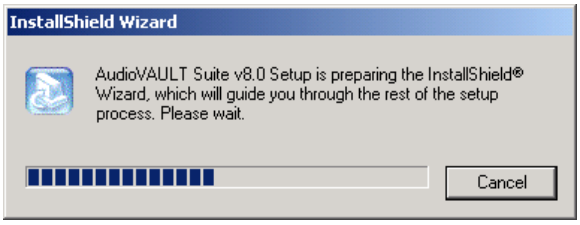


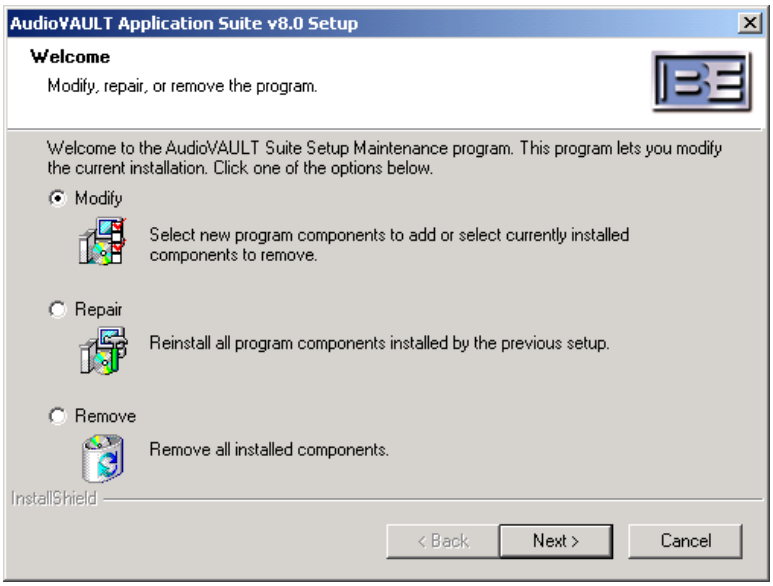
If your configuration is such that the cards to be used by this workstation are not local (reside in a remote server) you must use the **vault2** switch the first time you run **Setup**. Subsequent **Setup** sessions will detect the Vault² configuration automatically, so once you've run **Setup** with the **vault2** switch once, you don't have to do it again.

RUNNING SETUP

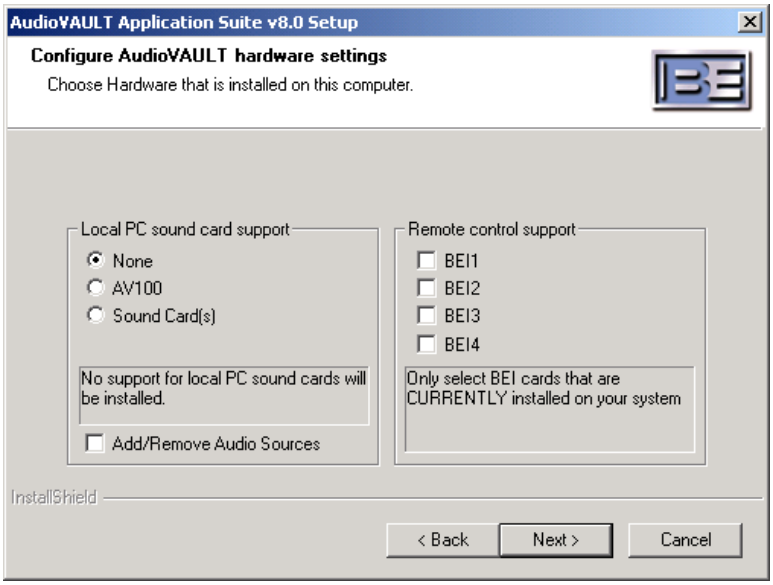
Remember that the applications that will run on your Vault² machine is actually controlled by the license file. Only the components that have been purchased from Broadcast Electronics and added to your license file will operate.

Once Setup launches, it will copy temporary install files to your system.

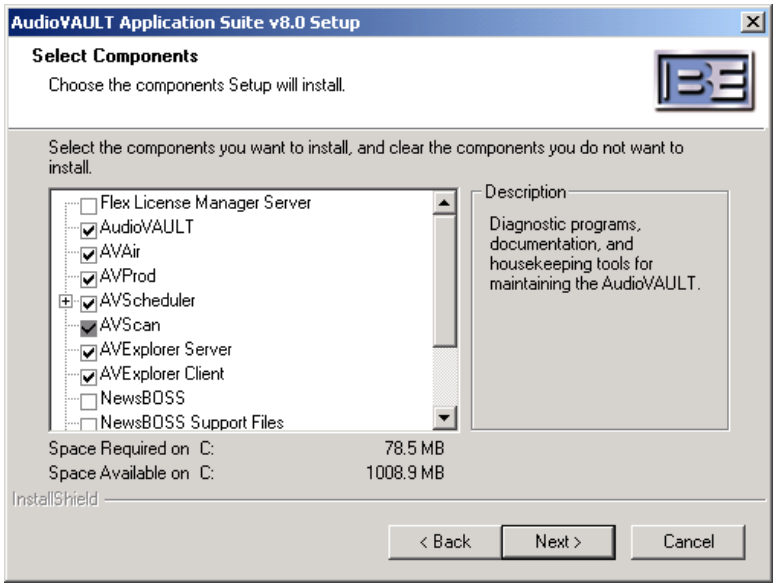




You will have the options of modifying and adding components, reinstalling or removing components.



This screen allows you to identify the type of hardware in this specific workstation. It also gives you the option of installing BEI remote control cards. Setup will recognize previous settings. If you're adding or removing sound cards, check the **Add/Remove Audio Sources** check box.



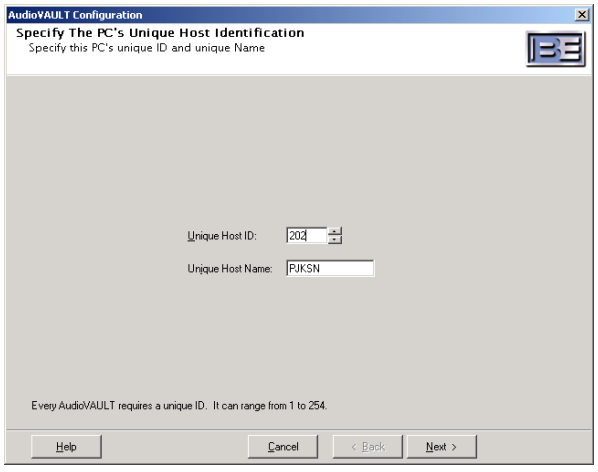
The next screen is the **Select Components** dialog. Here, you can select the components to install. Setup will automatically check off components it finds already installed.

Unchecking any component will un-install that component!

Component	Description
FLEXlm Server	Each system has **one** machine designated as the host for the License Manager hardware dongle and License file host.
AudioVAULT	This is the AudioVAULT executable. If you're running an AudioVAULT screen on this machine, select this option. Screens include AVRPS, AVSat, and AVNet.
NFServer	The component that allows you to maintain multiple synchronized volumes.

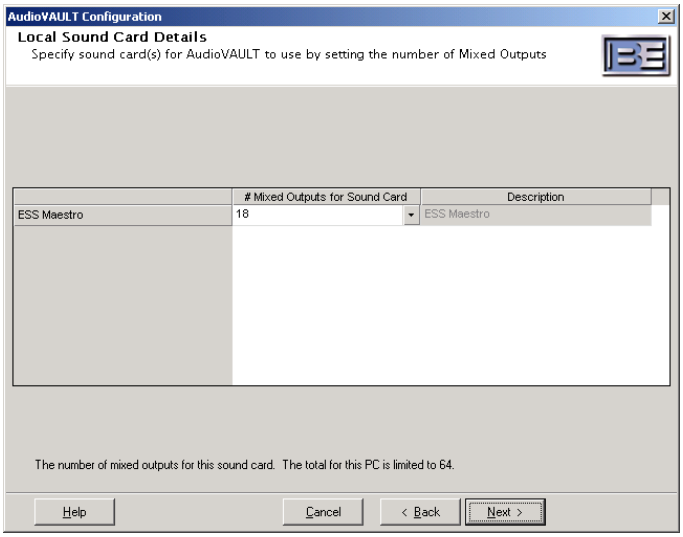
AVAir	Our multi-channel On Air playback program.
AVProd	Our stereo cut-and-paste editor.
AVScheduler	The application used to create Event Files for AVAir.
Program Files	The main AVScheduler program files.
VoiceTracker	AVScheduler's VoiceTracker module.
AutoScheduler	AVScheduler's AutoScheduler engine, allowing for automatic imports and exports.
AVScan	An application used to keep AVAir databases up-to-date.
AVExplorer Server	Half of the AVExplorer program.install this on machines that have resources you want to share through AVExplorer.
AVExplorer Client	The other half of the AVExplorer program. Install this on computers you want to use to access resources shared using AVExplorer Server.
NewsBOSS	This installs NewsBOSS components including the Editor, Prompter, and Wires programs.
NewsBOSS Support	Allows AVAir to work with NewsBOSS.
AirBOSS	This installs the AirBOSS editor.
AirBOSS Support	This installs files allowing AVAir and AVScheduler to work with AirBOSS.
AudioVAULT Preview Tool	A tool allowing you to preview your audio files.
Engineering Utilities	A host of tools allowing you to configure and maintain your Vault^2.
AVConsole	Writes an activity log used in troubleshooting.
AVFixUp	Maintenance tool for working with audio files.
AVMaint	Configuration for Categories, Classes and Security
AVRename	Renames Vault^2 files in bulk.
AVDisk	Graphical representation of drive fullness.
AVDBView	Allows you to sort, search and print you database.
AVDBM	Tool for repairing and compacting the database.
AVGetCFG	Gathers configuration information.
AVCFG	Writes configuration files.
FadeCFG	Overrides EOM fades based on category.
Help Files	Gotta have 'em!
Online Manuals	AudioVAULT manuals in PDF format.

Once you've checked the components to install, click next.

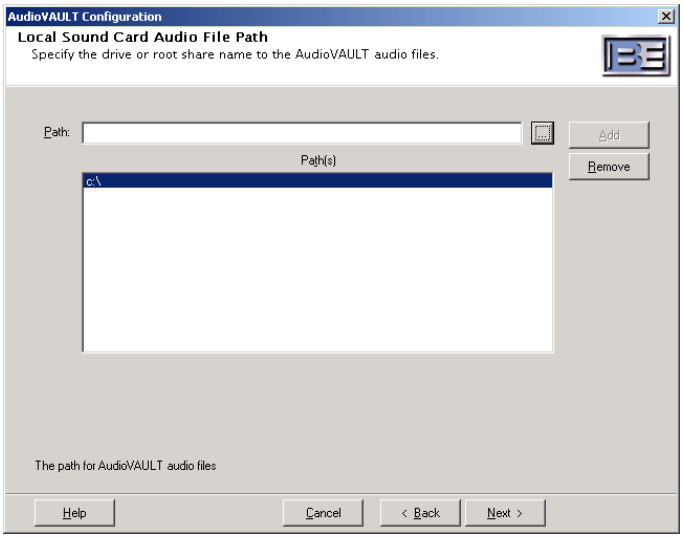


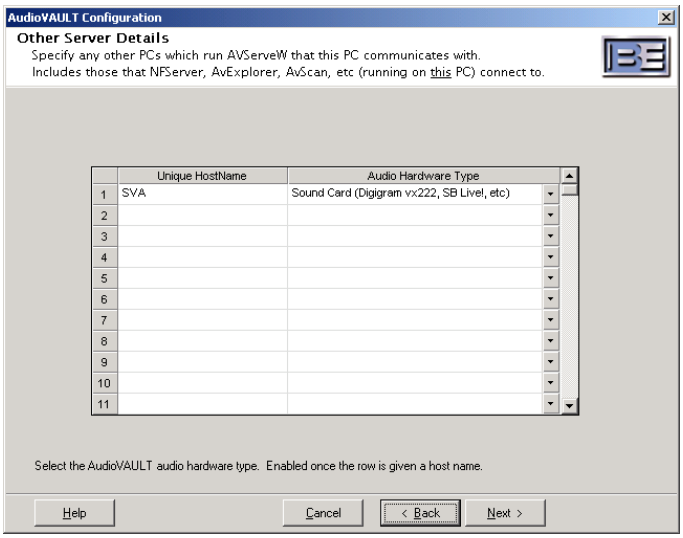
Each workstation on your Vault^2 network must have a unique Host Name and Host ID. Setup will recommend these identifiers based on TCP/IP address and the computer's network name, but you can choose your own.

A standard Vault² workstation has local sound cards. Vault² machines can also integrate remote sound cards and AV-100 sound cards. Setup will show a list of local cards detected and installed by Windows. Here's where you determine the number of Mixed Outputs for each stereo pair.



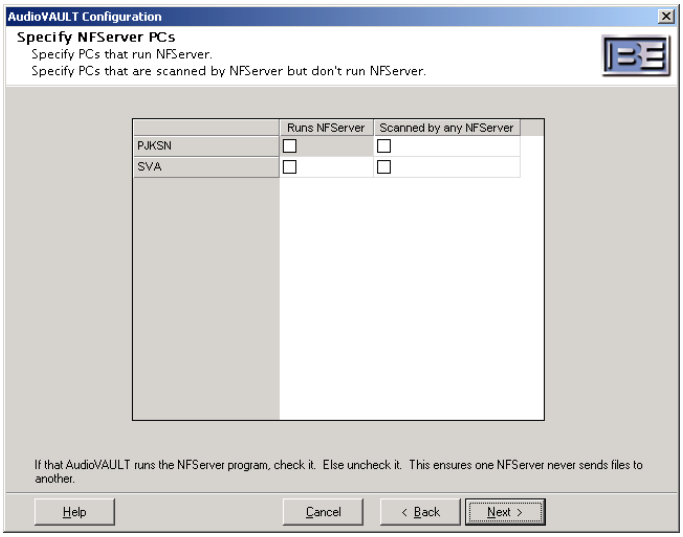
Next, we set the directory or directories this workstation will use as an Audio Volume.



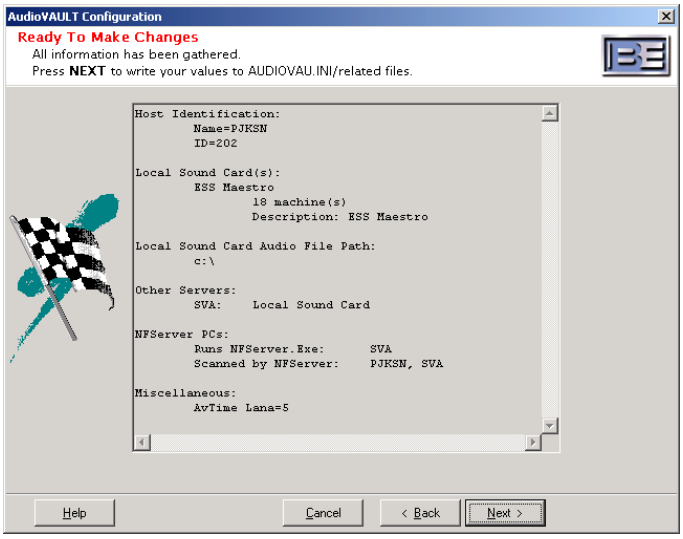


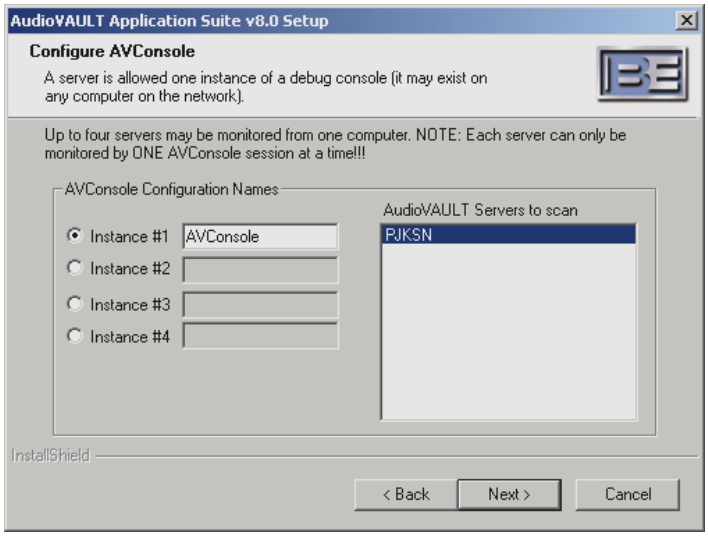
Next, tell this workstation about the other Vault² machines in your system. This machine will need to know about them to connect to their resources.

After setting up your AudioVAULT shortcuts (which can easily be created manually later) specify the machines on the network that run the NFServer program. Also identify the workstations that are scanned by NFS. This dialog sets options regarding global and local deletions. You'll have the option of configuring NFS copy rules, although in most cases you will want to specify "mirror all," which is the default.



Setup is now ready to write the configuration files and start making some registry entries.



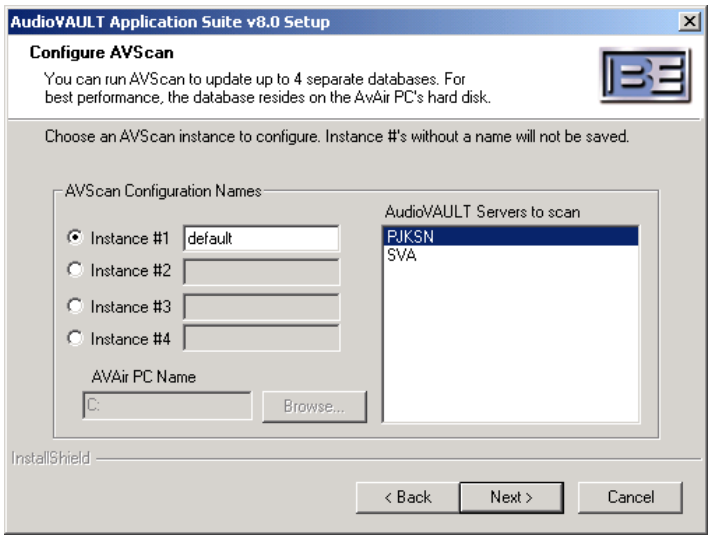


Local program activity can be monitored using an application called AVConsole.

Vault^2 machines can run more than one instance of AVConsole, each attached to a different Vault^2 server.

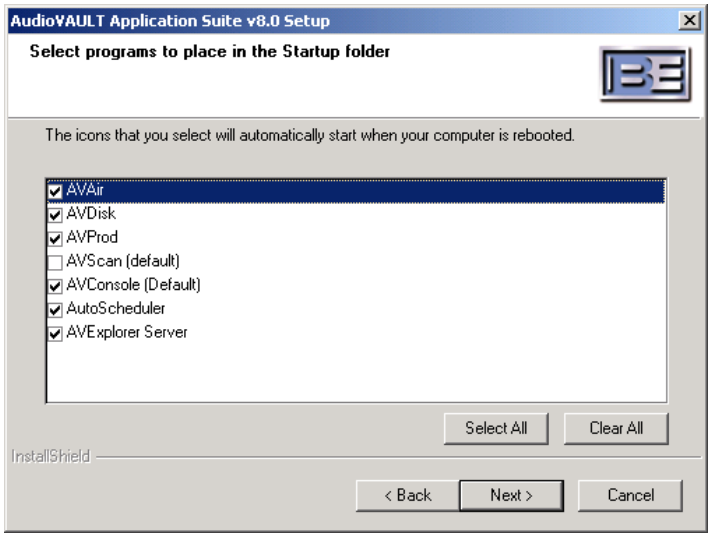
Vault^2 installs only "scan" themselves, so click **Next**.

AVScan is the utility that keeps your file database up to date. Vault² machines can run more than one instance of AVScan, each attached to a different Vault² server.



Select the Host Name of the machine hosting the volume this workstation will use.

Select the applications you want to launch automatically when this machine starts. Icons for those applications will be written to the Windows Start Up folder.



Additional screens may ask you about the role of AVTime on this workstation. In addition, if NewsBOSS or AirBOSS were selected to be installed, those components have their own Setup routines that will launch during the Vault² setup.

Setup will copy files to your hard drive and ask you to restart. Once the workstation restarts, you will have to configure each application to suit your specific requirements.

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Section 6: Working with the AUDIOVAU.INI

By the end of this section, you should be familiar with:

- The structure of Windows INI files
- How to write custom INI sections
- The AudioVAULT remote control macro language

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EDITING THE AUDIOVAU.INI

> This information is intended for system administrators only. Please do not attempt to make any changes to the audiovau.ini file without first consulting with a Studio Systems Customer Service Engineer.

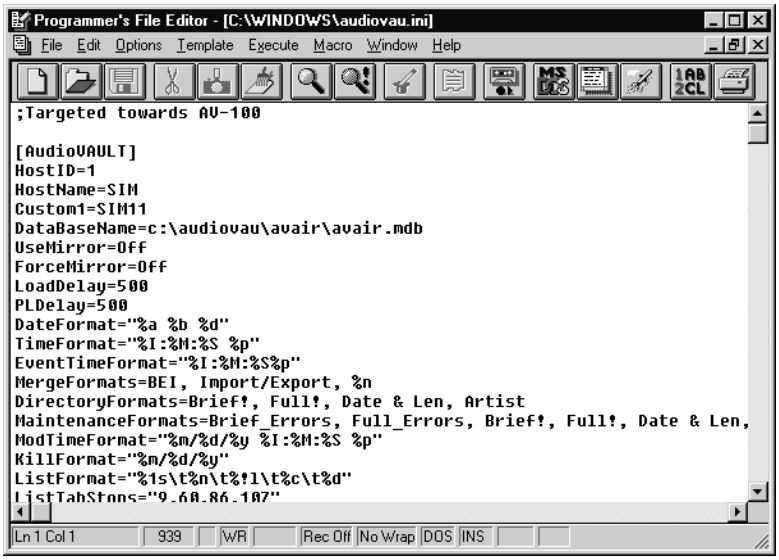
The AUDIOVAU.INI controls the AudioVAULT system configuration and initialization. The AUDIOVAU.INI file resides in the C:\WINDOWS or C:\WinNT directory and consists of the code controlling all system operations such as:

- The configuration and operation of the AudioVAULT machines.
- Loading the decks with a playlist.
- Customizing the AudioVAULT machine screens
- Mapping functions to remote control pins or keyboard keys.

The AUDIOVAU.INI file is constructed using a standard Windows INI file format. The file is equipped with:

- Section Names
- Key Names

To edit the AUDIOVAU.INI file we suggest using the PFE (Programmers File Editor Program)



AUDIOVAU.INI SECTIONS DESCRIPTION

The opening section of the AUDIOVAU.INI is commonly referred to as the general section. Some lines are more interesting than others:

HostID=
Host ID number. Must be unique over all hosts in the work group. Numbers range from 1 to 254.

HostName=
The NETBIOS name of this workstation. It does NOT have to be the same as the PC's computer name however it is recommended.

DataBaseName=
Sets the primary Database path for applications requiring access to an AVAir Database. Setting the path via UNC is preferred.

Custom1=
This is general for the station's call letters, as the font is large and the field is wide enough for about 4 characters. (99-Jazz)

Custom2=
This is most often the slogan or motto. (WBEI)

Custom3=
This is usually set to "AudioVAULT". (Cool Jazz)

ShutdownDialog=
Setting the value to "False" will cause the AudioVAULT program to exit. Setting the value to "True" will result in a "mission critical" dialogue box prompt before shutting down applications.

MergeFormats=
The defined formats available in the Import/Export playlist drop-down box. Each format refers to a "Fmt." INI section. Custom sections can be defined. The first format in this line will be the default format.

DirectoryFormats=
The defined formats available in the Search Format drop-down box. Each format refers to a "Fmt." INI section. Custom sections can be defined. The first format in this line will be the default format.

MaintenanceFormats=
The defined formats available in the Maintenance Search Format drop-down box. Each format refers to a "Fmt." INI section. Custom sections can be defined. The first format in this line will be the default format.

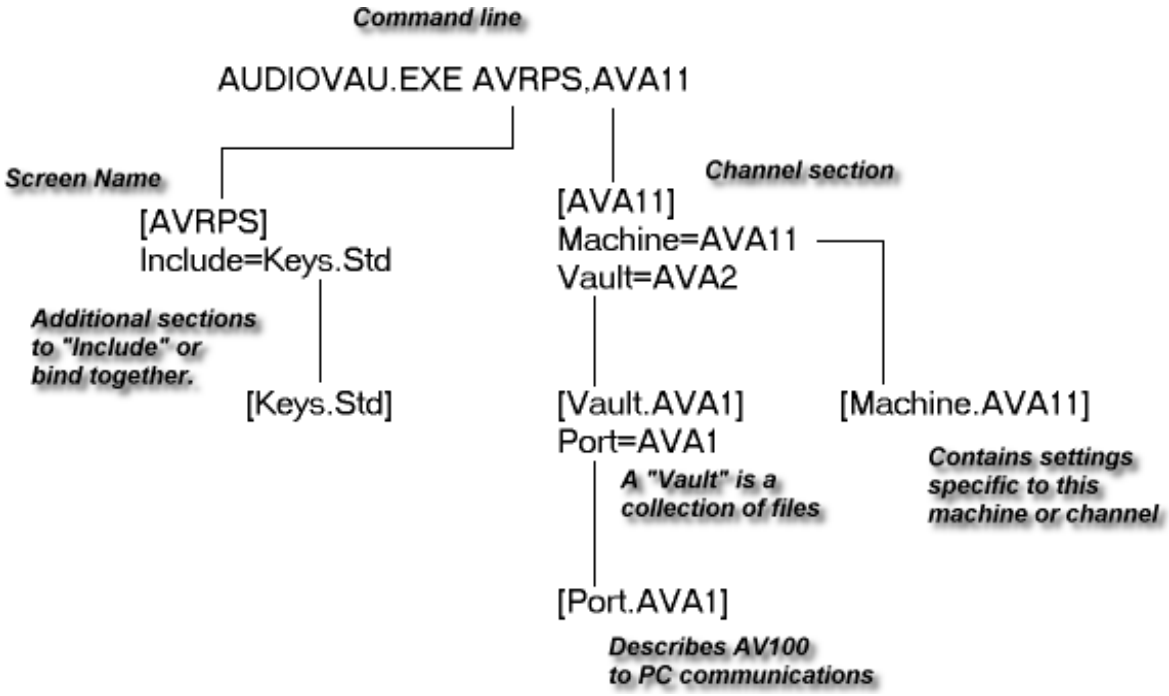
KillFormat=
The format to be used for Start/Kill Dates. (mm/dd/yy)

DefaultCutCategory=COM
Sets category default for new Cuts. Maximum of 3 letters.

DefaultListCategory=COM
Sets category default for new Lists. Maximum of 3 letters.

The rest of the AUDIOVAU.INI file is divided into the sections for:

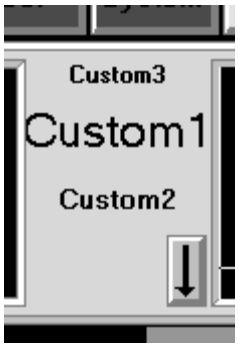
- Sections describing various screen displays. Combine with [Channel] section on the icon's command line.
- Keyboard Mappings and button defaults.
- Card/Hardware sections
- Satellite Automation Decoder Starts



CUSTOMIZING AUDIOVAULT

There are a number of ways to customize the AudioVAULT. One simple way is by using the Custom lines. By setting the value of Custom1, Custom2 and Custom3, you can add call letters, card assignments and even short identifiers to the AudioVAULT screen.

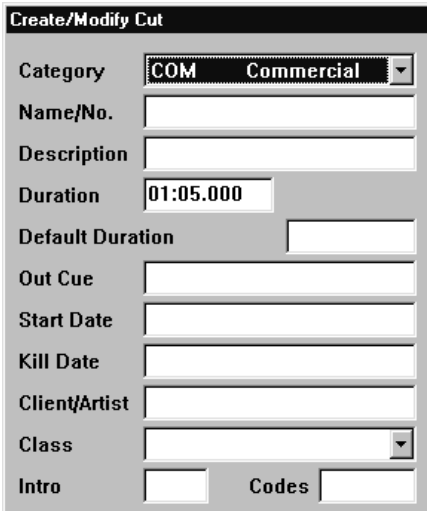
Custom1=Custom1
Custom2=Custom2
Custom3=Custom3



Custom1=Prod 1
Custom2=AVB11
Custom3=WBEI

Custom lines are added manually to the AUDIOVAU.INI in either the screen section ([AVRPS], [AVSAT]) or the card section ([AVB11], [PCR41]). You can also define the Custom lines in AVCFG.

You can also change some of the prompts in the Create/Modify Cut dialog. By default, when you go to record a cut, you should see something like this:



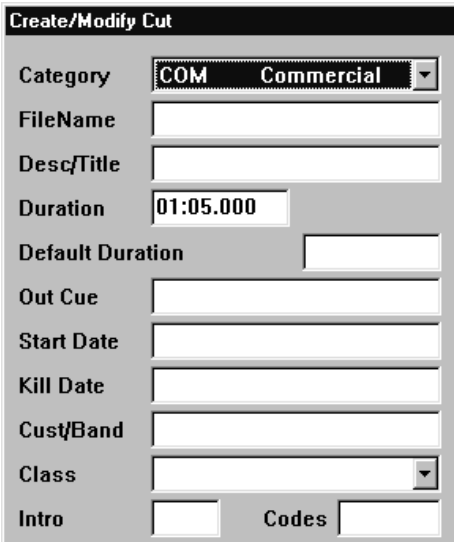
Many of those prompts can be renamed something that might make more sense to your users:

Field	Description
CutNamePrompt	The text to left of Name/No. field on Cut-Info dialog.
CutDescPrompt	The text to the left of Description field on Cut-Info dialog
ClientIDPrompt	The text to the left of Cut-Info and List-Info dialogs.

So if we make some changes in the AVRPS section, like this:

CutNamePrompt=FileName
CutDescPrompt=Desc/Title
ClientIDPrompt=Cust/Band

We wind up with a Create/Modify Cut dialog like this:



MOVING THE AUDIOVAULT SCREEN

By default, the AudioVAULT screens position themselves in the top left-hand corner of the display:

By modifying the Top and Left values in the INI like this:

[AVRPS]
AVRPS_Load=Top=75:Left=70

We can center or move the position of the AudioVAULT screen by the specified number of pixels.

You can even use this command to move the AudioVAULT screen to the right hand side of a dual monitor display, simply by adjusting the pixel values.

MODIFYING DEFAULT BUTTONS

The record default buttons are intended to make production much quicker--simply click one button, enter the spot name, description, out cue and then ENTER.

They allow station-wide default choices of sample rate, compression, and stereo/mono settings, resulting in a simple choice for Production and a consistent sound for the station.

The record default buttons are configured in AUDIOVAU.INI, commonly in a section called [Buttons.Record]. Regardless of the section name, make sure it is listed on the **INCLUDE=** line in the main screen name. For example, if our AVRPS used [Buttons.Record3.1], our INI would contain lines like this:

```
[AVRPS]
Include=Buttons.Record3:1
```

Each button has a text caption, a face color, and a sequence of macro commands to execute when clicked. These three attributes are programmed in the INI using these commands for Button "X":

Command	Value	Description
DefaultX.Caption=	Text string	Changes the button caption.
CutInfo_Load=DefaultX.State=	0 (Green) 1 (Blue) 2 (Yellow) 3 (Red)	Changes the button color
DefaultX_Clicked=	Colon separated commands	Set defined fields to defined values when clicked. See list below for accepted values.

DEFAULTX_CLICKED= VALUES

Field name	Example values
Category	"COM" or "ID"
Duration	"1:32" or "5:02"
DefaultDuration	Duration to use same value, or put different value like "5:32"
StartDate	"03/04/2000", "TOMORROW", "TODAY"
KillDate	"TOMORROW", "TODAY", "TODAY+7", "TODAY+30"
Stereo	1=On, 0=Off
BeginAutoTrim	1=On, 0=Off
TrimDiscard	1=On, 0=Off
Class	"FM", "AM", "ALL"
SampleRate	48000, 44100, 32000, 26000, 22050
CompressionType	"NONE", "MPEG1", or "MPEG2"
MPEGMode	"JOINT", "STEREO", or "DUAL"
CompressionRatio	"3.2:1", "4:1", "6.4:1"
RedoAudio	1=On, 0=Off
RedoCues	1=On, 0=Off

By replacing the values in the default INI section, you can custom configure your stations Default buttons. You can even add buttons that fill in default File Names, Descriptions, and Start/Kill Dates.

Remember that an AUDIOVAU.INI is specific to a single workstation.changes would have to be copied to each workstation's INI for each workstation to be consistent.

IDD PROGRAMMING BASICS

One of the most common reasons to customize the **audiovau.ini** file is for remote control purposes. AudioVAULT commands with the exception of those requiring a parameter may be mapped to an external contact closure, most commonly via a BEI remote control card. The assignments must be located in one or more sections of the AUDIOVAU.INI. The remote control device must reside in the same PC. The assignments are loaded in two possible ways:

- When the AudioVAULT program starts
- With the LoadRemoteControl "Section-name" command is executed

IDD_ SYNTAX

All Remote Control lines follow the same basic syntax. All characters are case insensitive:

IDD_<command><n>=,BEI<b>:<polarity><input-bit>

IDD_	All remote control assignments begin with these four characters. IDD is short for IDentifier Device. Letter case is NOT significant for this, or any other, portion of the BEI board remote control assignment.
<command>	The AudioVAULT function or command being mapped.
<n>	The command selector, used to specify which deck a command applies to
=	An equal sign.
,	A comma identifies this statement as an input. Statements WITHOUT commas are interpreted by the system as Outputs.
BEI	Identifies the remote control device as a BEI remote control card. Other common options include PCR, COM, SEA, TCP and KEY
<b>	The device number.the BEI card number, or COM port for example.
:	A colon separating the Remote Control device from the Input Bit.
<polarity>	A plus sign (+) or a minus sign (-) or neither, which designates when to activate the command (<name>); use - to indicate a logic high voltage level and + for a logic low voltage level. If neither is specified, + is assumed.
<input-bit>	This lists the logical bit on the BEI port that is to be assigned the <name> function. This is not a DB-25 pin number. It also can refer to the AV100 Bit number, Serial/COM information, or Key.

CLICK AND UNCLICK

Some functions require a down (click) and an up (unclick), as the function repeats while held "down". Without the up definition, once invoked, the function would never stop. For example, if NextLine were mapped to a down button but not an up, the on-screen highlight bar would go into a run away condition--it would continue to NextLine until it reached the bottom of the list.

These commands most typically use the same BEI input bit for up and down mapping. A correct definition for the above-mentioned NextLine (and its brother PreviousLine) is:

IDD_NextLine1=,BEI1:-1,BEI1:+1
IDD_PreviousLine1=,BEI1:-2,BEI1:+2

MULTIPLE PUSH BUTTONS PER FUNCTION

In some cases the Customer requires two different commands to activate the same AudioVAULT function. Usually this involves a push button in addition to a keyboard function key. Separating the two assignments with a semicolon can easily accommodate this. Do NOT use two IDD_xxx statements, one for the BEI board and another for the keyboard key--only the first will be used by the AudioVAULT software.

Although not generally recommended, it is technically possible to map four or even five buttons or keyboard keys to a given function, providing the line length doesn't exceed about 250 characters.

WRITING MACROS

Macro statements can combine several actions or functions into a single command. We've already encountered some examples of Macros. **AVRPS_Load=Top=75**, DefaultX_Clicked=, and CutInfo_Load= are all Macros.

AudioVAULT also provides 15 Macro buttons that can be defined by the user, and clicked on-screen or from a playlist command. Macro definitions are written into the INI and must be placed in a section included with a screen to be accessible. A Macro can be a single command or a series of commands, all separated with a colon. For example:

Macro1_Clicked=Indicator1:LoadRemoteControl "ABC":LoadList2 "ABC-STACK"

When Macro1 is clicked, it would execute the instructions associated with **Indicator1** (*switch an audio switcher to input 1*), load the remote control section called **ABC**, and load the **ABC-STACK**.

Macro1 may be fired in a playlist, by clicking on the Macro1 button in an AudioVAULT screen with the mouse, or the Macro may be mapped to another remote control event:

IDD_Macro1=,KEY:F1;,BEI1:-4

OBJECTS AND PROPERTIES

In computer programming, an **object** is generally any item that can be individually selected and manipulated. This can include shapes and pictures that appear on a display screen as well as less tangible software entities. In object-oriented programming, for example, an object is a self-contained entity that consists of both data and procedures to manipulate the data.

In AudioVAULT, the properties of many objects can be manipulated with the built-in macro language.

Object: Button

Property	Valid Values	Example
State	0, 1, 2 0=Disabled (gray), 1=On, 2=Off	Macro9.State=2
Configuration	A string that defines the section in another INI file where the button's color information is to be extracted from.	Macro9.Configuration="#Color[Yellow]" *Refers to a [Yellow] section in a file called COLOR.INI.*
Visible	0 or 1 0=Not visible, 1=Visible	Quit.Visible=0
Caption	A string specifying the message to be displayed on the button.	Macro9.Caption="Re Rec"

Object: Indicators

Property	Valid Values	Example
Value	0 or 1 0=Off, 1=On	Indicator9.Value=1 *or simply* Indicator9=1 *Value is the object's default property.*
Duration	0ms through 4000000ms	Indicator9.Duration=250
Caption	A string specifying the message to be displayed on the Indicator button.	Indicator9.Caption="Cnn News"

Object: Combo Boxes

Property	Valid Values	Example
Enabled	0 or 1 0=Disabled, 1=Enabled	CutInfo_Load=Class.Enabled=0
Visible	0 or 1 0=Not visible, 1=Visible	CutInfo_Load=Class.Visible=0

Object: Text Boxes

Property	Valid Values	Example
Enabled	0 or 1 0=No editing, 1=Editing enabled	DefaultDuration.Enabled=0
Visible	0 or 1 0=Not visible, 1=Visible	CutInfo_Load=DefaultDuration.Visible=0

INDICATORS, MACROS, THE INCLUDE STATEMENT AND NULS

Adding or modifying AUDIOVAU.INI remote control information requires a thorough understanding of Indicators, Macros, the AudioVAULT "INCLUDE" statement, and NULs.

"**Indicators**" are software "buttons." Indicators can:

- Output NUL bits.
- Allow remote control of external equipment.
- "Fire" other events (including Indicators) when turned "on" or "off"
- Be "clicked" by hot keys, contact closures, playlists, and macros.
- Be momentary or latched operations.

- Have user-definable momentary durations.
- Have user-customizable button captions
- Present visual "on" and "off" states

"**Macros**" are another type of software "button." Macros can:

- Automate several simple steps into one.
- "Fire" other events (including Indicators) when turned "on" or "off"
- Be "clicked" by hot keys, contact closures, playlists, and macros.

The "**INCLUDE**" command allows several INI sections to be combined and be treated as one "machine." Each section to be included is defined in the INI and separated by a comma.

Important Note #1

Each AudioVAULT machine (defined as INI sections combined by the INCLUDE statement) can have a combined TOTAL of 15 Indicator and 15 Macro commands. For example, using the following statement:

```
[f3AVSat]
Include=Buttons.Record3:1,f3_RM,f3_AP
```

[F3AVSAT], [Buttons.Record3:1], [F3_RM], and [F3_AP] have a TOTAL of 15 Indicators and 15 Macros available.

Important Note #2

Indicator and Macro definitions are specific to each AudioVAULT machine, defined as INI sections combined by the INCLUDE statement. Another machine on the same workstation can have different Indicators and Macros. EACH machine can have a total of 15 Indicators and 15 Macros.

"**NULs**" are internal software wires. NULs can:

- Be sent and received by different INI sections or applications ON THE SAME COMPUTER.

Important Note #3

Since NULs can talk to other machines, defined as INI sections combined by the INCLUDE statement on the same computer, each **COMPUTER** is limited to a TOTAL of 56 NUL bits.

MISTAKES AND TROUBLESHOOTING

If an IDD_ line is written incorrectly, it will probably just be ignored. If problems exist follow these steps to resolve it:

1. Enable DebugFlags or trace logging.
2. Double-check all comma, semi-colon, and colon characters. Each is critical.
3. Try to simplify the assignment. See if you can get a part of it to function.
4. Look for duplicate statements. If an IDD_xxx function is listed more than once, then the first one is used.
5. IDD_xxx remote control commands are always checked and executed from left to right, top to bottom.
6. If multiple push buttons are connected to a given IDD_xxx command then additional ", down, up" instances are appended to the same line, separated by a semi-colon.
7. The BEI card or other remote control device must reside in the workstation. It is not possible to access remote control devices that are not local.

COMMANDS THAT CAN BE REMOTE-CONTROLLED

A

AbandonList<..8>	Discard list's changes and re-read from the SCSI drive.
About	Show AudioVAULT software version dialog.
ArmDeck<..8>	Preloads the specified deck's cut for instant audio upon start and sets timer/outcue.
AutoSegue<..8>	Enable the auto start + signs, if present.
AutoTrimCut<..8>	Run AutoTrim on the highlighted cut.

B

BeginAutoTrim	Toggle trim-after-record mode on RecordSet dialog, or AutoTrim now if Trim & Tones dialog is visible.
BeginSearch	Begin file select/maint database search.

C

Cancel	Most DONE buttons.
CancelDelete	"NO" in response to 'ARE YOU SURE'--don't actually delete it.
ClearList	Delete all lines in the currently loaded list.
CopyLine<..8>	Copy highlighted line to 'paste buffer'.
CreateList<..8>	Make a new/empty playlist, cart, stack, editlist, or cartlist.
CutLine<..8>	Move highlighted line to 'paste buffer'.
CutMenu<..8>	Show CUT menu.

D

Default<..8>	Presets fields on the record dialog to speed inventory production.
DelayNextLine<..8>	After the specified number of seconds, execute the next playlist event.
DeleteCut	Delete highlighted cut and removes the line from the list.
DeleteList	Delete the currently loaded list.

E

EditCues<..8>	Show Trim & Tones dialog for the cut.
EOM<..8>	Record: add a SEC tone upon depress, stop recording upon release. Playback: indicates the cluster's last cut's SEC.
ExecuteString	Execute ASCII commands in the serial port buffer.
ExportList	Export the currently loaded list to PC disk file or DOS device (i.e., PRN).
ExtendedCutModify	Visibility toggle dialog portion showing sample rate & compression.

F

FileMaintenance	Show dialog used to delete SCSI file inventory.
ForceLoad<..8>	Show load dialog even if list changes aren't saved.

H

Help	Display on-line help.

I

Indicator<..15>	General purpose remote outputs. Momentary or latched.
InsertCue	Trim & Tones INSERT: Inserts a 1/4 second SEC or TER tone at current cursor position.
InsertLine<..8>	Insert a new line after the highlighted line.

L

ListLabel<..8>	Show the list's label/header. Can change header details & rename list.
ListMenu	Show LIST menu.
ListName<..8>	Shows what list is loaded. Sets edit focus when clicked.
Load<..8>	Show load dialog.

M

Macro<..15>	Automate some simple steps into one.
MarkBegin	Set the selected tone's beginning to the cursor's position.
MarkEnd	Set the selected tone's ending to the cursor's position.
MergeList	Insert (import) PC disk file/list after highlighted line.
Minimize	Hide the AudioVAULT screen from view.
MixOver<..8>	Select satellite mix ratio 0 - 8. MixOverX is "hard wired" to StartX.
ModifyCut<..8>	Change the cut's label/header details. Use to rename cuts too.
ModifyLine<..8>	Change the highlighted line.

N

NextEdge	Scan towards the right for a tone or marker on Trim & Tones.
NextLine<..8>	Move highlighted bar down. Requires "unclick" if button-activated.
NextPage<..8>	Move highlighted bar down a page. Requires "unclick" if button-activated.

O

OK	Accept the settings. These buttons are also OK: ARE YOU SURE:YES TRIM & TONES:DONE LOAD:LOAD QUICKSTART:LOAD TIME ANNOUNCE:SET FORMAT.

P

PasteLine<..8>	Insert 'paste buffer' after highlighted line.
Pause	Pause playing/recording.
Play	Play audio from cursor on Trim & Tones.
Power	Free the AV-to-Screen assignment.
Preview<..8>	Play intro & outro of each spot in cluster.
PreviousLine<..8>	Move highlighted bar up. Requires "unclick" if button-activated.
PreviousPage<..8>	Move highlighted bar up a page. Requires "unclick" if button-activated.

Q

QuickStart<..32>	QuickStart shows QuickStart dialog. QuickStart1 or greater executes a QuickStart line.
Quit	Shutdown AudioVAULT program.

R

Record<..8>	Re-record the deck's cut which is highlighted. TimedRecord is preferred.
RecordSet<..8>	Show record new cut dialog.
Reload<..8>	Get list changes made at other workstations.

S

SaveList<..8>	Save list changes to SCSI disk.
SaveListAs<..8>	Copy the loaded list to another list.
ScanForward	Audible scan towards end of cut.
ScanReverse	Audible scan towards front of cut.
Secondary	Adds a SEC tone on record. Indicates SEC tone on play.
SegueLine<..8>	Toggle the line's auto start + sign.
SelectDeck<..8>	Set edit focus to this deck.
SelectMachine<..8>	Flip screens in a multi-screen configuration.
SetClock	Update the PC clock NOW!
SkipForward	Skip to next cut.
SkipReverse	Skip to previous cut begin point.
Start<..8>	Start if no deck is running. Else nothing.
StartASAP<..8>	Start this deck as soon as possible.
StartImmediate<..8>	Stop the running deck, then start this one.
StartQueued<..8>	Start this deck once the running deck stops.
Stop<..8>	Stop playing/recording.
Submenu<1..8>	Show dialogs: 1=Ext 2=Files 3=Misc 4=Macros 5=Indicators 1 - 8 6=Indicators 9 - 15.
SwapLine<..8>	Swap pre-SWAP line with post-SWAP line.
SystemInfo	Show SCSI disk fullness/error dialog.
SystemMenu	Show SYSTEM dialog.

T

Tertiary	Adds a Tertiary tone on record.
TimedRecord<..8>	Set the cut's duration then re-record the cut.
TrimCut<..8>	Show Trim & Discard dialog.

Z

ZoomIn	Magnify around the cursor on Trim & Tones.
ZoomOut	Opposite of ZoomIn.

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Section 7: AVSat

By the end of this section, you should understand the following concepts:

- How AVSat can manage multiple audio sources
- How AVSat mixes input and hard drive audio
- How to plan AVSat strategies
- How to write AVSat playlists

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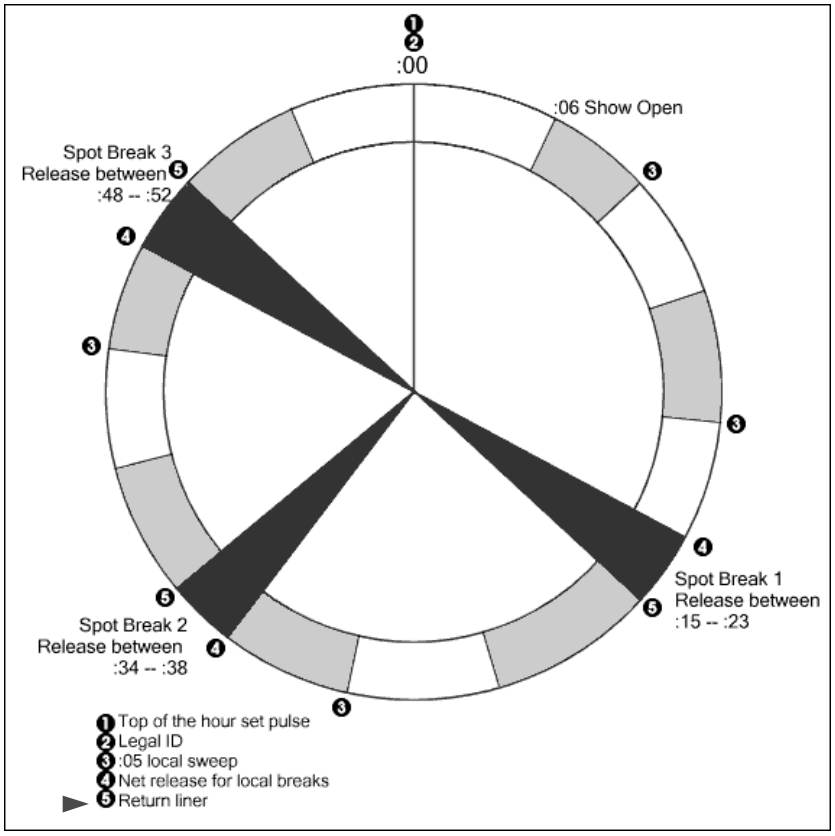
AVSAT

The application that makes the most use of AudioVAULT's powerful remote control language is AVSat. It is the AudioVAULT application designed to put satellite-delivered formats on the air. It combines satellite audio with local commercials and liners to localize network content.

AVSat can respond to signals called **closures** or **relays** from a network provider and insert local events into satellite audio.

Network providers offer a map of how an hour of satellite programming is schedule in the form of a **format clock**. The format clock describes when each closure is sent, and what each closure should do. Each closure is like a pair of wires.when the closure is **fired**, the wires are touched together, completing an electrical circuit. Your AudioVAULT can watch those wire pairs, and when it sense the completed electrical circuit, it can perform an action.

In the example to the right, when the jock at the network hits a button on his console that causes a 0 to fire, the AudioVAULT should play a return liner.



The actual command that we program into the AudioVAULT (*a process called* ***mapping***) is actually a command to start a specific deck. So when AVSat senses a completed circuit on the wires attached to relay 5, it starts the deck mapped to that closure. As long as we have a return liner loaded in that deck, the right audio element will play. Working with the engineering staff, programming has to make sure that the right audio is loaded at the right time, so when the closure comes down from the network, the correct audio plays.

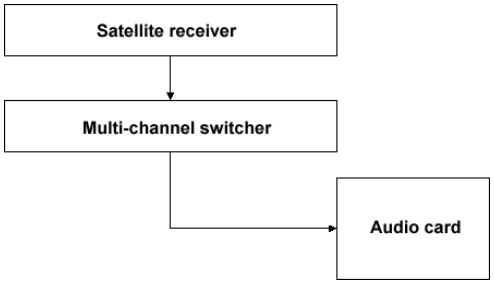
Commands are mapped in a file called the **audiovau.ini** in **remote control sections**.

MANAGING MULTIPLE AUDIO SOURCES

AVSat can integrate incoming satellite audio feed with AudioVAULT inventory. AVSat can be in one of three conditions:

- Sending satellite audio directly to the air chain during normal programming by passing audio from the card's inputs to its outputs.

- Muting satellite audio to play commercial elements when signaled to by the satellite.
- Mixing satellite audio and local elements like liners, jingles, and station IDs. AVSat can actually **duck**, or reduce the volume, of the satellite audio feed as it plays back recorded elements. When these elements are finished playing, the satellite audio feed returns automatically to its standard output level.



In all three cases, there are two sources of audio: audio feeding from a satellite receiver to the input of the audio card, and audio generated from a local volume.

Each AudioVAULT application is assigned to a specific audio channel. AVSat requires the dedicated use of a channel with record capability. AVSat, like all applications, can use audio cards that are either local to the workstation or remotely located in a server. The only way AVSat can control the level of the satellite audio to handle ducking while playing back local elements is to have the satellite audio running through the audio card.

AVSat can only adjust the audio coming into the record input of the specified audio card. The card's input can be wired directly to the output of a satellite receiver or other device if you're only going to be using a single network provider.

If you're going to be using programs from multiple sources, you'll have to run each source to the input of a multi-channel switcher. By controlling the switcher from AVSat, the selected audio will be allowed to pass to the card.

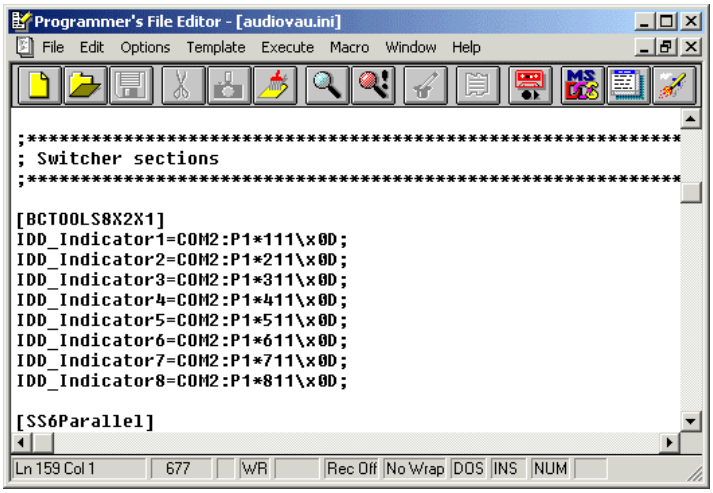
The switcher can be remote controlled by commands in the AVSat playlist. AudioVAULT uses commands called **Indicators** and **Macros** to reference instructions coded into the **audiovau.ini** file.those instructions send commands to the switcher through contact closures, serial strings from a COM port, or through a TCP/IP connection.

INDICATORS: SELECTING THE SATELLITE SOURCE

Indicators and Macros are written into the AVSat workstation's **audiovau.ini** file. Depending on the type of switcher you're using, the commands in the ini file will vary. You should be able to develop a grid showing the relationship between the Indicator or Macro and what's wired to each switcher channel.

The example to the right shows 8 Indicators, each switching between channels on a switcher. To program anything useful with them, we'd need a grid like this:

	Switcher channel	Audio/Network
Indicator 1	1	ABC
Indicator 2	2	WOR
Indicator 3	3	CBS
Indicator 4	4	WW1
Indicator 5	5	JONES
Indicator 6	6	Premiere 1
Indicator 7	7	Premiere 2
Indicator 8	8	Premiere 3



What's important to know is that each Indicator or Macro corresponds to a specific satellite source or channel on the audio switcher. Once we know what audio is associated with Indicator, we can switch between the different audio sources

by entering the Indicator number as a playlist command or by clicking on the Indicator button (**SystemIMiscIIndicators** on the AudioVAULT menu).

CONTROLLING THE BROADCAST TOOLS 8X2 SWITCHER

The example INI section above shows commands written for the 8x2 switcher from Broadcast Tools. The **8 x 2** is designed to accommodate 8 stereo inputs and 2 stereo outputs. It's possible to switch between inputs using contact closures or using RS232 serial commands.

By default, the 8x2 switcher looks for COM port settings of 2400-N-8-1, no flow control. It's often easier to confirm control of the unit through an application like HyperTerminal before tackling the project in the AUDIOVAU.INI.

Burst Mode Command Syntax Overview

The 8x2 looks for a string like this to execute a switch:

P(x)*(I)(O)(S)<enter>

P(x)	If a password is configured (x), the Password must precede all command strings.
*	All burst mode commands begin with an asterisk.
(I)	Input
(O)	1 - Connect input channel to Output 1 2 - Connect input channel to Output 2 B - Connect input channel to Both Outputs 1 & 2 0 - Disconnect input channel from both Output channels 4 - Connect input channel to Output 1 regardless of Mode 5 - Connect input channel to Output 2 regardless of Mode 6 - Disconnect input channel from Output 1 regardless of Mode 7 - Disconnect input channel from Output 2 regardless of Mode
(S)	Should the switcher provide a status response? 1 displays status, 0 does not.
<*Enter*>	Executed with the string \x0D

AUDIOVAU.INI Programming

To send the kind of string the 8x2 requires, we need a section like this in the **audiovau.ini**:

```
[BCTOOLS8X2]
IDD_Indicator1=COM2:P1*111\x0D
IDD_Indicator2=COM2:P1*211\x0D
IDD_Indicator3=COM2:P1*311\x0D
IDD_Indicator4=COM2:P1*411\x0D
IDD_Indicator5=COM2:P1*511\x0D
IDD_Indicator6=COM2:P1*611\x0D
IDD_Indicator7=COM2:P1*711\x0D
IDD_Indicator8=COM2:P1*811\x0D
```

This INI section assumes a switcher with a password of 1. Each input would be connected to the specified output.

Changing the Password

Front panel switches One and Two must be held down while the password command is entered, so this is best done through HyperTerminal. To set the Password to "01," for example, the following string is entered through HyperTerminal:

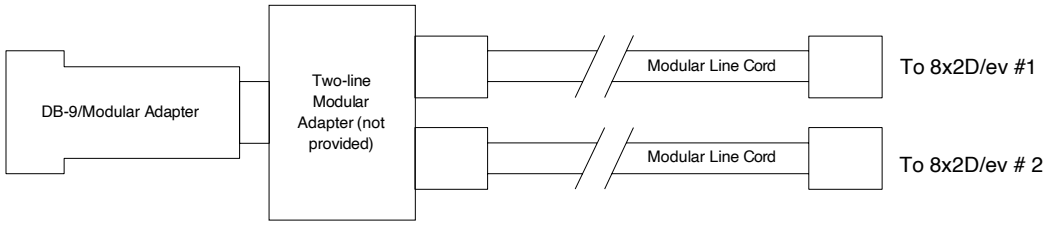
***P01<enter>**

Operating Two 8 x 2's from a single computer

Multiple **8x2**'s may be cascaded serially to operate from the same serial port. The first step is to assign ID's (passwords) to each 8 x 2. One suggestion is to assign P1 to the first 8x2 and P2 to the second switcher.

The second step is to parallel the serial ports of the 8x2's. Plug the male end of the duplex modular adapter into the supplied female DB-9 to RJ-11 adapter, then attach the supplied modular line cords into each of the duplex modular adapter receptacles and the other ends into each 8x2 modular receptacles. See the diagram below.

Note: Three or more 8x2's may be daisy chained by using the above description and a Radio Shack 279-410UK 5-jack modular adapter



We also need to adjust our INI section. Remember, each AudioVAULT machine (defined as INI sections joined together with the Include= line) has only 15 Indicators. Commands are differentiated by Password:

```
[BCTOOLS8X2]
IDD_Indicator1=COM2:P1*111\x0D
IDD_Indicator2=COM2:P1*211\x0D
IDD_Indicator3=COM2:P1*311\x0D
IDD_Indicator4=COM2:P1*411\x0D
IDD_Indicator5=COM2:P1*511\x0D
IDD_Indicator6=COM2:P1*611\x0D
IDD_Indicator7=COM2:P1*711\x0D
IDD_Indicator8=COM2:P1*811\x0D
IDD_Indicator9=COM2:P2*111\x0D
IDD_Indicator10=COM2:P2*211\x0D
IDD_Indicator11=COM2:P2*311\x0D
IDD_Indicator12=COM2:P2*411\x0D
IDD_Indicator13=COM2:P2*511\x0D
IDD_Indicator14=COM2:P2*611\x0D
IDD_Indicator15=COM2:P2*711\x0D
```

PLANNING AVSAT STRATEGIES

As you prepare to implement AVSat at your site, it's important to begin the project with a lot of planning. Since our goal is to use the AudioVAULT to reproduce what we're doing on the air now, that's where we start.with a clear definition of what we're doing now. For each different day of the week, make a grid showing what happens and when.

Time	Program	Network
0900	ABC News	ABC
0904	**Live News**	Local
0906	Dr. Joy Browne	WOR
1000	ABC News	ABC
1004	**Live News**	Local
1006	Dr. Joy Browne	WOR
1100	ABC News	ABC
1104	**Live News**	Local
1106	Dr. Joy Browne	WOR
1200	ABC News	ABC
1204	**Live News**	Local
1300	ABC News	ABC
1304	**Live News**	Local
1306	Dr. Laura	Premiere 1

For each day of the week, AVSat will have two playlists. One playlist will contain information about the commercials and liners that will play.the **traffic playlist**. The other list will describe the different switches that will execute.the **control playlist**.

The switches described here will be written into a control playlist that will load automatically in AVSat when the program starts, and will load the next day's schedule at a specified time.

	Switcher channel	Audio/Network
Indicator 1	1	ABC
Indicator 2	2	WOR
Indicator 3	3	CBS
Indicator 4	4	WW1
Indicator 5	5	JONES
Indicator 6	6	Premiere 1
Indicator 7	7	Premiere 2
Indicator 8	8	Premiere 3

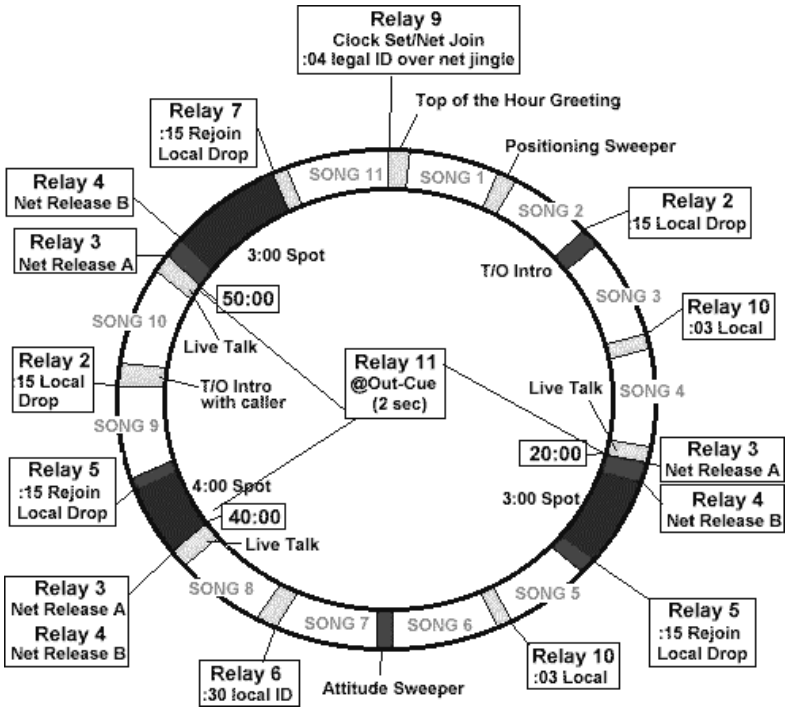
The switches are executed based on Indicator number. This is where our Indicator-Network assignment grid comes in handy.

Time	Program	Network	Indicator
0900	ABC News	ABC	1
0904	**Live News**	Local	--
0906	Dr. Joy Browne	WOR	2
1000	ABC News	ABC	1
1004	**Live News**	Local	--
1006	Dr. Joy Browne	WOR	2
1100	ABC News	ABC	1
1104	**Live News**	Local	--
1106	Dr. Joy Browne	WOR	2
1200	ABC News	ABC	1
1204	**Live News**	Local	--
1300	ABC News	ABC	1
1304	**Live News**	Local	--
1306	Dr. Laura	Premiere 1	6

Based on the way we wired our audio switcher, we now know that at 0906, when we need to switch to Dr. Joy Browne on the WOR Radio Network, we need to fire an Indicator 2 from AVSat. That Indicator will send the correct commands to the switcher to send WOR audio to our AudioVAULT. Now we can add this information into our strategy grid.

WRITING REMOTE CONTROL SECTIONS

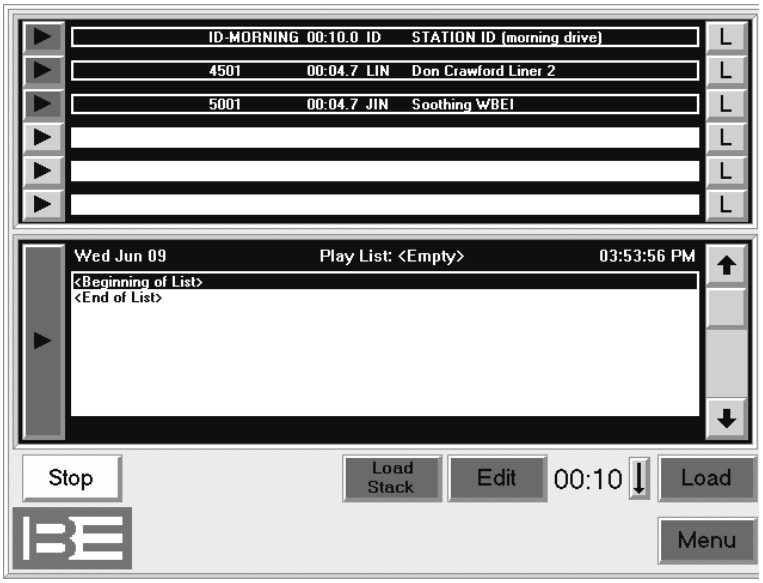
Contact closures from an external tone decoder are used to fire specific Decks in AVSat. For example, looking at the format clock of **Neon Nights** from Jones Radio Networks, we can see how each relay is designed to trigger a certain type of event:



Each relay is "mapped" to start a certain Deck, which will have the appropriate type of liner loaded and waiting, like a cart in a cart deck. When the closure comes down, AVSat recognizes it and starts the correct deck. Using "Neon Nights" again, we decide how to load the liners:

JRN Relay	Purpose
Relay 1	--
Relay 2	:15 Local Drop (T/O Intro)
Relay 3	Net Release A
Relay 4	Net Release B
Relay 5	:15 Rejoin
Relay 6	:30 Local ID
Relay 7	:15 Rejoin (Last break of hour)
Relay 8	--
Relay 9	:04 Legal (Dry over Net Jingle)
Relay 10	:03 Local Drop
Relay 11	:02 Out Cue for breaks 1,2 & 3

There are 5 different lengths: 2 seconds, 3 seconds, 4 seconds, 30 seconds, and 15 seconds. (Even though the 15 seconds liners have three different purposes, we only have 6 decks to work with.Decks 2 through 7. All three use the same liner for different purposes, so we can combine them into one deck)
Our AVSat will wind up like this:



Deck 2 - :04 Liner
Deck 3 - :15 Liner
Deck 4 - :30 Liner
Deck 5 - :02 Liner
Deck 6 - :03 Liner
Deck 7 - Unused

Deck 1 - Traffic Playlist

Deck 8 - Control Playlist
(Deck 8 is hidden)

Why did the cuts wind up in those specific decks? No reason, really. Once you determine what you need, assign them to the decks in whatever order makes the most sense to you.

Now that we know what JRN Relay is associated with each type of liner, and we know which AVSat deck those liners are in, we can associate the JRN Relays with their AVSat decks.

JRN Relay	Purpose	AVSat Deck
Relay 1	--	--
Relay 2	:15 Local Drop (T/O Intro)	3
Relay 3	Net Release A	--
Relay 4	Net Release B	1
Relay 5	:15 Rejoin	3
Relay 6	:30 Local ID	4
Relay 7	:15 Rejoin (Last break of hour)	3
Relay 8	--	--
Relay 9	:04 Legal (Dry over Net Jingle)	2
Relay 10	:03 Local Drop	6
Relay 11	:02 Out Cue for breaks 1,2 & 3	5

Each AVSat deck will be started with a contact closure on a specific BEI card pin, so we can assign those as well:

JRN Relay	Purpose	AVSat Deck	BEI Pin
Relay 1	--	--	--
Relay 2	:15 Local Drop (T/O Intro)	3	3
Relay 3	Net Release A	--	--
Relay 4	Net Release B	1	1
Relay 5	:15 Rejoin	3	3
Relay 6	:30 Local ID	4	4

Relay 7	:15 Rejoin (Last break of hour)	3	3
Relay 8	--	--	--
Relay 9	:04 Legal (Dry over Net Jingle)	2	2
Relay 10	:03 Local Drop	6	6
Relay 11	:02 Out Cue for breaks 1,2 & 3	5	5

Why are those pins mapped to those specific decks? No reason, really. It seemed to make sense to map a pin to a corresponding deck number. Again, you can set it up so it makes sense to you.

Using this information, I can write my remote control section. We know an INI section is identified by a Section name in brackets and a series of keys and values. We'll call this one "AVSAT.NEON"

```
[AVSAT.NEON]
IDD_Start1=,BEI1:-1
IDD_Start2=,BEI1:-2
IDD_Start3=,BEI1:-3
IDD_Start4=,BEI1:-4
IDD_Start5=,BEI1:-5
IDD_Start6=,BEI1:-6
```

A closure on pin 1 will start deck 1, and so on. We can Include this section and make it part of AVSat by listing it in AVSat's Include line like this:

```
[AVSAT]
Include=AVSAT.NEON
```

Now, whenever we start AVSat, it will map those contact closures to those Start functions.

CHANGING REMOTE CONTROL SECTIONS

You probably aren't going to run the same Satellite show all day long. Since each show is different, you need a way to change how AVSat responds to contact closures. We do this by adding new Remote Control sections, and switching between them using a command called **LoadRemoteControl**. This command may be used in a Macro or a playlist. Syntax is:

LoadRemoteControl "SectionName"

For example, after we run Neon Nights, we want to disable the remote starts. A live jock will be on the air, and we don't want JRN accidentally firing liners. We need to "unmap" the remote controls. To unmap a function, load IDD_xxx= where there is nothing on the right hand side of the equal sign. Our new Remote Control section will look like this:

```
[AVSAT.NoNEON]
IDD_Start1=
IDD_Start2=
IDD_Start3=
IDD_Start4=
IDD_Start5=
IDD_Start6=
```

Unmentioned IDD statements are left unchanged.

ADDING REMOTE CONTROL INFORMATION TO OUR GRID

Provider changes and Remote Control Section changes usually go hand in hand. When we're on ABC, we'd want the ABC remote control section loaded for example.

Time	Program	Network	Indicator	RC Section
0900	ABC News	ABC	1	[ABC]
0904	**Live News**	Local	--	[Live]
0906	Dr. Joy Browne	WOR	2	[DrJoy]
1000	ABC News	ABC	1	[ABC]
1004	**Live News**	Local	--	[Live]
1006	Dr. Joy Browne	WOR	2	[DrJoy]
1100	ABC News	ABC	1	[ABC]
1104	**Live News**	Local	--	[Live]
1106	Dr. Joy Browne	WOR	2	[DrJoy]
1200	ABC News	ABC	1	[ABC]
1204	**Live News**	Local	--	[Live]
1300	ABC News	ABC	1	[ABC]
1304	**Live News**	Local	--	[Live]
1306	Dr. Laura	Premiere 1	6	[DrLaura]

So we can add the information to our grid, and now have everything we need to write a control playlist:

Time
Indicator
RemoteControlSection

WRITING THE CONTROL PLAYLIST

You can create and write the control playlist in AVRPS. First, open AVRPS and click on the **List** menu button.

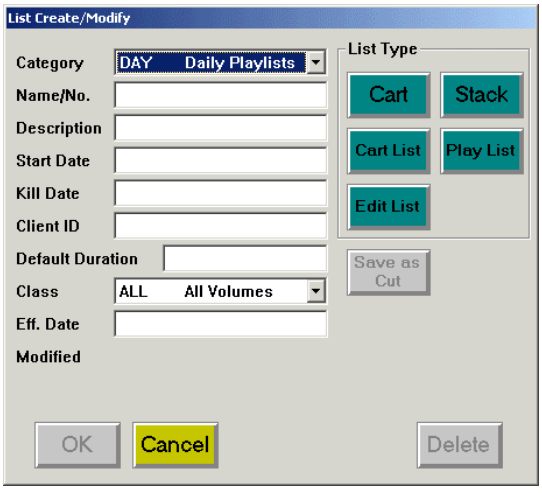
Since we're creating a new list, click **New**.

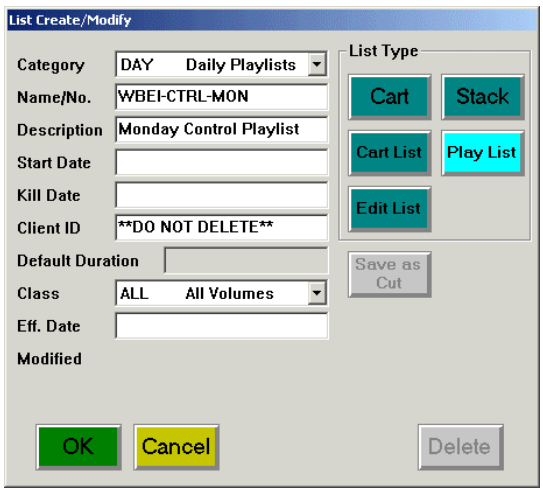
The **List Create/Modify** dialog will appear. Here, you'll enter the information pertaining to our new list.

Like all AudioVAULT files, you'll need to assign this file to a **Category**. It's recommended you keep all satellite playlists in the same category.

The playlist will also need a unique name. Select a name that includes a reference to the day of the week.we'll use that reference to load the playlist into AVNet later. The recommended naming convention is **CTRL-DAY**. **CTRL-MON**, **CTRL -TUE**, etc.

If you have multiple stations using AVSat, simply append the call letters or some other identifying string to the beginning of the list name. **AM-CTRL-MON** or **WBEI-CTRL-MON** for example.





For this example, we've set a category of **DAY**, given the list the name **WBEI-CTRL-MON**, a description of **Monday Control Playlist**, and selected the **Playlist** type. We also added the text ****DO NOT DELETE**** to the **ClientID** field. Labeling the file clearly can reduce the chance that it will be deleted accidentally.

Once you've set the properties of your list, click **OK**.

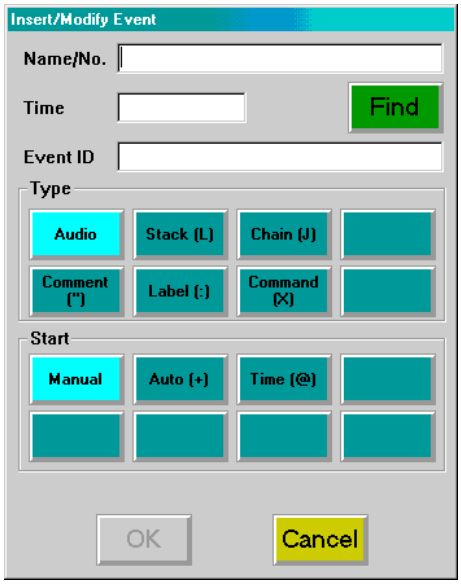
The next step is to begin inserting lines of instruction into our new list. Click **Insert Line**.

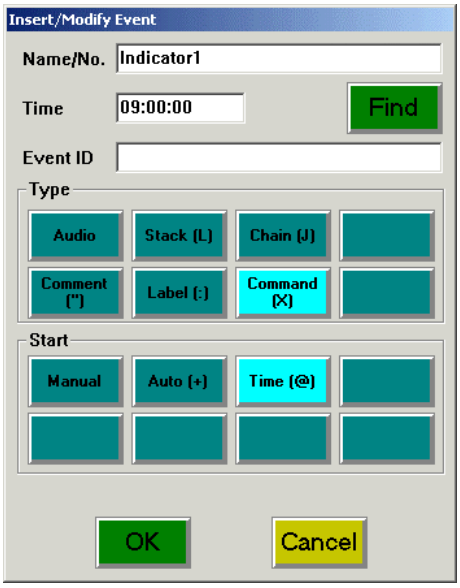
This opens the **Insert/Modify Event** dialog.

The **Name/No.** field accepts the actual instruction codes.

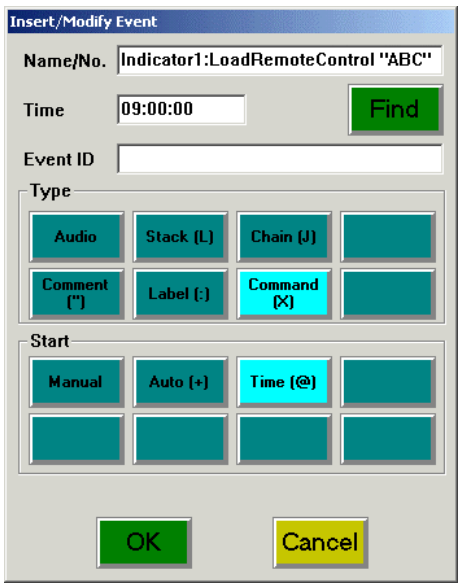
If this event is supposed to execute at a specific time, enter the time in the **Time** field in **HH:MM:SSA/P** or **24-hour** format.

In the **Type** group, there are several options. For control playlists, most events will be time-started commands.





Our strategy grid says we need to switch to ABC at 0900. To get ABC audio from the 8x2 switcher, the AudioVAULT needs to fire an Indicator 1. In our playlist, we add a time-started command and put **Indicator1** in the playlist as a time-started command. With this control playlist loaded in AVSat, at 9:00 AM, the command **Indicator1** will execute which tells the switcher to switch to ABC. Other commands can be entered into the control playlist, detailing every switch that AVSat needs to make in a day.

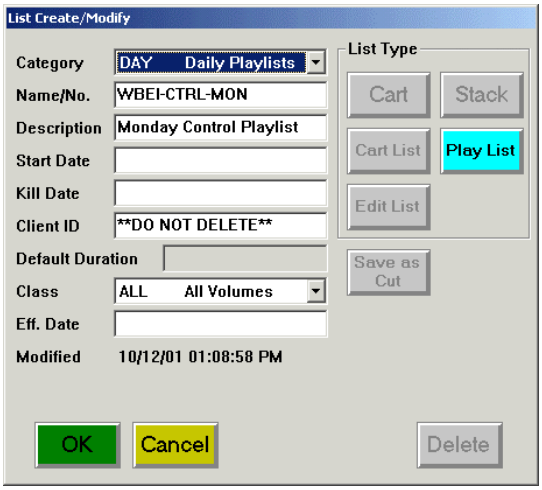


Multiple commands can be programmed on the same line, using a colon to separate them.

For example, we can switch Indicators and load a remote control section by putting both instructions in the same time-started command.

You'll need seven playlists

You'll need to create playlists for every day of the week, even if the only event in the playlist is a join command to the next day. If you're doing completely different events every day, it may be necessary to write each daily control playlist individually. If you're following basically the same schedule every day however, you can just save the same list to a new file and make copies of your work.



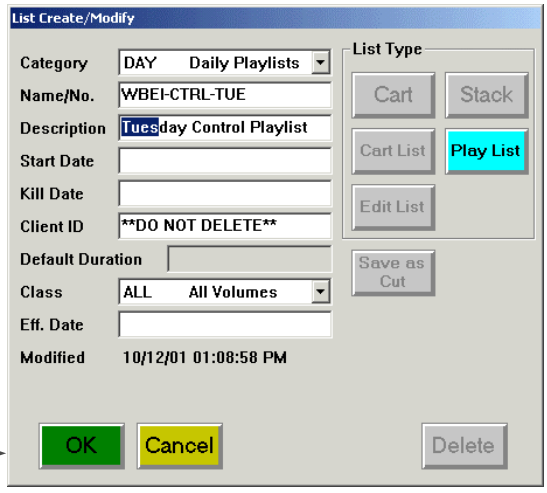
To save a playlist with a different name, first load the list you want to copy into AVRPS.

Click the **List** button on the AVRPS menu bar, and click **Save As**. This brings up the **List Create/Modify** dialog.

Change the **Name/No.** field to the new name, and change any other text fields as appropriate.

In this example, we're saving **WBEI-CTRL-MON**, the **Monday Control Playlist**, as **WBEI-CTRL-TUE**, the **Tuesday Control Playlist**.

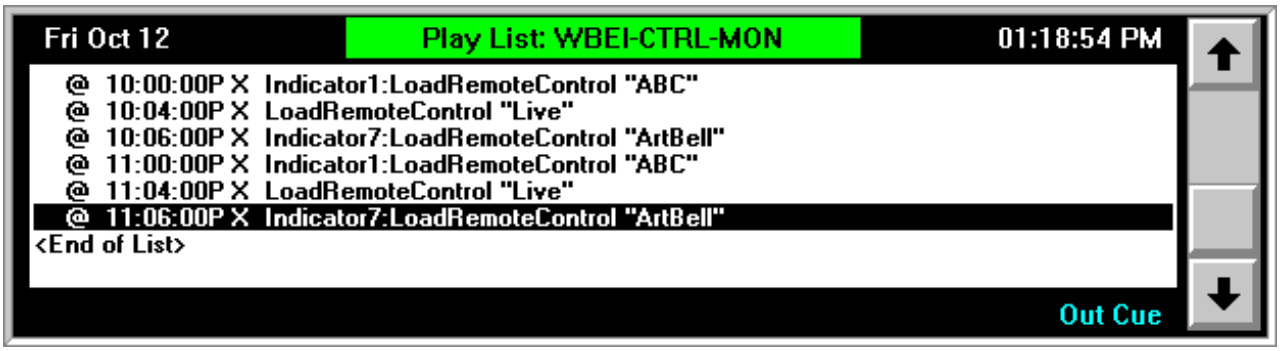
When you've made your changes, click **OK**.



Chaining the lists together

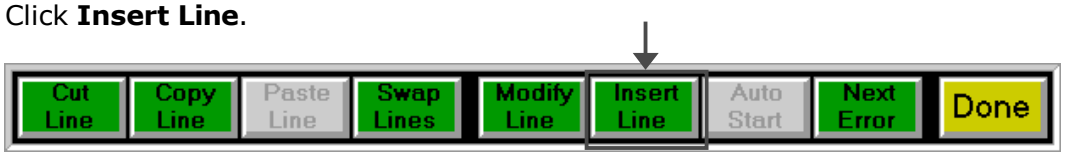
The last thing to do is to chain the seven lists together. The **chain** function is what loads the next day's list. You'll chain Monday's list to Tuesday's list, and so on.

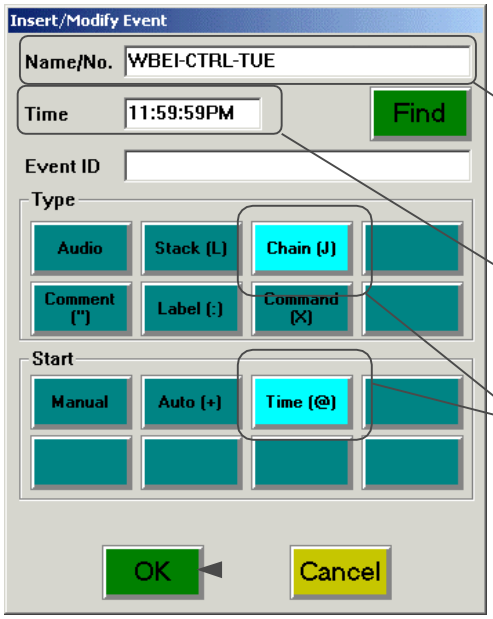
To insert a chain command, load the first playlist into AVRPS. We want to position the **Chain** command as the event of the day, so click the last event in the playlist. This repositions the black **highlight bar**. All new lines are inserted into the playlist immediately after the highlight bar.



Click the **List** button on the menu bar, and since we're adding something to the contents of the list, click the **Contents** button.

Click **Insert Line**.





Type the name of the following day's list in the **Name/No.** field.

WBEI-CTRL-TUE

Enter the time for the **Chain** command to execute. All of the chain times for the series **must be the same**!!

11:59:59PM

.and we'll define this playlist line as a.

time-started Chain command

When you've completed the settings, click **OK** to accept your changes.

After inserting the Chain command, click **Save** on the menu bar to save the playlist.

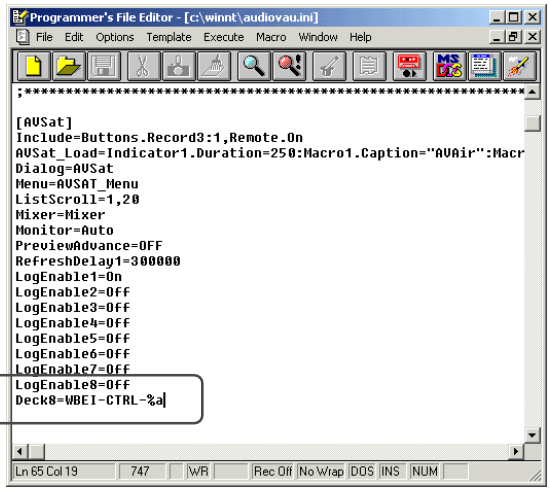
Make sure you get the correct Chain command in each of the seven daily playlists. Even if you're not recording any events on a day, you need to have a playlist with a **chain** command in it.

It's also very important that each Chain command be scheduled for the exact same time each day.

Loading a playlist in AVSat on startup

On startup, AVSat looks in the **audiovau.ini** file for default parameters. The file is located in your Windows directory (***c:\windows*** or ***c:\winnt***) and can be modified in a standard text editor like **Programmer's File Editor** or **Notepad**.

Open the INI file and find the section used by your AVSat. If you're not sure which section is being called, check the icon's command line. You can search for **[AVSAT]** using your editor's **find** feature.



Look for the **Deck8=** statement. This specifies the AudioVAULT file that AVSat will load into deck 8 on startup. If the line doesn't exist, you can add it.

The default value is **AM-0/oa**. **0/oa** is a wildcard for the three letter day of the week abbreviation. AVSat is smart enough to know what day it is, and can load the correct list. With that default value, if you restarted on Monday, AVSat would automatically load an AudioVAULT file called **AM-MON** into deck 8 on startup.

If the value was set to **WBEI-CTRL-0/oa**, and you restarted on Wednesday, AVSat would automatically load an AudioVAULT file called **WBEI-CTRL-WED** into deck 8 on startup.

Additional lines can be added to load other playlists into other decks.the traffic playlist into Deck 1 for example.

Once the file is loaded, the **Chain** commands take over, loading the next day's list each night.

Control playlists can be complex, but with proper planning, they're not difficult to write or understand. Once they're complete, they only need to be modified if you change programming. It's also recommended they be exported to text files and stored on floppy disks for backup purposes.

RECOVERY PROCEDURES

When AVSat is restarted, it's important to make sure the proper source and remote control sections are loaded.to make sure the right audio is on the air, and that the remote control events are correct for that satellite provider.

Defaults can be written into the INI file, telling AVSat to load a specific remote control section, to go to a specific source, and to load the correct day's playlist on start up. If AVSat is restarted during a time when those defaults are valid, there is no recovery procedure.the correct playlists will be loaded and ALIGNs will catch up the schedule to where it needs to be.

Time	Program	Network	Indicator	RC Section
0900	ABC News	ABC	1	[ABC]
0904	**Live News**	Local	--	[Live]
0906	Dr. Joy Browne	WOR	2	[DrJoy]
1000	ABC News	ABC	1	[ABC]
1004	**Live News**	Local	--	[Live]
1006	Dr. Joy Browne	WOR	2	[DrJoy]
1100	ABC News	ABC	1	[ABC]
1104	**Live News**	Local	--	[Live]
1106	Dr. Joy Browne	WOR	2	[DrJoy]
1200	ABC News	ABC	1	[ABC]
1204	**Live News**	Local	--	[Live]
1300	ABC News	ABC	1	[ABC]
1304	**Live News**	Local	--	[Live]
1306	Dr. Laura	Premiere 1	6	[DrLaura]

If AVSat is restarted when those defaults **aren't** valid, it's a little more difficult.

Obviously, the first thing to do is know what Indicator and remote control section **is** valid for a given time. It's a good idea to make a hard copy of your program log and to keep it near the AVSat. By looking at the program log, you know at any given time what Indicator you **should** be on, and what remote control section **should** be loaded.

It's possible to program an AudioVAULT button called a Macro to switch to a specific source and load the associated remote control section with a single mouse click. This is the easiest way to get AVSat back on track.have the program log list the right Macro for each program segment.

Time	Program	Network	Indicator	RC Section	Macro
0900	ABC News	ABC	1	[ABC]	1
0904	**Live News**	Local	--	[Live]	2
0906	Dr. Joy Browne	WOR	2	[DrJoy]	3
1000	ABC News	ABC	1	[ABC]	1
1004	**Live News**	Local	--	[Live]	2
1006	Dr. Joy Browne	WOR	2	[DrJoy]	3
1100	ABC News	ABC	1	[ABC]	1
1104	**Live News**	Local	--	[Live]	2
1106	Dr. Joy Browne	WOR	2	[DrJoy]	3
1200	ABC News	ABC	1	[ABC]	1
1204	**Live News**	Local	--	[Live]	2
1300	ABC News	ABC	1	[ABC]	1
1304	**Live News**	Local	--	[Live]	2
1306	Dr. Laura	Premiere 1	6	[DrLaura]	6

You can access Macros on the AVSat screen. Up to 8 macros are available on-screen.

If you don't have a program log or programmed macros, you can get the same information from the control playlist itself **if** you know the name of the list. Load the list into Deck 1 (*it's normally in Deck 8, which is hidden*) and scroll down to the current time.

Back up to see what was the last Indicator fired; highlight that line and manually fire the command by clicking on the big green start button to the left of the playlist. You will want to do the same thing to load the correct Remote Control Section

If you load the Control Playlist into Deck 1, be sure you load the correct playlist back into the Deck when you're done!

CASE STUDY: USING AVAIR AND AVSAT FOR SATELLITE SHOWS

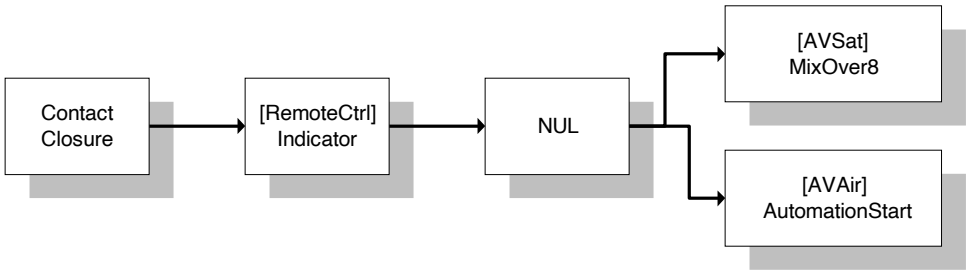
The combination of these two AudioVAULT programs is used to allow stations to run satellite shows through AVSat, but play back commercial inventory through AVAir. This is especially handy when the station is already using AVAir.only one commercial log must be generated instead of separate logs for AVAir and AVSat. AVSat is brought into the mix for several reasons:

- Easier mapping of contact closures to start audio cuts like Liners and Legal Ids.
- AVSat can use the audio card's mixer to duck Satellite audio. AVAir cannot.
- AVSat can handle switching between multiple Satellite sources. AVAir cannot.

Tasks handled by AVSat	**Tasks handled by AVAir**
Satellite switching	Playback of Commercials
Playback of Programming Elements	

Satellite audio is automatically "ducked" as the Liners and Ids play back from AVSat. When AVSat receives a closure to fire a commercial break, however, satellite audio is muted and the commercial break is started in AVAir. Muting and UnMuting of Satellite audio is accomplished using the audio card's mixer.

The commercial break contact closure mutes the satellite (using the MIXOVER command) and starts the AVAir Automation using a NUL:



INI PROGRAMMING FOR AVAIR/AVSAT

```
[AVSat]
Include=NoNeon
AVSat_Load=Indicator1.Duration=250

Deckl=CTRL-%a
  IDD_Power=NUL:3
IDD_MixOver8=,NUL:3

  [Neon]
IDD_Startl=
IDD_Start2=,BEIl:-2
IDD_Start3=,BEIl:-3
IDD_Start4=,BEIl:-4
IDD_Start5=,BEIl:-5
IDD_Start6=,BEIl:-6
IDD_Start7=
IDD_Start8=
IDD_Indicator1=,BEI1:-l4 NUL:l
IDD_MixOver8=,NUL:l
IDD_MixOver0=,NUL:2

[StartAVAir]
IDD_Startl=
IDD_Start2=
IDD_Start3=
IDD_Start4=
IDD_Start5=
IDD_Start6=
IDD_Start7=
IDD_Start8=
IDD_Indicator1=NUL:l,BEIl:-2
IDD_MixOver8=,NUL:l
IDD_MixOver0=
  [NoNeon]
IDD_Startl=
IDD_Start2=
IDD_Start3=
IDD_Start4=
IDD_Start5=
IDD_Start6=
IDD_Start7=
IDD_Start8=
IDD_Indicator9=
IDD_MixOver8=
IDD_MixOver0=
```

AVSAT section
Loads the "NONEON" section on power-up
Sets Indicator9 Duration to 250ms

Loads Control Playlist in Deck l

Uses the Power Button to go to "Silent" state on
Power-up. See Mixer.Mixer section.

All Liners fire normally from their respective Relays.

When the Net Release closure fires,
Indicatorl fires a NUL:l, which changes the Mixer settings to Mute
Satellite audio via the MIXOVER8 command.
It also fires "AutomationStart" in AVAir. @See [AVAir] SectionA

The IDD_MixOver0 line responds to commands from AVAir to UnMute
Satellite audio.

At the end of the show, the Control Playlist loads the StartAVAir
section, which unmaps most liners.

.and changes the function of BP Relay 9 to fire Indicatorl,
and then fire NUL:l,
which Mutes Satellite audio via the MixOver8 command
and fires "AutomationStart" in AVAir. @See [AVAir] SectionA

Of course, we must have a section to unmap
remote assignments.

```
[Mixer.Mixer]
          Pad   H   x      x   x      A   x      x   x
Mixer0=   #,    0,  #,     #,  #,     0,  #,     #,  #
Mixerl=   #,    0,  #,     #,  #,     #,  #,     #,  #
Mixer2=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer3=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer4=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer5=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer6=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer7=   -2,   0,  #,     #,  #,     #,  #,     #,  #
Mixer8=   #,    #,  #,     #,  #,     #,  #,     #,  #
```

The Mixer section controls the on-card mixer.

Mixer8 sets EVERCTDINE to "F" or OGG. This line is invoked using the "MixOver8" command.

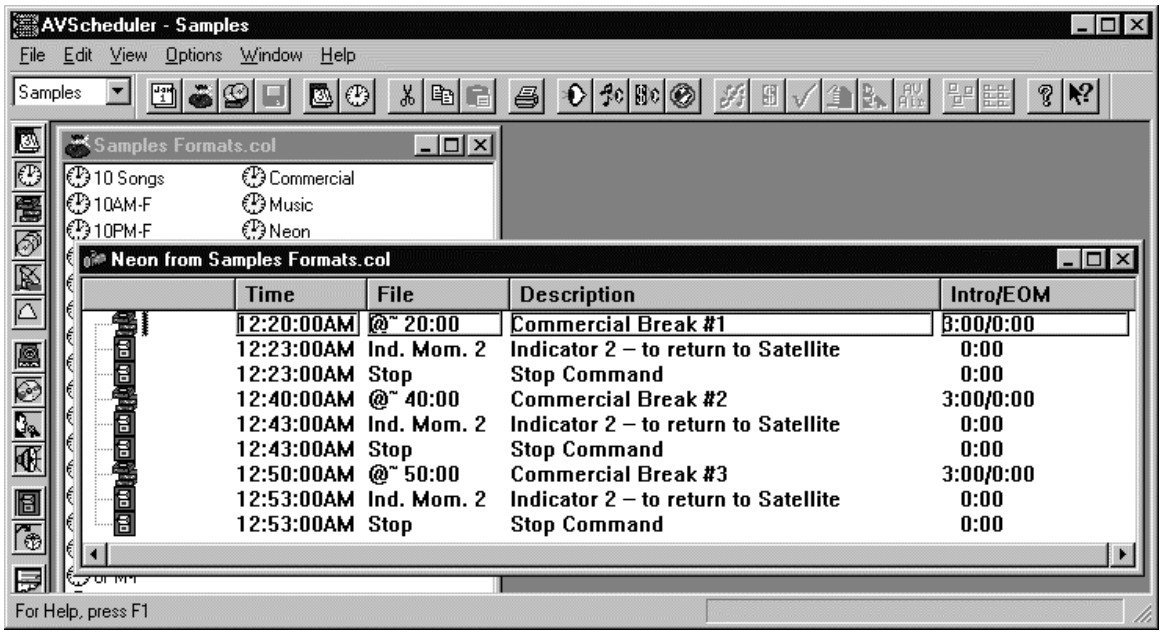
```
[AVAir]
IDD_AutomationStart=,NUL:1
  RelayMomentaryTime=250
IDD_Indicator2=NUL:2
```

NUL:1 will start Automation.

The RelayMomentaryTime line gives RMO events scheduled in AVAir a duration.

When fired by AVAir, Indicator2 fires a NUL:2, which will restart Satellite audio if the affiliate chooses not to cover a break. Otherwise, un-muting is handled by the return liner.

TYPICAL AVSCHEDULER HOUR



Section 8: AVNet

By the end of this section, you should understand how to:

- Wire AVNet
- Integrate audio switchers
- Plan Net Delay strategies
- Write Net Delay playlists

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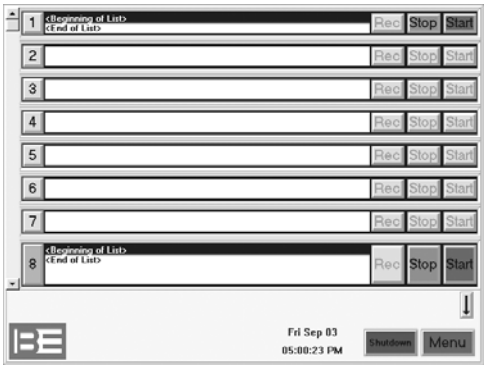
AVNET

AVNet is an AudioVAULT application designed specifically to automatically record network audio feeds. AVNet can operate without any manual intervention.

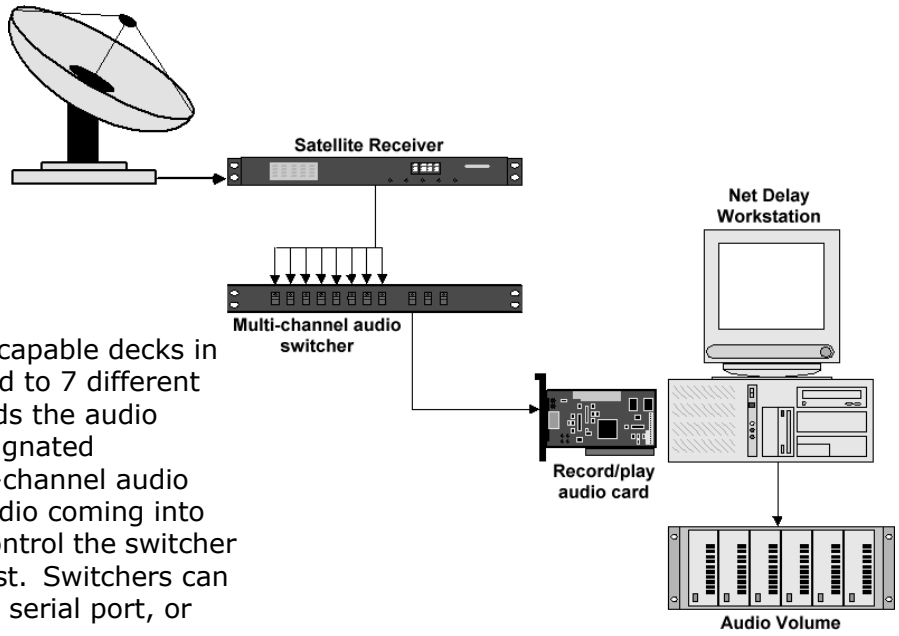


AVNet is basically an automated tape recorder. Using an AudioVAULT playlist, you can program AVNet to start recording an AudioVAULT cut at a specified time.

AVNet operates using an AudioVAULT Record/Play channel. **Deck 8** (the bottom deck in AVNet) contains a **control playlist**, which contains instructions describing details about each recording. Decks 1 through 7 are used to hold the cut currently being recorded. Even though there are 7 decks, AVNet can only record one event at a time.

Closure relays can also be wired to a remote control card in the workstation running the AVNet screen. Multiple decks are provided for ease of remote control wiring with multiple satellite channels.

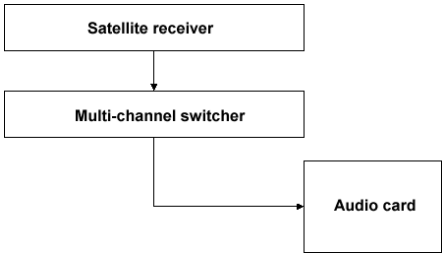
Audio is routed to the input of the Record/Play card assigned to the AVNet screen. Recorded feeds are stored on the main AudioVAULT volume, so the cuts are available automatically to the rest of the system.



Even though there are 7 record-capable decks in AVNet, the program is not limited to 7 different audio feeds. AVNet simply records the audio feeding into the input of the designated Record/Play card. Using a multi-channel audio switcher, you can change the audio coming into the audio card. Commands to control the switcher are included in the control playlist. Switchers can be controlled by contact closure, serial port, or TCP/IP connection.

WIRING AVNET

Each AudioVAULT application is assigned to a specific audio channel. AVNet requires the dedicated use of a channel with record capability. AVNet, like all applications, can use audio cards that are either local to the workstation or remotely located in a server. Regardless of where the physical audio card is located, AVNet will use that card to convert audio coming into the sound card into digital AudioVAULT files.



AVNet will only record the audio coming into the record input of the specified audio card. The card's input can be wired directly to the output of a satellite receiver or other device if you're only going to be recording from a single audio source.

If you're going to be capturing programs from multiple sources, you'll have to run each source to the input of a multi-channel switcher. Then wire the output of the switcher to the input of the audio card. Each channel is hot going into the switcher, but only the selected audio will be allowed to pass to the record card. The switcher can be remote controlled by commands in the AVNet playlist. AudioVAULT uses commands called **Indicators** and **Macros** to reference instructions coded into the **audiovau.ini** file.those instructions send commands to the switcher through contact closures, serial strings from a COM port, or through a TCP/IP connection.

Using AVNet also effectively precludes the use of the card's playback capability. The record and play capabilities of the audio cards are tied together, and are exclusive. You wouldn't be able to use AVAir for example, to play from the playback side of an AVNet record channel. First, they're not able to operate in both modes concurrently. Second, the monitor signal would play back through the AVAir wiring when AVNet is recording.

PREPARING FOR AUTOMATED RECORDING

The key to using AVNet is **planning**. Wiring AVNet is the easy part. Even writing the automation instructions (***playlists***) is simple once you've planned ahead.

A **playlist** is an AudioVAULT file that contains instructions that tell AVNet what to do and when. It's organized into **lines**, and stored as an AudioVAULT file. Playlists are written in an AudioVAULT screen like AVRPS.

As you think of AVNet playlists, think of recording a program to cassette or reel. You would do something like:

1. Set the audio source.
2. Insert or cue a tape.
3. Set the recorder to pause-and-record.
4. Start the recording.

AVNet follows those same steps, so you'll need to know the same information for each cut to be recorded in AVNet:

- The AudioVAULT Indicator or Macro associated with the recording's audio source
- The AudioVAULT filename of the cut to be recorded
- When each recording should begin
- The duration of each recording

Since AVNet playlists are generally written in sequential order, one of the handiest tools you can use in planning an AVNet record schedule is a grid like this:

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck

By filling out a grid entry for AVNet record event, you accomplish several important things. Not only do you gather all the information you'll need to write your playlist, you'll ensure that you're not trying to overlap your record events. If you start to overlap record events, you'll need an additional instance of AVNet.

Determining the Feed and Start Times

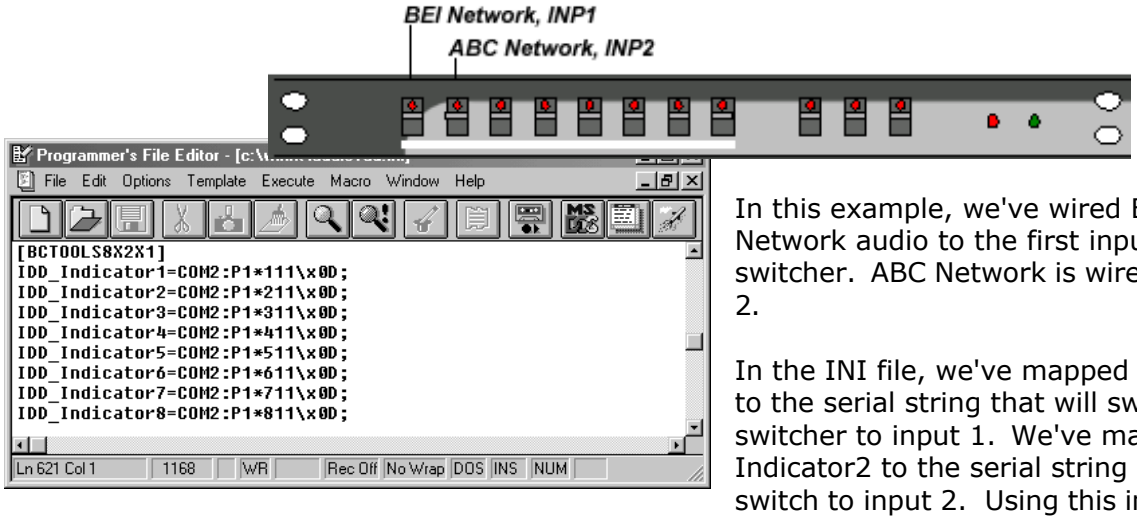
You should be able to track down the actual **feed time** of your net delay events fairly easily. As you decide what event you want to capture, when does the network begin sending the audio? If you want to record the BEI Network feed of "*Today in AudioVAULT News*" that comes down at noon, the feed time is 12:00:00. Arrange every feed you'll take in a day in chronological order, with one entry in your grid for each feed. If you record the top of the hour news every hour, your grid for Monday would have 24 entries describing those feeds.

As you fill out your record grid, try to factor in 15 seconds on either side of the recording. This gives the system time to load and arm a recording. So for the BEI Network feed "Today in AudioVAULT News," the feed time is at 12:00:00, but the **start time** is 11:59:45. So for this feed, our grid will be filled out like this so far:

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45				

Determining the Source

Source refers to the AudioVAULT Macro or Indicator that will route the correct audio to the input of the sound card. Since these commands often control a multi-channel switcher for example, each Macro or Indicator will be associated with a specific input of your switcher. Each input in turn, will be physically wired to a receiver or other audio source. Macro and Indicator **remote-control mappings** are established in the **audiovau.ini** file. Contact Broadcast Electronics Digital Customer Service for more help with writing remote control sections.



In this example, we've wired BEI Network audio to the first input on our switcher. ABC Network is wired to input 2.

In the INI file, we've mapped Indicator1 to the serial string that will switch our switcher to input 1. We've mapped Indicator2 to the serial string that will switch to input 2. Using this information, writing **Indicator1** in the playlist will switch the switcher to the first input, or the BEI Network.

Writing **Indicator2** in the playlist will switch the switcher to the second input, or the ABC Network.

In your grid, write the correct Indicator or Macro.

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45	Ind1			

If you're only recording a single audio channel, not using a multi-channel switcher, or you're manually switching between sources, you won't need to add a source statement to the playlist.

Determining the Filename

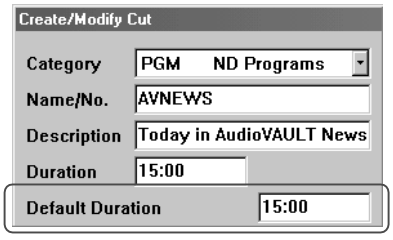
AVNet uses the **timed record** feature of AudioVAULT to record over existing AudioVAULT cuts. AVNet does not automatically create new cuts for each recording, so cuts must be created in the system for AVNet to function. The cut can have any name that conforms to standard AudioVAULT naming conventions (13 alphanumeric characters and no spaces), but it's suggested that you give the cuts descriptive names. For our "*Today in AudioVAULT News*" feed, we could create an AudioVAULT cut named **AVNEWS**. If we recorded the file every day, and wanted to keep a week's worth of programs in the system, we could create multiple cuts called **AVNEWS-MON**, **AVNEWS-TUE**, and so on. How you name the cuts isn't important.you could use just numbers or develop your own coding system.as long as they conform to the AudioVAULT naming requirements and they make sense to you.

Once you've decided how to name your cuts for each feed, add them to your grid:

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45	Ind1	AVNEWS		

Determining the duration

The **timed record** feature uses the **Default Duration** attribute of the cut to determine how long the recording should be. AVNet cuts are created like any other AudioVAULT cut.most commonly in AVRPS. It may be advantageous to create a separate AudioVAULT category to help track your Net Delay files (see the **Category Add** topic in the AudioVAULT Help File).



In AVRPS, click **Record** to create a new cut. On the **Create/Modify Cut** dialog, assign the new cut to a category. Give the file a name and a description, and specify the **Default Duration**. In this example, the program we're recording is fifteen minutes long, so we'll set the **Default Duration** to **15:00**.

If the feeds you're recording have a history of not being an exact length, you may want to set the **Default Duration** longer than the actual scheduled duration. In your control playlist, you can have AVNet start recording a little early, and let the cut record for a little longer than the scheduled duration. By expanding this record window, you can capture the entire feed. There will likely be a period of fine-tuning after you start capturing network feeds.

Once you've decided how long the recording needs to be, add the value to your grid:

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45	Ind1	AVNEWS	15:00	

While the duration value isn't actually coded into the control playlist, it's an important value to know. Having it in a record grid can help you make sure you're not overlapping events. When the cut being recorded hits the **Default Duration**, the recording will stop automatically, just like a reel-to-reel running out of tape.

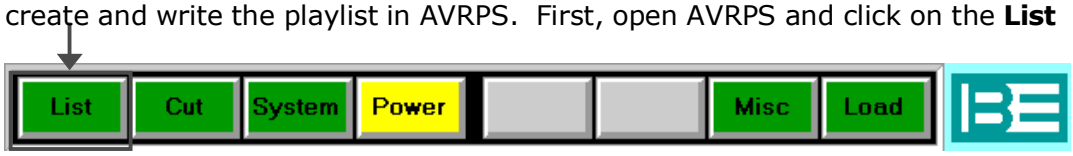
Determining the record deck

Even though AVNet can only record one event at a time, AVNet has seven decks capable of recording. It was set up this way to allow for easier remote control configuration. If you're using contact closures to start your recordings, consider using different decks for each source. Since you can only record one event at a time anyway, you can safely do all your recordings in AVNet's Deck 1 as long as you're using time-started commands instead of contact closures.

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45	Ind1	AVNEWS	15:00	1

Writing the Playlist

Now that we have this information, we have everything we need to write the playlist. You can create and write the playlist in AVRPS. First, open AVRPS and click on the **List** menu button.

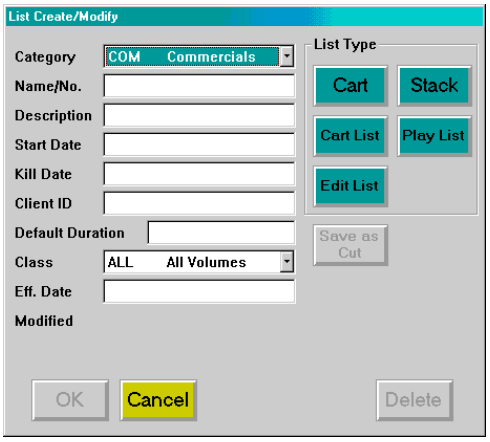


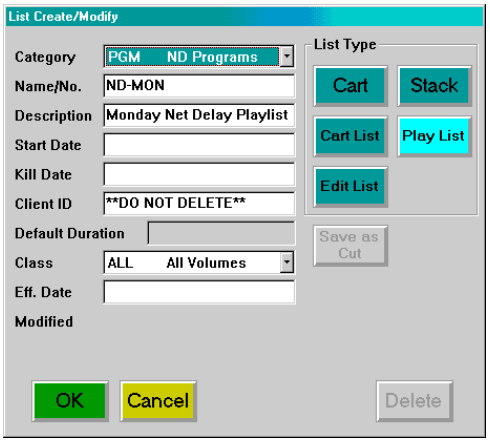
Since we're creating a new list, click **New**.

The **List Create/Modify** dialog will appear. Here, you'll enter the information pertaining to our new list.

Like all AudioVAULT files, you'll need to assign this file to a **Category**. It's recommended you keep all net delay cuts and playlists in the same category.

The playlist will also need a unique name. Select a name that includes a reference to the day of the week.we'll use that reference to load the playlist into AVNet later. The recommended naming convention is **ND-DAY**. **ND-MON**, **ND-TUE**, etc.





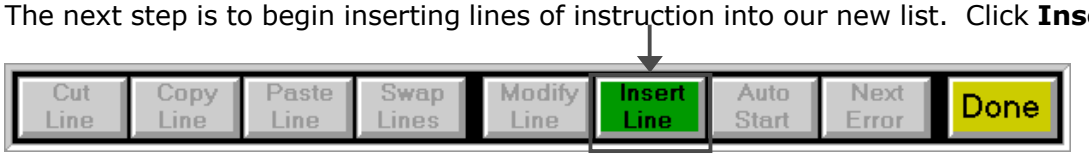
Click the **Playlist** button in the **List Type** group and add any other desired text. This is one of the few instances where it's recommended **Start Date** and **Kill Date** are left blank.it keeps the playlist out of any pre-start or post-kill file maintenance searches.

For this example, we've set a category of **PGM**, given the list the name **ND-MON**, a description of **Monday Net Delay Playlist**, and selected the **Playlist** type. We also added the text ****DO NOT DELETE**** to the **ClientID**

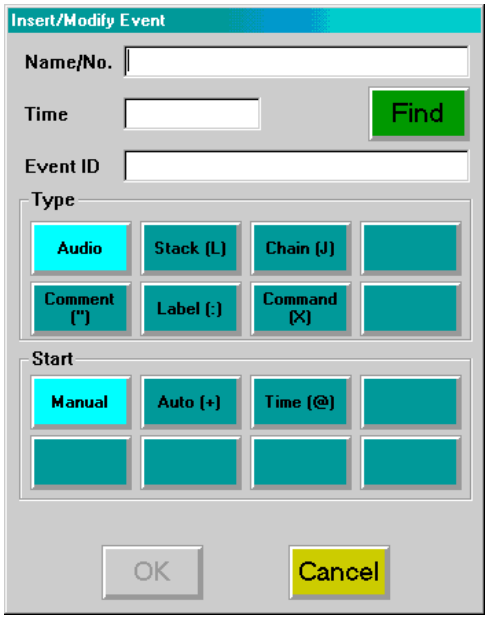
field. Labeling the file clearly can reduce the chance that it will be deleted accidentally.

Once you've set the properties of your list, click **OK**.

The next step is to begin inserting lines of instruction into our new list. Click **Insert Line**.



This opens the **Insert/Modify Event** dialog.



The **Name/No.** field accepts the actual instruction codes.

If this event is supposed to execute at a specific time, enter the time in the **Time** field in **HH:MM:SSA/P** or **24-hour** format.

In the **Type** group, there are several options. For AVNet playlists, the major ones we need to be concerned with are:

Chain (J)	This loads the next day's playlist
Comment (")	You can add comments to your playlist
Command (X)	Most lines in the playlist are commands, or automation instructions

In the **Start** group, we specify how this line of code executes:

Manual	Some process executes the line. This could be a mouse click on the screen, a contact closure, or another playlist command.
Auto (+)	This starts this event automatically as soon as the previous event executes.
Time (@)	This starts the event at the time specified in the **Time** field.

Common playlist commands

As we prepared to write our playlist, we outlined the steps that need to happen:

1. Set the audio source.
2. Insert or cue a tape.
3. Set the recorder to pause-and-record.
4. Start the recording.

All we have to do is translate these commands into AudioVAULT language:

Process	AudioVAULT Command	Syntax
Set the audio source	Indicator or Macro	Indicator**X** or Macro**X**, where **X** is the Indicator or Macro number.
Insert or cue a tape	LoadList	LoadList**X "FILENAME"**, where **X** is the AVNet deck being loaded, and **"FILENAME"** is the AudioVAULT cut to load.

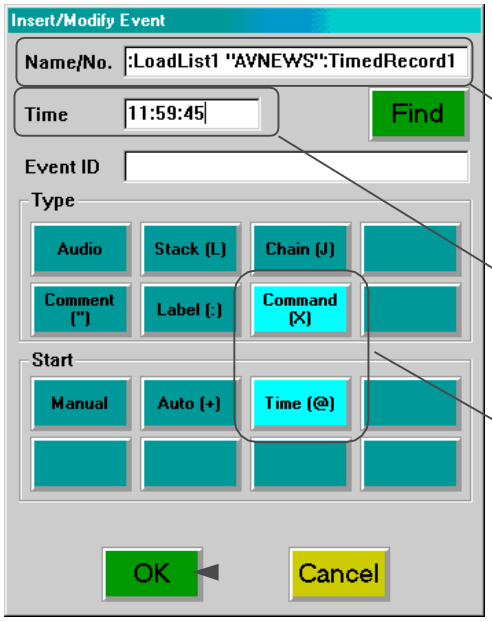
Pause-and-record	TimedRecord	TimedRecord**X**, where **X** is the AVNet deck
Start the recording	Start	StartX, where **X** is the AVNet deck

Using our record grid, we've answered most of these questions already.

Monday Record Schedule					
Feed Time	Start Time	Source	Filename	Duration	Record Deck
12:00:00	11:59:45	Ind1	AVNEWS	15:00	1

So we can write our playlist line using that information:

Process	Grid Field	AudioVAULT Playlist Command
Set the audio source	Source	Indicator1
Insert or cue a tape	Record Deck Filename	LoadList1 "AVNEWS"
Pause-and-record	*--None--*	TimedRecord1
Start the recording	*--None--*	Start1



Using colons to separate them, we can type the commands into the **Name/No.** field in the **Insert/Modify Event** dialog.

Indicator1:LoadList1 "AVNEWS":TimedRecord1

We'll use our record grid's **Start Time** entry to tell AVNet when to execute this event.

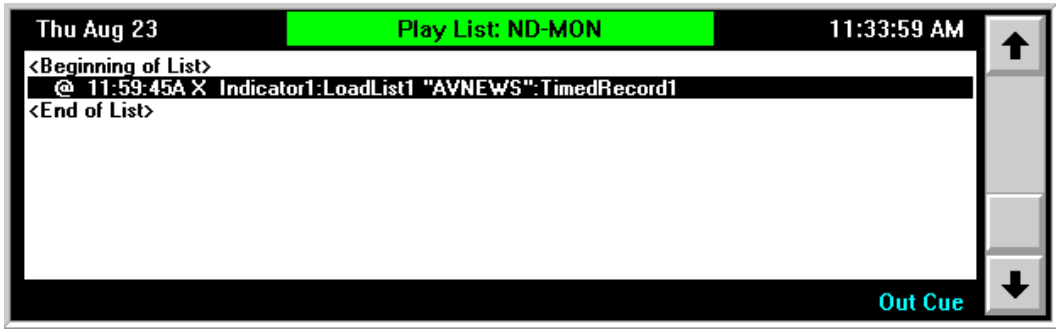
11:59:45

.and we'll define this playlist line as a.

Time-Started Command.

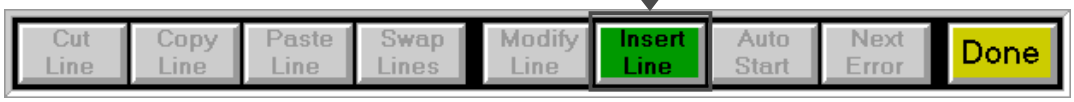
When you've completed the settings, click **OK** to accept your changes.

You'll see the line we just entered in the AVRPS playlist box.

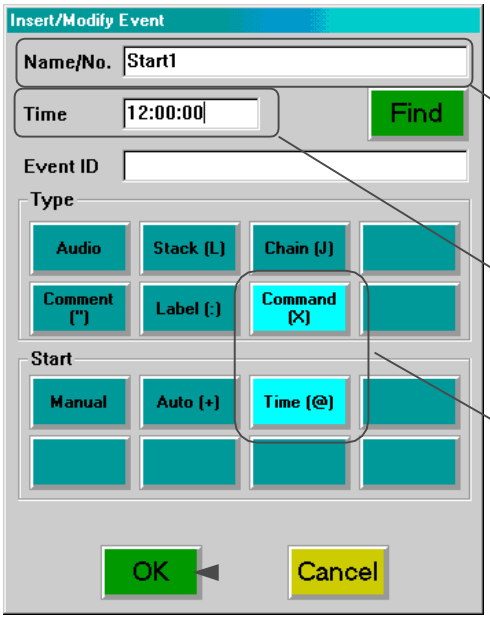


This line says ***at 11:59:45A, switch the switcher to the BEI Network, load a cut called AVNEWS into deck 1, and set deck 1 to timed record so the new audio will record over the existing audio***.

The remaining step in our sequence is to start the recording. To accomplish this, we need to insert a **Start1** line to our playlist. Click on **Insert Line** on the menu bar.



This opens the **Insert/Modify Event** dialog.



Type the command into the **Name/No.** field in the **Insert/Modify Event** dialog.

Start1

We'll use our record grid's **Feed Time** entry to tell AVNet when to execute this event.

12:00:00

.and we'll define this playlist line as a.

Time-Started Command.

When you've completed the settings, click **OK** to accept your changes.

You'll see the line we just entered in the AVRPS playlist box, appended after our original statement

This line says ***at 12:00:00P, Start deck 1 and record for the default duration of AVNEWS***.

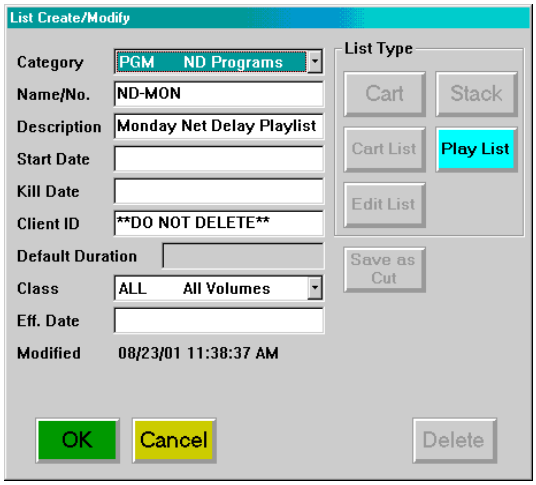
Before we go any further, save the playlist. Click **Done** on the menu bar, and click **Save**.

Repeat this process for the remainder of your net delay events.

- Click **Insert Line**
- In the **Name/No.** field, type the commands to switch the audio source, load a net delay cut, and set the deck to timed record
- Click **OK**
- Click **Insert Line**
- In the **Name/No.** field, type the command to start the deck

You'll need seven playlists

You'll need to create playlists for every day of the week, even if the only event in the playlist is a join command to the next day. If you're doing completely different events every day, it may be necessary to write each daily control playlist individually. If you're following basically the same schedule every day however, you can just save the same list to a new file and make copies of your work.



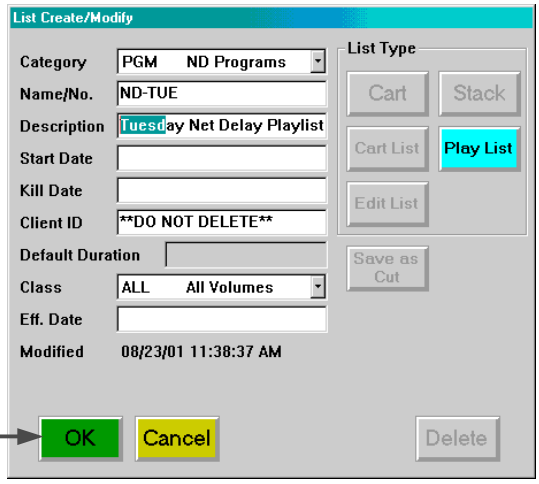
To save a playlist with a different name, first load the list you want to copy into AVRPS.

Click the **List** button on the AVRPS menu bar, and click **Save As**. This brings up the **List Create/Modify** dialog.

Change the **Name/No.** field to the new name, and change any other text fields as appropriate.

In this example, we're saving **ND-MON**, the **Monday Net Delay Playlist**, as **ND-TUE**, the **Tuesday Net Delay Playlist**.

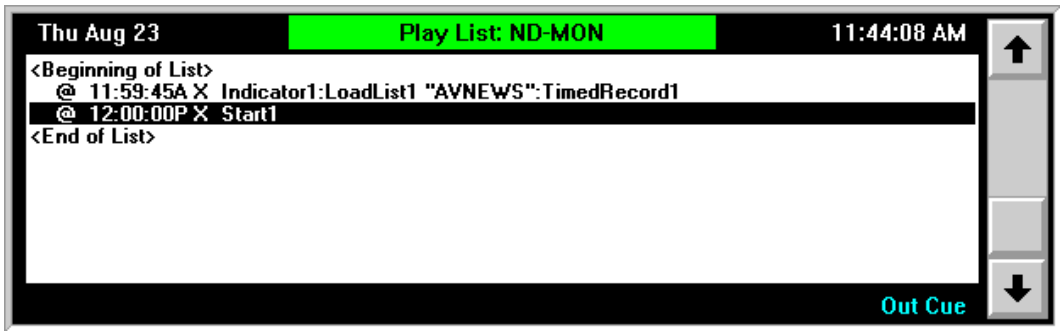
When you've made your changes, click **OK**.



Chaining the lists together

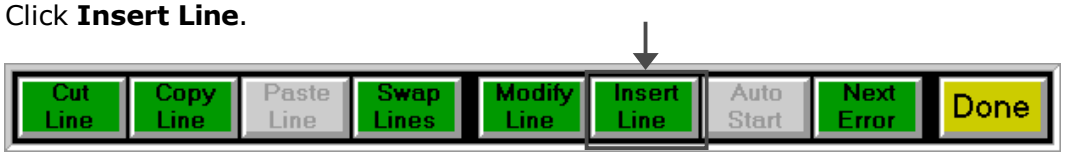
The last thing to do is to chain the seven lists together. The **chain** function is what loads the next day's list. You'll chain Monday's list to Tuesday's list, and so on.

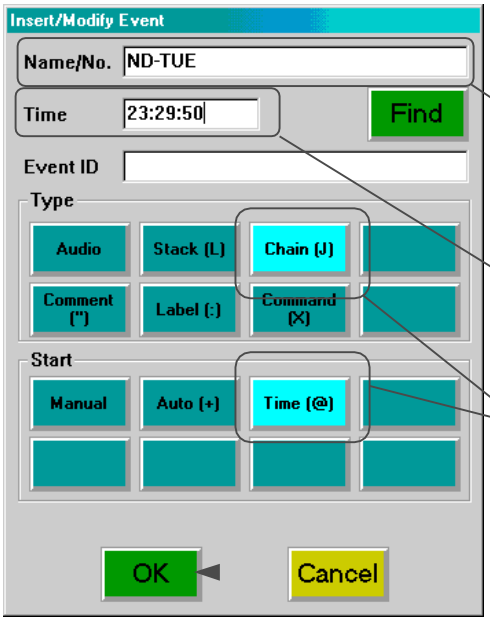
To insert a chain command, load the first playlist into AVRPS. We want to position the **Chain** command as the event of the day, so click the last event in the playlist. This repositions the black **highlight bar**. All new lines are inserted into the playlist immediately after the highlight bar.



Click the **List** button on the menu bar, and since we're adding something to the contents of the list, click the **Contents** button.

Click **Insert Line**.





Type the name of the following day's list in the **Name/No.** field.

ND-TUE

Enter the time for the **Chain** command to execute. All of the chain times for the series **must be the same**!!

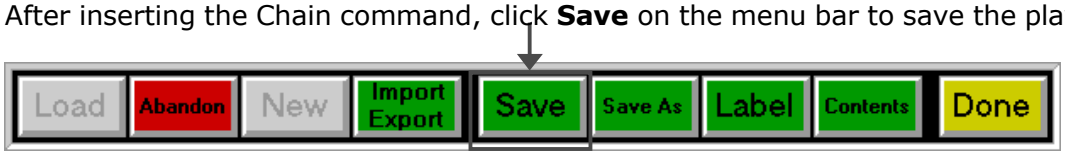
23:29:50

.and we'll define this playlist line as a.

time-started Chain command

When you've completed the settings, click **OK** to accept your changes.

After inserting the Chain command, click **Save** on the menu bar to save the playlist.

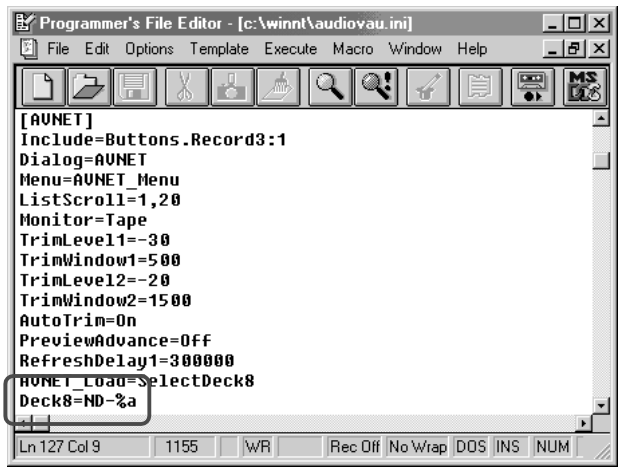


Make sure you get the correct Chain command in each of the seven daily playlists. Even if you're not recording any events on a day, you need to have a playlist with a **chain** command in it.

Loading the playlist in AVNet on startup

On startup, AVNet looks in the **audiovau.ini** file for default parameters. The file is located in your Windows directory (***c:\windows*** or ***c:\winnt***) and can be modified in a standard text editor like **Programmer's File Editor** or **Notepad**.

Open the INI file and find the AVNet section. You can search for **[AVNET]** using your editor's **find** feature.



Look for the **Deck8=** statement. This specifies the AudioVAULT file that AVNet will load into deck 8 on startup.

The default value is **ND-0/oa**. **0/oa** is a wildcard for the three letter day of the week abbreviation. AVNet is smart enough to know what day it is, and can load the correct list. With that default value, if you restarted on Monday, AVNet would automatically load an AudioVAULT file called **ND-MON** into deck 8 on startup.

If the value was set to **AVNET0/oa**, and you restarted on Wednesday, AVNet would automatically load an AudioVAULT file called **AVNETWED** into deck 8 on startup.

Once the file is loaded, the **Chain** commands take over, loading the next day's list each night.

OVERVIEW

Although it can appear overwhelming, the process isn't as complicated as it appears. Planning is the key.

- Wire audio to the input of the record/play card being used by AVNet
- Organize each event you want to record, noting the specifics for each event in a Record Grid.
- Create the Net Delay files in AVRPS
- Write the seven control playlists in AVRPS
- Add join commands to the playlists
- Modify the INI to load the correct list on startup

Once those steps are accomplished, the automated features of AVNet will take over. As long as AVNet is open on the workstation, AVNet will follow the commands in the control playlist and capture the events you've described. You don't have to anything after the recording. Since the files are written directly to the AudioVAULT volume, they're instantly available to all workstations reading those drives.

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Section 9: AVAir and AVAir Utilities

By the end of this section you should understand these key concepts:

- The difference between Live and Auto modes
- The role of the AVAir.MDB
- How to configure decks and tabs in AVAir

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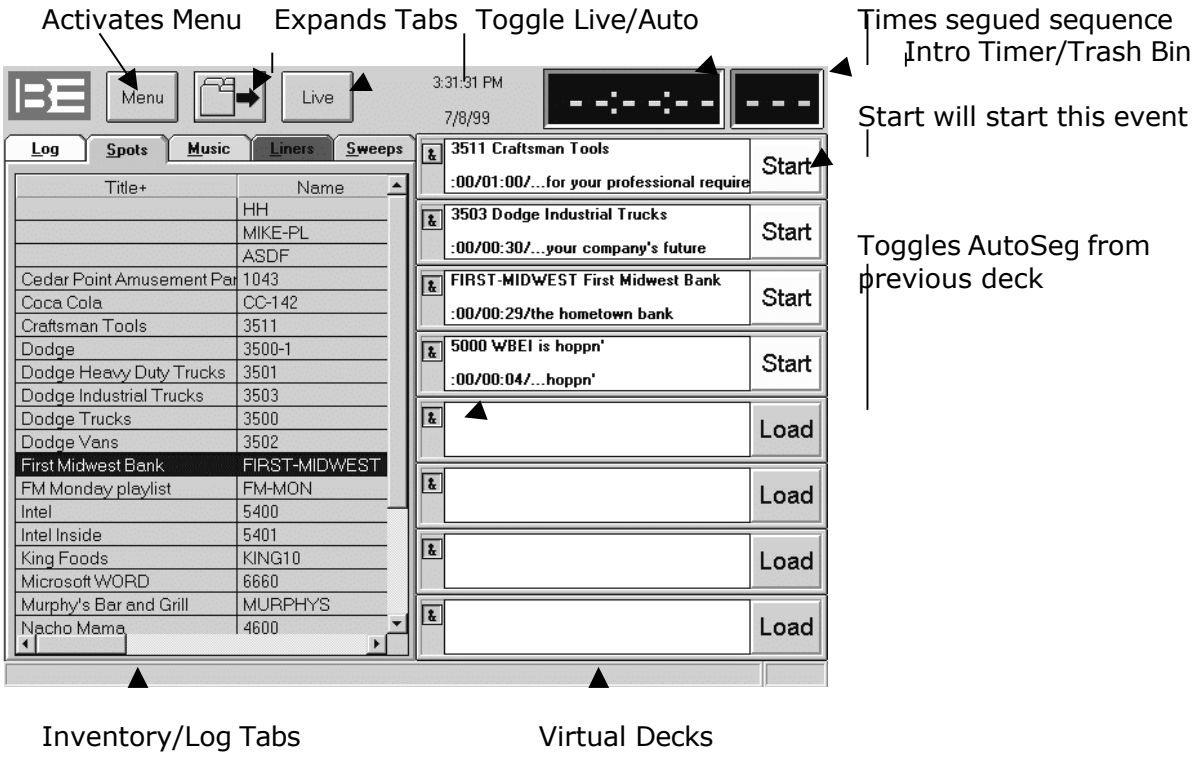
AVAIR AND AVAIR UTILITIES

AVAir is designed specifically for on-air playback in live studio and automated radio station formats. The AVAir machine is equipped with two modes of operation, Live and Auto.

AVAIR LIVE MODE OPERATION



Decks play audio cuts such as music and commercials. The decks are loaded manually in live mode, can be configured for autosegue operations, and allow the audio overlap of two or more cuts.

Overlap is accomplished by:

Manual starts/stops when Autosegue is **not** enabled
By EOM when Autosegue **is** enabled.

A deck is loaded manually with a cut or cart:

Using drag-and-drop placement
By selecting a cut with the mouse and using the deck load button.

Deck starting options include:

A mouse click on the start button
A touch screen
A remote control switch panel
A keyboard stroke or Hot Key

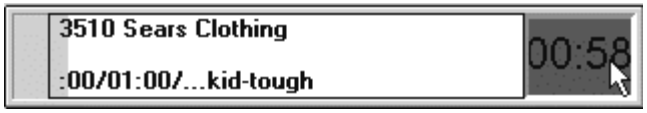
AutoSegue Decks

Decks can be programmed for autosegue operations. AutoSegue **(&)** is the automatic sequential starting of cuts contained in decks using a single start command.

ADDITIONAL LIVE-MODE FEATURES

Pause

With "Pause" enabled, you will have the ability to pause playback in that specific AVAir deck. Clicking once on the "Start" button will start the cut. Clicking on the "Start" button again will pause playback, and the button will go purple. To Stop the cut, click on the label. Clicking on the label again will clear the cut.



Preview

With "Preview" enabled, you will have the ability to listen to the first and last few seconds of a cut. Once the feature is enabled, a small Preview button will show up on the deck in Live mode. If the deck is loaded, clicking the preview button will play the beginning and ending of the song as defined by the "Seconds" field in the Decks tab. One important notes.the Preview audio will playback through the regular faders on the console. Make sure the fader is in cue or audition, or the cut will preview on the air!

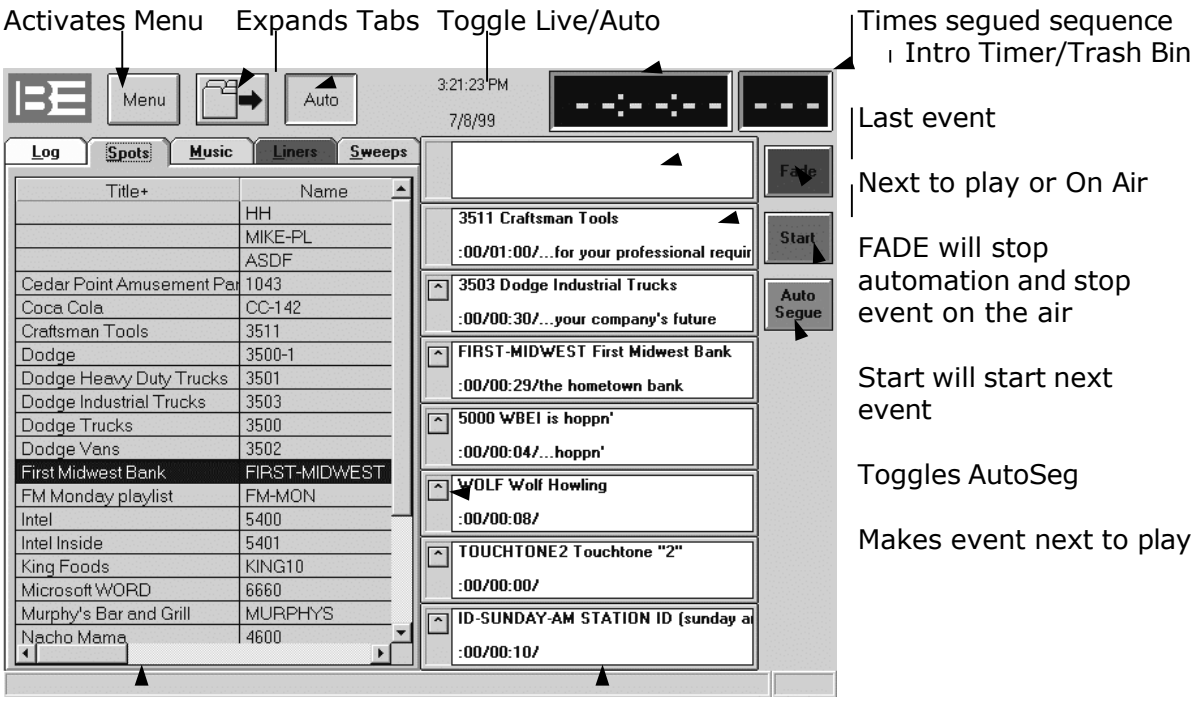
Editing

With the Edit feature enabled, you will be able to preview the cut. You will also be able to manually set the begin point and segue point of the selected event. The editing is temporary and non-destructive. It will remain in effect until the cut is completely unloaded. Once the feature is enabled, the small Preview button will show up on the deck in Live mode. When you click it, the Editing buttons will show up.

|>	Previews beginning of cut
>|	Previews end of cut
<<	Adjusts edit point backwards
>>	Adjusts edit point forwards

To adjust an edit point, click on either Preview Beginning or Preview End button, then use the Adjust buttons to reposition the edit point. To exit the Edit feature, click the "P" button again. Again, the Preview audio will playback through the regular faders on the console. Make sure the fader is in cue or audition, or the cut will play on the air!

AVAIR AUTO MODE OPERATION



Decks play audio cuts such as music and commercials. The decks are loaded automatically in Audo mode, by default allow autosegue and overlap.

Overlap is accomplished by:

By EOM when Autosegue **is** enabled.

A deck can still be loaded manually with a cut or cart:

Using drag-and-drop placement

Deck starting options include:

A mouse click on the start button
A touch screen
A remote control switch panel
A keyboard stroke or Hot Key

USING THE AUTOMATION ➔ GOTO FEATURE

When using an Event File and toggling between Live and Auto modes, use of the Automation ➔ Goto feature is recommended. The function allows the operator to specify a location in the Log tab by clicking on that row, and hitting a menu option.

If you run in Live mode, and skip scheduled events, when you toggle to Auto mode, AVAir will assume those events still need to be played, and will automatically load them in decks for playback. Click Menu ➔ Automation ➔ Goto will discard these events and cause the current cursor position to be the beginning of the event list.

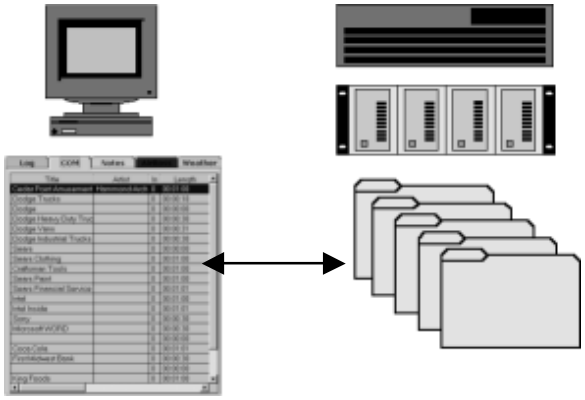
THE AVAIR.MDB

AVAir inventory tabs get their information from a file stored on each AVAir computer called the AVAIR.MDB. This is a Microsoft Access Database that is kept up to date by a utility called AVScan. The AVAIR.MDB contains:

- Inventory information, sorted by server and category
- Category and Class files
- Deck color information

Think of the MDB as a simple list. If you were to walk into your studio now and make a list of each cart in the rack and put that list by the operator, it would be like the AVAIR.MDB.a simple list of available inventory. If someone comes in and removes a cart, or adds a cart, that list is now out-of-date. The list needs to be refreshed to show the changed list of available inventory.

Just because a cut is on our list doesn't mean it's still in the cart rack, and just because a cart is in the rack doesn't mean it's on our list. Regardless, if the jock knows the name of the cart, they can grab the cart and play it. AudioVAULT works the same way. Whether or not a file appears in a tab (is in our AVAIR.MDB "list") has no impact on the availability of the audio. If AVAir knows the name of the file, and the file really exists on the server, AVAir can play it. The name of the file can be retrieved from the Event File (if it was scheduled by Traffic) or Inserted manually into the daily schedule.



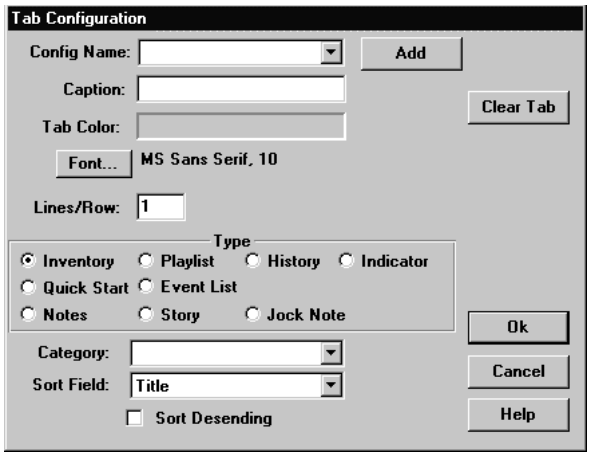
The list is refreshed one of two ways. Either manually through an AVAir menu option, or with a separate utility called AVScan. If you are using AVScan, do not manually rebuild the database. This can cause damage to the database. It is possible to remove the menu option if AVScan is in use. Add the line **RebuildEnabled=False** to the AVAir section of the INI.

CONFIGURING AVAIR TABS

AVAir has the ability to display up to 15 tabs. When using AVAir with a log generated by AVScheduler the first tab must be used for the log.

STEPS TO CONFIGURING A TAB

1. Select the tab to configure by single clicking on it.
2. Click **Menu → Settings → Tab**. You'll see this dialog box:



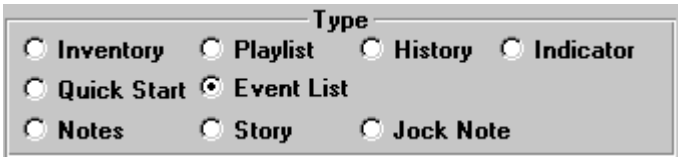
3. If you're creating a new Tab Configuration, fill in the appropriate information and click on **Add** in the top right corner and then click on **Save**. If you're simply modifying an existing configuration, just click **Save**.
4. Move the cursor to **OK** and the tab will appear.
5. Move the cursor to **Menu**, **File**, and **Save Config**. This will save the screen configuration with the new tab.

DESCRIPTION OF TAB CONFIGURATION FIELDS

Configuration Name	The name you want to give the category and should be unique.
Caption	The name you want to appear on the tab in AVAir.
Tab Color	This can be selected by double clicking on the shaded area, which will disclose a color palette.
Font	(MS Sans Serif, 8) is the default but can be changed by clicking the font button.
Lines/Row	Refers to the particular width of the line and row in that specific tab.
Type	See individual descriptions below.
Category	Is activated when an inventory type is selected. Which Category do you want to appear in this Inventory tab?
Sort Field	Sets the default Sort column.

Note: *Other options will appear depending on the type of tab being created.*

TAB TYPES



Inventory Tab- consists of any audio element. This tab can be configured to show everything in the AVAir database or just a category

Playlist Tab- consists of a specific playlist the user wishes to have displayed. The playlist is typically created using the AVRPS screen.

History Tab- this tab consists of both a Today and Yesterday. This tab can display all elements that played on either the current day or the previous day.

Indicator Tab- This tab displays a series of 15 buttons, which can be used to send or receive contact from AVAir through the computer. This tab may require some special INI settings for certain remote control functions and even duration of the tabs.

Quick Start- this tabs displays a series of buttons that are configured to fire specific audio elements when clicked. This uses a playlist for this function.

Event List- this is the most import tabs in AVAir. This tab displays the log that is generated using AVScheduler. Without this tab AVAir will not run properly in Automation. This tab uses either and Event File or a Playlist as it source. This tab requires special INI settings for proper configurations.

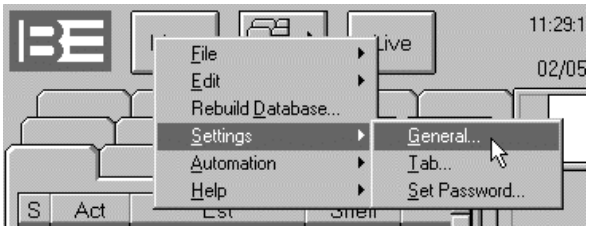
Notes- this tab gives AVAir the ability to associate Audio and Text elements together. Plus it also allows for simply text to be displayed in a dialog in AVAir. This feature requires AirBoss.

Story Tab- This tab gives the Air Personality the ability to view stories that read into the NewsBOSS database. Typically, this tab is configured for a specific Story Queue. Multiple tabs can be used.

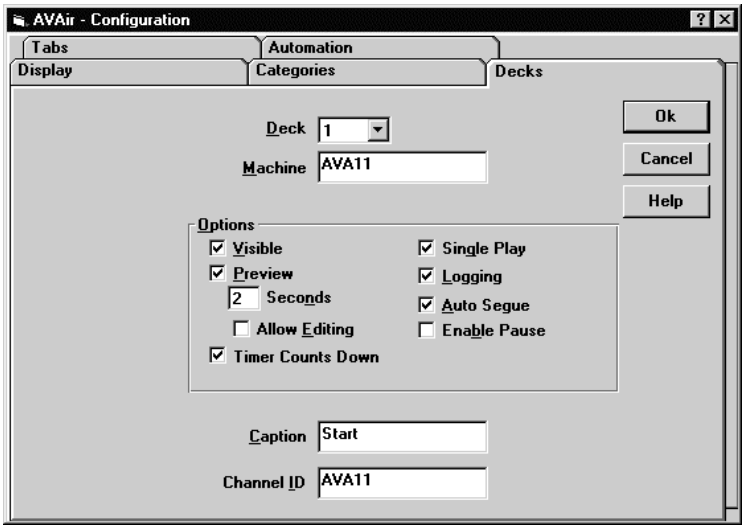
Jock Note- this tab gives the Air Personality the ability to edit text of information within an AVAir tab. This tab is typically used for preparing show prep and requires the use of AirBoss.

CONFIGURING AVAIR DECKS

Go to the Decks Configuration Tab in the General Settings Dialog:



Once you click on the Decks tab, you will see fields for each option:

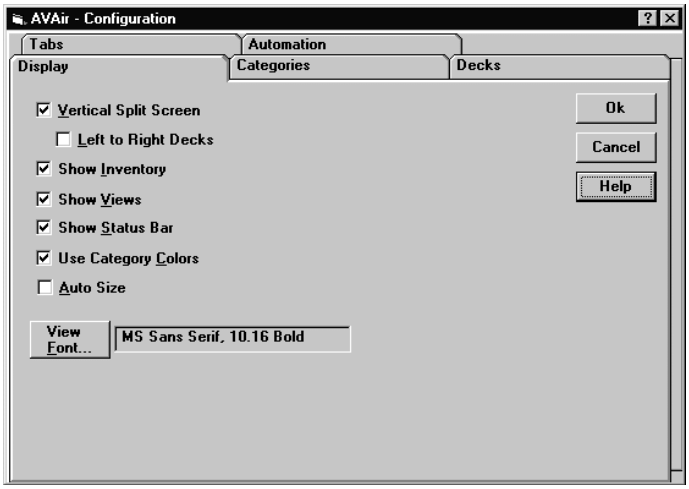


Deck	This is the deck number that is being configured. All settings below are specific for the deck number listed.
Machine	This indicates the server name and channel number that the deck will "attach" to.
Visible	This allows the deck to appear on the screen when selected.
Preview	This option allows for deck previewing and editing.
Seconds	This defines the amount of preview in seconds.
Allow Editing	This enables the Edit feature, allowing the user to adjust the begin point and EOM point of a cut.
Timer Counts Down	This affects the behavior of the countdown timer on a deck's Start button.
Single Play	Configures the deck to clear the assigned cut immediately following the end of the cut audio.
Logging	The user can enable or disable the logging capabilities of the deck. By default every item played in a deck is logged for reconciliation purposes.

AutoSegue	This removes the **&** symbol on certain decks while in Live mode and defeats the AutoSegue functionality in both modes.
Enable Pause	This enables decks to pause during playback instead of simply stopping and starting over.
Caption	This option allows for custom information to appear in the Label of the deck. This is typically good when running in Automation mode.
Channel ID	This allows for text to appear in the Label of the deck that could be useful for the operator. Typically, define the deck with the pot on the console. Example: Console start button reads AV-1, then AVAir Deck 1 will read AV-1.

OTHER AVAIR GENERAL SETTINGS

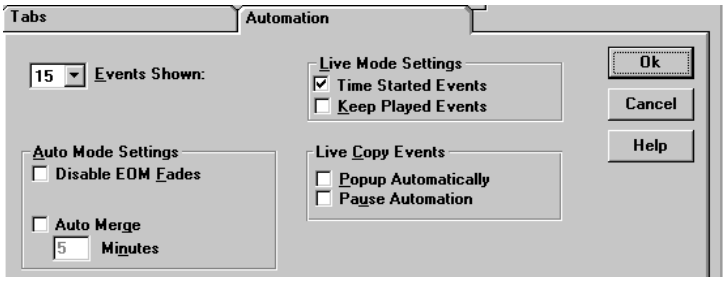
Display-This tab gives the user the ability change to appearance of the AVAir screen. The user can change the way the decks and tabs are displayed, and even whether or not to show decks at all. The View Font allows AVAir to be resized based on the screen resolution and font size.



Category- This tab allows the user to assign colors to particular categories. This gives AVAir the ability to display these events in decks with the correct color outlining the deck. For example, if your Music tab were blue, you could tell AVAir that every time a Music event was loaded into a deck, to turn the deck outline blue.

Tabs- This tab allows the user to configure AVAir to only display a certain number of tabs, font size, locking and unlocking the columns in the tabs, and what height the caption of the tab will be.

Automation- This tab allows AVAir to have custom configuration during Automation mode. The settings pertain to how many events AVAir will pre-load into configured decks while in Automation as well as whether or not copy elements will stop Automation.



AVAIR INI SETTINGS

While many of the settings for AVAir have moved from the Database or the Windows Registry, some items remain in the AUDIOVAU.INI file. Items found in the INI include remote start mappings, hot keys for menu options, and where to locate the Event file for the log tab.

AvailCategory	This setting designates which categories of cuts to check for the AvailShelf. The default is "COM", and it is not case sensitive.
AvailShelf	This setting reserves a name/number for the avail cut. Note that this is a character string and that "0" is different that"0000". The default is "0."
EventFMT	The setting in the INI file used for path and file name to use when loading an EVT file or merger an EVR file. It is set equal to the drive, path, and file format for the file to use. The file format should not have an extension and should only reference the date format of the filename to be used. For example: %m%d%y
HistSkeletonName	Path and filename where avhstskl.mdb is located.
IDD_Search	To enable Speed Search, the function must be mapped in the INI file. For example, the following would cause the search to be enabled when the control key plus the S key were hit together: IDD_Search=,KEY:CTRL+S This function works on tabs other than the EVENT LIST Tab
IDD_SearchNext	Also related is the Next function on Speed Search. This causes the next item after the cut searched to be found.
IDD_StartX	This specifies which deck to remotely start from the console or the output of the remote control would turn on a channel on the console.
IDD_StopX	This enables remote stopping of the deck and also turning a channel on the console off.
IDD_SecondaryX	Active when Secondary cue tone is active for the deck X. Output function only.
IDD_TertiaryX	Active when Tertiary cue tone is active for Deck X. Typically used to light an external light bulb in studio to warn the jock that an event is preparing to end.

DEFAULT AVAIR HOTKEYS

Need to CUT a line from the Log?
ctrl+x
This cuts the highlighted line from the Log tab. This also will copy the item to the Windows95 Clipboard, which gives you the ability to paste item somewhere else in the log.

Need to COPY a line from the Log?
ctrl+c
Much like a word processor, you can copy the highlighted line and paste elsewhere in the Log!

Need to PASTE a line in the Log?
ctrl+v
This will paste the cut or copied line to a point in the schedule immediately before your highlight bar.

Need to use the GOTO function?
ctrl+g
Set your highlight bar, then use the "goto" function to discard previous events. It's easy to get a few days logs piled up in the log tab, which will decrease performance. It's important to clear those events out after your shift. This will bring up a warning box asking you if you are sure.

Need to INSERT an event by name in the Log?
ctrl+i
This brings up the "Insert by Name" dialog box. If you need to insert a new audio event into the Log (like a make good spot, for instance), use "
insert," enter the cut number, and hit "OK."

Need to activate AVAir's MENU?
ctrl+m
This opens AVAir's standard menu dialog wherever your cursor is on the screen..

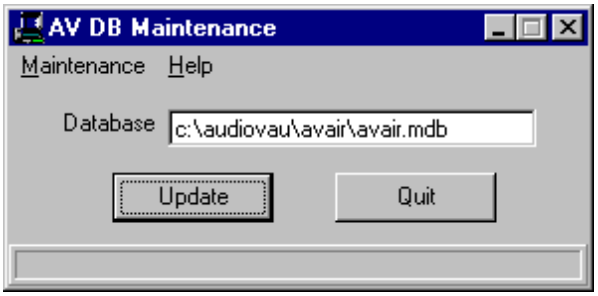
Need to bring up the SEARCH box?
ctrl+s
This pops up the search box directly below the current tab. Type in the first few letters or numbers of what you're looking for to narrow your search. When you switch tabs, the box disappears, and you'll have to open it again.

AVAIR UTILITIES: AVDBM

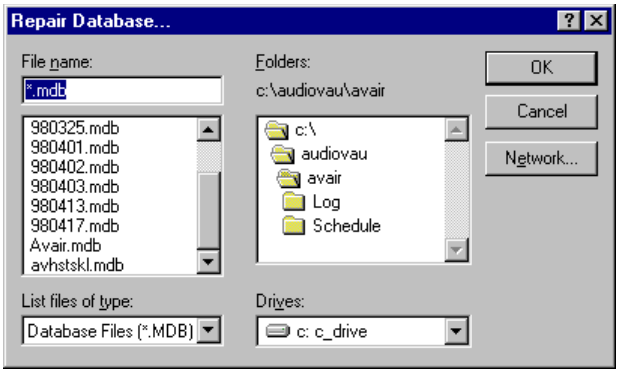
AVAir uses a Microsoft Access Database to store some configuration settings and tab inventory. Occasionally, that database can become corrupt. The AudioVAULT Software Suite contains the AVDBM utility that can repair most database problems. To run AVDBM, either click on the AVDBM icon in the AudioVAULT program group, or launch the utility through Win95/NT's Run dialog. In version 6.6, the utility is located in the C:\AUDIOVAU folder. In versions before 6.5, it is recommended you use the AVDBM located in the C:\AUDIOVAU\AVAIR folder.

> BEFORE YOU LAUNCH THE APPLICATION, YOU MUST EXIT OUT OF AVAIR AND TERMINATE THE AVSCAN ASSIGNED TO THE DATABASE YOU WILL BE REPAIRING.

When you launch the application, you will see the main AVDBM dialog in the middle of your screen.

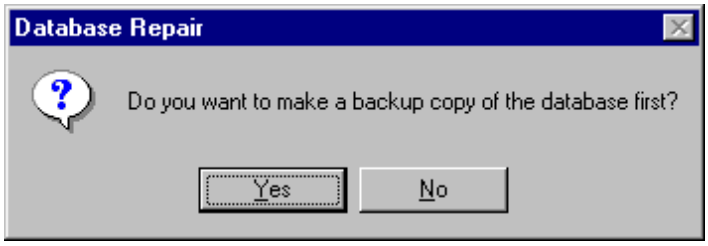


Click MAINTENANCE, and select REPAIR. You will then see a file select box.

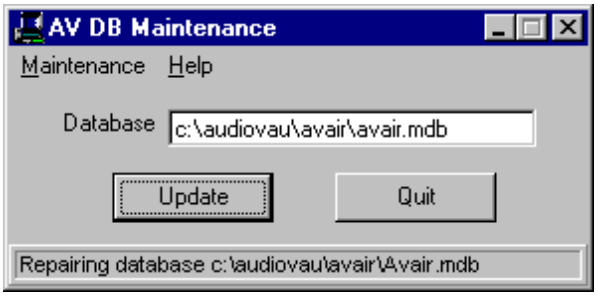


Scroll down the list and select the AVAIR.MDB.

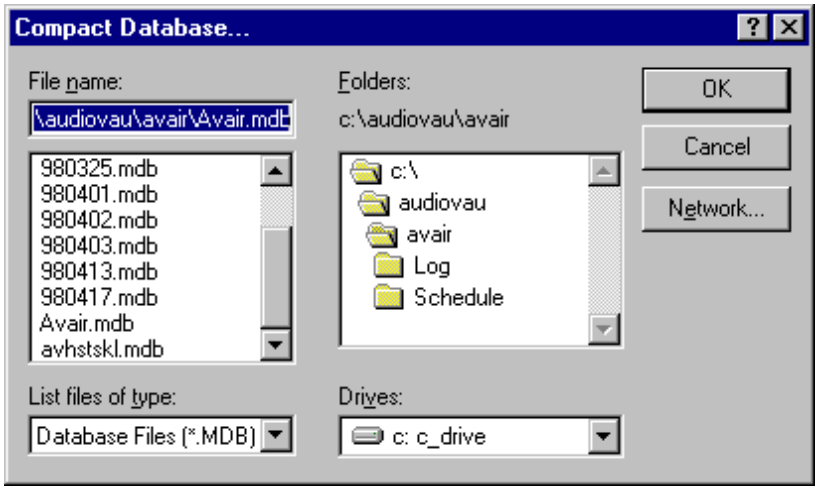
When you click "OK," the utility will ask if you want to make a backup of the database. You do. Backups are good.



As the repair progresses, you will see a message in the bottom left corner of the AVDBM box.

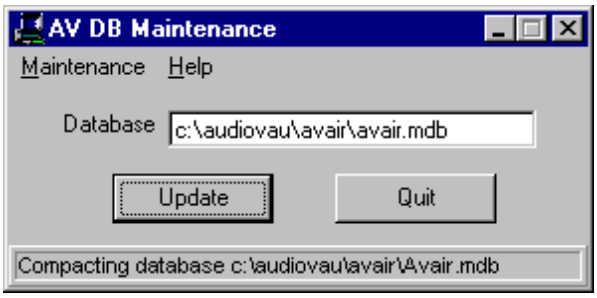


When this message disappears, the process is complete. The next step is to Compact the database. Click on MAINTENANCE and select COMPACT. You will see another file selection box.



Again, select the AVAIR.MDB, and click OK.

As the compaction begins, you will see a status message in the bottom left corner of the AVDBM box.



When that message disappears, the process is complete. Re-start AVAir and AVScan.

As of v6.6x, most AVAir configuration settings are stored in the System Registry rather than the AVAIR.MDB. All that remains in the database in these versions is Inventory information, Category/Class information and Deck Color information.

AVSCAN

AVScan is a powerful troubleshooting and database management utility. It runs in the background, normally on a production room PC, and performs a number of functions. As of v6.6x, up to four copies of AVScan may run on a PC, each pointed at a different database. AVScan is resource intensive, however.for each instance of AVScan, an additional 8meg of RAM is recommended.

You can pull up AVScan on the desktop by double clicking the icon located in the Win95 task bar depicting a hard drive with a check mark on it.

AVScan will:

- Update and Rebuild AVAir database, eliminating the need for manual rebuilds using the "Rebuild Database" option in the AVAir menu.
- Monitor all SCSI drives fullness on all servers.
- Report Vault status.
- Report any disk errors on the SCSI drives.
- Show the total number of files in the AVAir database.

Once AVScan is visible on the desktop you can double-click on each section for more detailed reports.

AVSCAN UPDATES THE AVAIR.MDB

AVScan's primary function is to keep your AVAir database up to date. AVScan will indicate when the rebuilds and updates are in progress, but this happens almost exclusively in the background. When a new cut is recorded in the production room, AVScan sees the new cut, and automatically inserts it into the AVAir database.

By default, AVScan updates your database every 10 minutes. The update will add new files, replace older files with newer versions, and remove entries for unfound files.

If the times of these procedures need to be adjusted, they can be changed in the [AVSCAN] section of the Audiovau.INI located in the Windows directory of the PC running AVScan. A detailed explanation of each INI line is at the end of this section.

While AVScan is active, it eliminates the need for manual rebuilds or updates using the "Rebuild Database" option in the AVAir menu. DO NOT manually rebuild or update the AVAir database while AVScan is active. It will drastically affect the performance of AVAir and AVScan, and possibly damage to the AVAir database.

AVSCAN REPORTS DRIVE FULLNESS

The "fuel gauge" in the Disk Space Used: box reports the status of the most-full server's file system. Thresholds have been set in AVScan to also change the color of the fuel gauge as the file system nears saturation: green (normal), yellow (warning), or red (danger).

Note that this is not the most-full SCSI drive; if a server had one full drive and one half-full drive the gauge would show 750/o not 1000/o. For server drive space details, show the VAULTS table and view the DISK USED field. For individual drive details, show the DISK table and view the DISK USED field.

AVSCAN REPORTS VAULT STATUS

This shows the status of the vaults currently "connected" to AVScan. If the counter's background is red, there has been a problem connecting to the Vault server.

Double-clicking on the Vault box will bring up a table that will report the vault's status, time of the last scan, the vault's file count, disk space used, the last error encountered on the vault, and the scan interval that has been defined in the AUDIOVAU.INI. Some customers leave the VAULT table displayed and positioned so that the colored fuel gauge can be seen at a glance. If the gauge ever shows a warning color then the problem can be quickly diagnosed to a given server.

AVSCAN REPORTS DISK ERRORS

This shows the number of SCSI drive errors, as reported by SYSTEM-INFO.non-zero entries can indicate a marginal or failing SCSI drive, or other SCSI problem. This is not necessarily cause for panic, but it should spark further investigation.

NOTES ON THE [AVSCAN] SECTION OF AUDIOVAU.INI

The AUDIOVAU.INI must have an [AVScan] section with a Vaults= setting, as a minimum. In addition, there are other global and vault-specific options:

Vaults=	A list of the [Vault.xxx] name. This is required, and there is no default. Note that the vault names are "stripped" of trailing digits.the vault should be listed as "SVA1," not SVA11, for example.
WarningThreshold=	The threshold (%) for red bar.
CriticalThreshold=	The threshold (%) for yellow bar.
MonitorInterval=	The seconds between attempts to restart a vault. The default setting is 00:00:30.
FullRefreshTime=	The time of day for full scan.
NewScanInterval=	The time (h:m:s) between scans for new/changed files.
DatabaseName=	The name of the database (with .MDB extension). Currently set via mapped network drive to the respective AVAir database. This line is contained within the [AudioVAULT] section of the Audiovau.INI

Example AVScan INI section:

```
[AVScan]
DatabaseName=C:\AUDIOVAU\AVAIR\AVAIR.MDB
Vaults=SVA1
WarningThreshold=75
CriticalThreshold=95
FullRefreshTime=01:00:00
NewScanInterval=00:10:00
```

AVAIR SERIAL EXPORT

AVAir is equipped with the ability to output serial data. Typically, the machine is programmed to output file data during the play of the on-air cut.

Typical serial output applications

Internet	For stations simulcasting on the internet, the AVAir machine can be programmed to output data such as the on-air cut description and artist/client, as well as, the next-to-run cut description and artist/client.
RDS	For stations using RDS, the AVAir machine can be programmed to output data.
Interlink of Two AVAir Machines	Serial output data can be used to connect two AVAir machines. This allows on AVAir to control functions in the second machine.

To configure the AVAir machine for serial output operation, the machine must be programmed. Serial programming consists of writing a program to perform the desired operation using a group of serial code commands. Due to the complexity of the programming requirements, it is recommended the serial output programming be done by Broadcast Electronics Digital Customer Service. Determine the type of application desired and contact the service department to write the programming for the desired application.

EXAMPLE OF SERIAL OUTPUT INI SETTINGS

```
EventViewFormat="%n  %d\r  %{%L}K  %C\r  :%i/%{%M:%S}D/%Q"
DeckViewFormat="%{%n  %d}E\r  %L  %{%C}E\r  %{:%i/%{%M:%S}D/%Q}E"
RemoteDeckViewFormat="*%{%n:%d}E+"
RemoteEventViewFormat="*%n  %d+"
IDD_DECKVIEW_1=COM2:+Deck1:
IDD_DECKVIEW_2=COM2:+Deck2:
IDD_DECKVIEW_3=COM2:+Deck3:
IDD_EVENTVIEW_2=COM2:+CurrentEvent:
IDD_EVENTVIEW_3=COM2:+NextEvent:
```

**Note that COM2 could be any available COM Port. ie. COM3 or COM4. COM1 is typically used for the mouse.*

All these settings belong in the Audiovau.ini file in the [AVAir] section.

INI KEYS COMPATIBLE WITH AVAIR SERIAL OUTPUT FUNCTION

DeckViewFormat=	Format of what shows in the Deck. This can be configured using the same parameters as the Serial Remote Control settings.
EventViewFormat=	Format of what shows for an Event.
IDD_BreakTimer=	Outputs serially the break timer as it is counting.
IDD_CurrentAudioEvent=	Allows for information about the current event on the error to be sent out the serial port to be interfaced to products that could display the information.
IDD_CustomX=	This will display, through serial output string, what is loaded into the deck. The X represents the deck number.
IDD_Date=	Output is Serial for the date.
IDD_IntroTime=	Outputs serially the intro timer as it is counting.
IDD_Time=	It is used to output the time.

FORMAT STRINGS

"n" Caption
L ChannelID
E Event- Chains to what is defined in Event
"d" Title
C Artist/Client ID
N Name
Q Outcue
"c" Category
I EventID
O Codes
A Action (PLY,UPD, etc)
"i" Intro In Seconds
"u" Source DeckID Number
"x" Flags
"s" Scheduled Time
T Estimated Start Time (Calculated)
S Start Time
D Duration (Seconds part only)
E Duration (mSeconds Part Only)
K Deck Associated with the event
{ } Specified Parameter for the Next Code

**Note that any time a letter is in quotes it must be lower case.*

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Section 10: AVScheduler

By the end of this section you should understand these key concepts:

- The role of AVScheduler
- How collections are used
- How to set up Imports and choose DLLs
- Configuration aspects of AVScheduler
- How Schedule Build works

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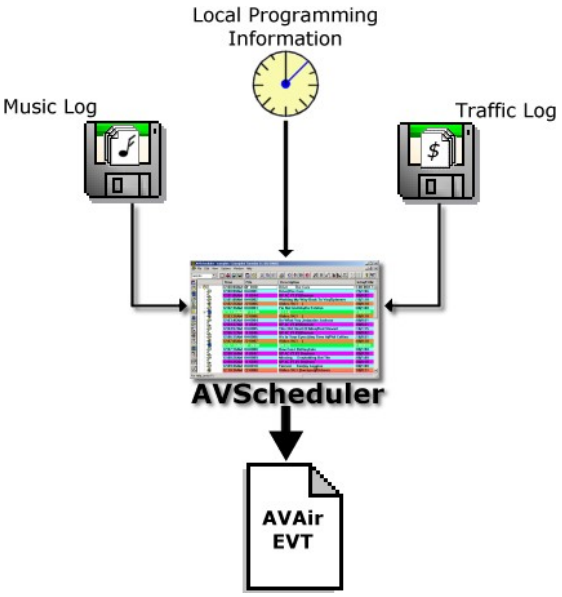
INTRODUCTION

While AVAir can use AudioVAULT playlists, more often an EVT file generated by AVScheduler is used. AVScheduler imports traffic and music scheduling information, allows it to be integrated with other events such as news, weather, liners, and talk segments, and then combines and translates that information into an Event File that AVAir can understand.

WHAT IS AVSCHEDULER AND WHY DO I NEED IT?

AVScheduler is a component of the AudioVAULT software suite that writes the AVAir Event File. Instead of "scheduling" events itself, AVScheduler imports information from music scheduling programs and traffic scheduling programs. It can combine those files with local programming information and create a single file called an event file that contains a list of every event listed in order from the Legal ID at midnight to the last song in the 11 o'clock hour.

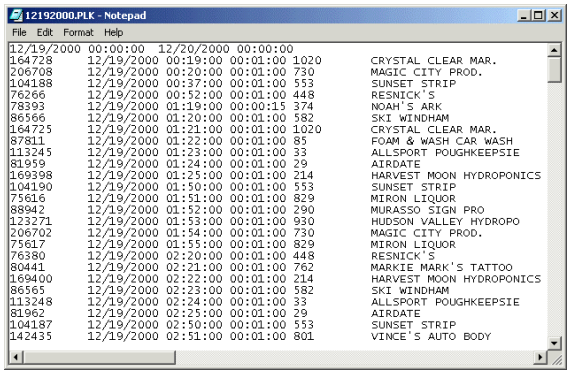


For the on-air talent, having the single Event File is great because it's like having all your carts pulled for the entire show. For the Programming staff, having the single combined file allows them to have a sequential overview of how all the elements in an hour or a day flow.

For Traffic directors, AVScheduler allows you to check what is scheduled against what AudioVAULT audio files are actually available with a feature called Log Check. AVScheduler will also give the Traffic department a way to modify the AVAir schedule without having to go into the on-air studio. There are even reconciliations that will report discrepancies between what was scheduled in AVScheduler and what was actually played in AVAir.

So to answer the original question, AVScheduler is a way to integrate schedules from your Music and Traffic programs into a single Event File. You need it to interface those programs with the AVAir software. You'll love it because of the flexibility it will provide.

WORKING WITH TRAFFIC AND MUSIC SCHEDULING PROGRAMS


12192000.PLK - Notepad

File Edit Format Help

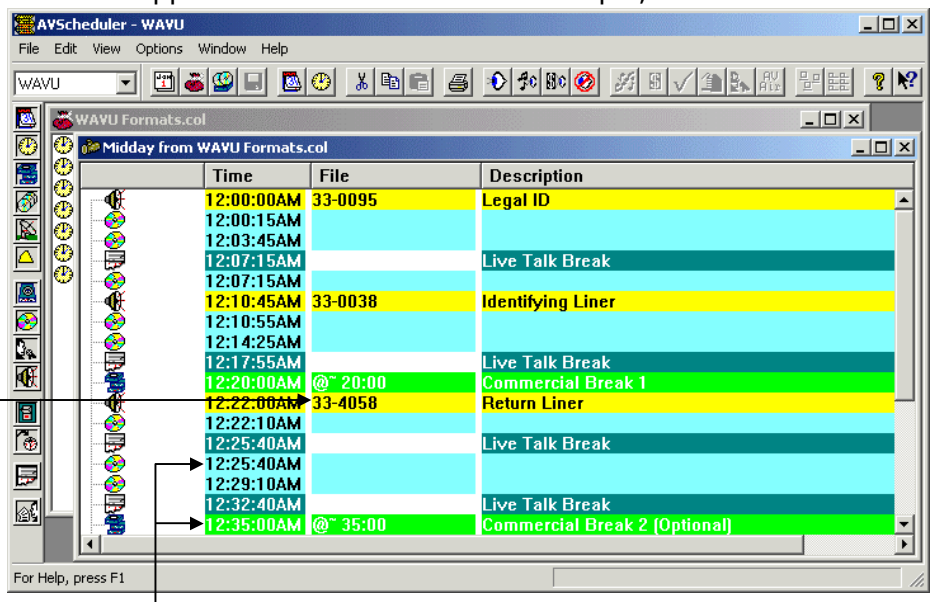
```
12/19/2000 00:00:00  12/20/2000 00:00:00
164728     12/19/2000 00:19:00 00:01:00 1020      CRYSTAL CLEAR MAR.
206708     12/19/2000 00:20:00 00:01:00 730       MAGIC CITY PROD.
104188     12/19/2000 00:37:00 00:01:00 553       SUNSET STRIP
76266      12/19/2000 00:52:00 00:01:00 448       RESNICK'S
78393      12/19/2000 01:19:00 00:00:15 374       NOAH'S ARK
86566      12/19/2000 01:20:00 00:01:00 582       SKI WINDHAM
164725     12/19/2000 01:21:00 00:01:00 1020      CRYSTAL CLEAR MAR.
87811      12/19/2000 01:22:00 00:01:00 85        FOAM & WASH CAR WASH
113245     12/19/2000 01:23:00 00:01:00 33        ALLSPORT POUGHKEEPSIE
81959      12/19/2000 01:24:00 00:01:00 29        AIRDATE
169398     12/19/2000 01:25:00 00:01:00 214       HARVEST MOON HYDROPONICS
104190     12/19/2000 01:50:00 00:01:00 553       SUNSET STRIP
75616      12/19/2000 01:51:00 00:01:00 829       MIRON LIQUOR
88942      12/19/2000 01:52:00 00:01:00 290       MURASSO SIGN PRO
123271     12/19/2000 01:53:00 00:01:00 930       HUDSON VALLEY HYDROPO
206702     12/19/2000 01:54:00 00:01:00 730       MAGIC CITY PROD.
75617      12/19/2000 01:55:00 00:01:00 829       MIRON LIQUOR
76380      12/19/2000 02:20:00 00:01:00 448       RESNICK'S
80441      12/19/2000 02:21:00 00:01:00 762       MARKIE MARK'S TATTOO
169400     12/19/2000 02:22:00 00:01:00 214       HARVEST MOON HYDROPONICS
86565      12/19/2000 02:23:00 00:01:00 582       SKI WINDHAM
113248     12/19/2000 02:24:00 00:01:00 33        ALLSPORT POUGHKEEPSIE
81962      12/19/2000 02:25:00 00:01:00 29        AIRDATE
104187     12/19/2000 02:50:00 00:01:00 553       SUNSET STRIP
142435     12/19/2000 02:51:00 00:01:00 801       VINCE'S AUTO BODY
```

AVScheduler reads a computer file commonly called an **ASCII** (ask-ee) file. This is a simple file that you can open in a text editor like Windows' Notepad. Most scheduling packages can write a file like this as part of an Automation Interface. You will need to contact your scheduling software providers to get information on how to produce an ASCII export. Once the file is created, send it to Broadcast Electronics' Digital Customer Service team to verify that it will work with AVScheduler.

HOW DO AVSCHEDULER COLLECTIONS WORK?

AVScheduler allows you to build a collection of templates that will be able to accept information from your music and traffic scheduling software. These templates are divided into two collections: a Formats Collection and a Days Collection.

The Formats Collection holds hour-long templates consisting of events. As you build a Format Hour, you include every event that happens in that hour. In this example, we start off the hour with a Legal ID, play 2 songs, go into a talk break, play a song, play a liner, do 2 more songs, and schedule a talk break into the 20-after commercial break.



We've assigned cut numbers for the Liners and IDs that will play every time we use this format.

For events that will change depending on the day like songs and commercials, we'll add empty events that will act like "containers." We'll fill in these containers when we go through the import process. These containers **must** be there so that when we import music or traffic, the events will have somewhere to go.

The Days Collection holds 24-hour long templates consisting of Format Hours. This allows you to organize and reuse template combinations.this Monday will follow the same basic outline as next Monday.

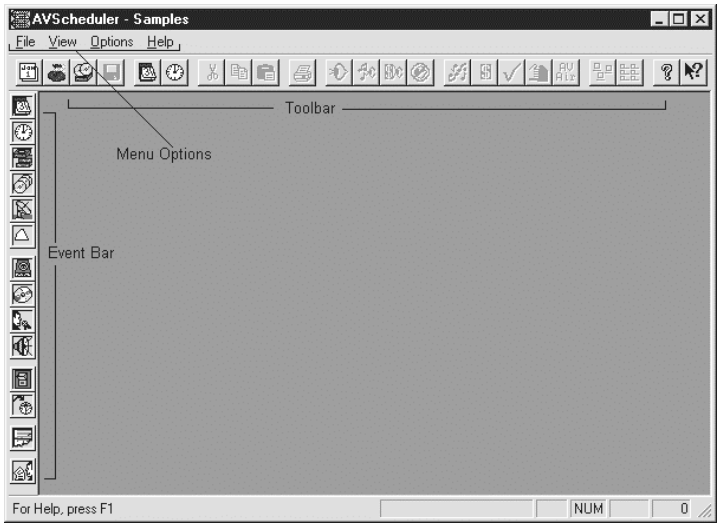
When we schedule a specific Date, AVScheduler reads the information stored in the Days templates to create a 24-hour long skeleton file called a **CSAW** file. Once that file has been created, we fill in the empty containers with information from the traffic and music scheduling software. The containers are already embedded in the local programming (IDs and Liners, for example) that we defined as we built the Formats collections, so when AVScheduler writes the Event File based on the CSAW, we have a 24-hour long file with every event in sequence.

SETUP STEP-BY-STEP

1. Contact the vendors of your music and traffic scheduling programs. Have them teach you how to export an ASCII automation file.
2. Send the resultant files to Digital Customer Service. If you would like to use the Schedule Build feature, we can help you configure the output file.
3. AVScheduler keeps all of its collections and data files in a single Windows Folder called a Data Directory. The next step is to use Windows Explorer to create the Data Directory. Create the directory on a machine that is always accessible, like the on-air workstation.
4. When you first start AVScheduler, it will ask you to create a station and identify that station's Data Directory. Type in your call letters in the **Station Name** field. Then use the **Browse** button next to the **Please select a folder to contain the station's data files** field and browse to the Data Directory we created in step three.

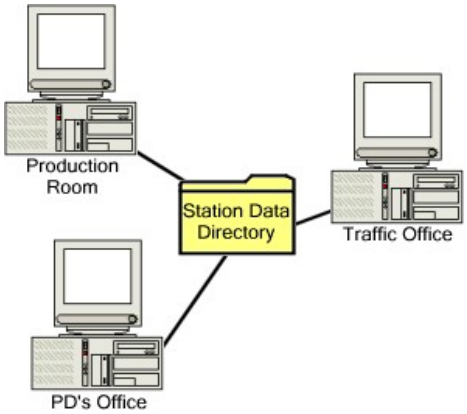
5. Go through AVScheduler's setup options to define the AVAir directories and the import definitions.
6. Build your Formats and Days templates. (Unless you're using Schedule Build.)

CONFIGURING AVSCHEDULER



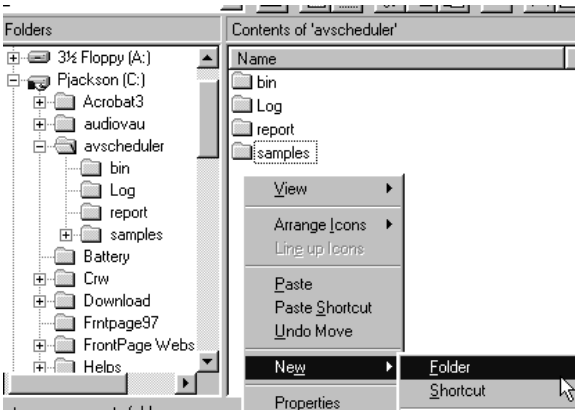
As you look at your AVScheduler screen, you will see the toolbar you will use to perform operations within AVScheduler. You will also see the Event Bar that you will to build scheduling information.

AVScheduler requires very little information to be configured. Plus, each "station" must only be set up once - the main data files are stored in a central Data Directory on a single workstation. Each instance of AVScheduler accesses that directory over a network connection, loading in the configuration settings automatically.



Typically, the Data Directory is created on the on-air workstation of the station being set up.

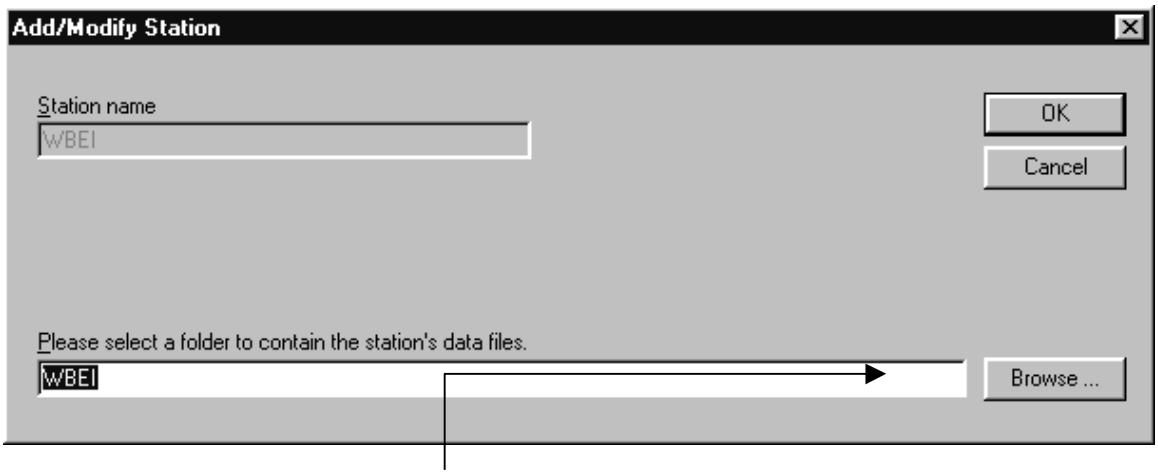
Using Windows Explorer, create a folder with a name that makes sense to you, like the station's call letters. You should create the folder in the AVScheduler folder on the machine that will host the Data Directory. Right click, and choose **New** and **Folder**.



Type the name of the New Folder. Once the folder has been created, launch AVScheduler. You'll see a box asking for you to enter the name of a Station, or to enter the name of a New One. For our example, we'll create a new station called WBEI.

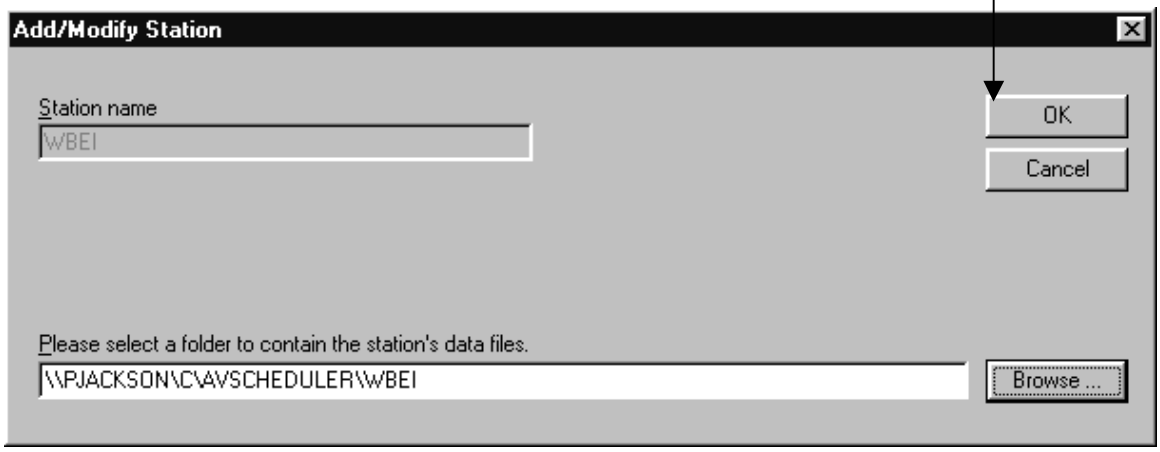
Type WBEI in this field,
Then click OK.

Next, AVScheduler will ask for the location of the station's Data Directory.

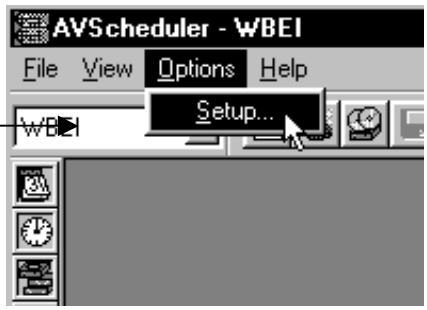


Click Browse and browse to the folder we just created.

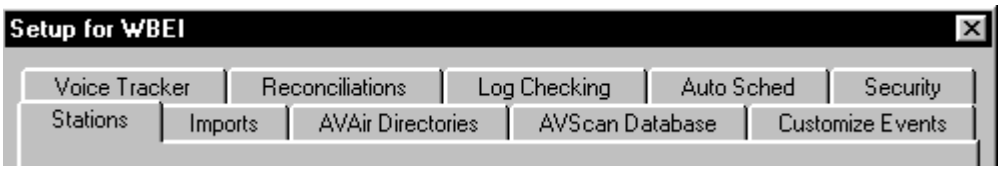
Once you've selected the data directory, click OK.



Once the station Data Directory is created, you can begin configuring AVScheduler. All configuration options are accessed by clicking Options, and Setup.



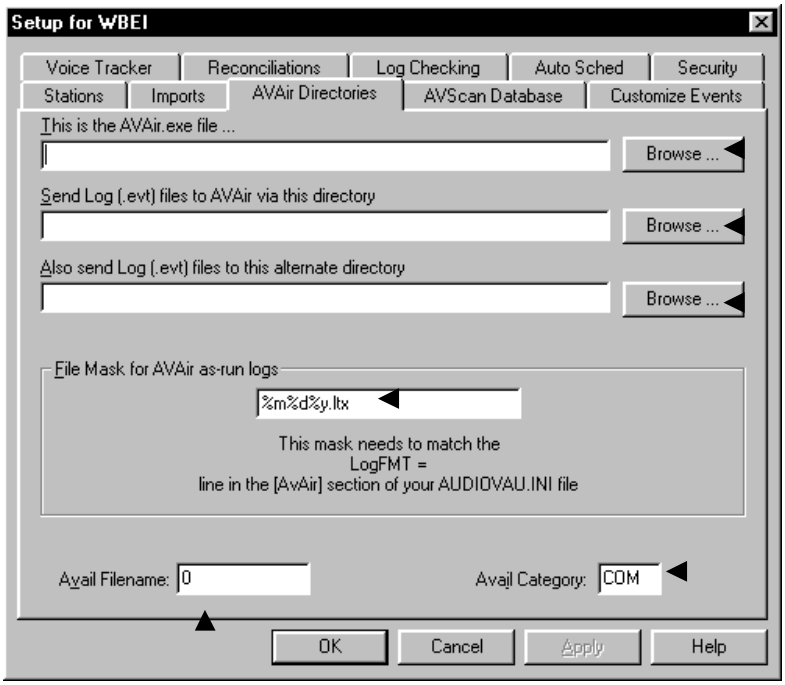
The Setup tabs allow you to set all configuration options for the station you're working with.



Stations	This tab allows you to add stations, delete stations, and point AVScheduler at alternate Data Directories.
Imports	Here's where you configure each Import for AVScheduler.
AVAir Directories	This tab defines where this station's AVAIR executable is, the directories to which you want the EVT files written, and avail filenames.
AVScan Database	This defines the location of the AVAir Database.
Customize Events	From here, you can create custom event types and icons.
Voice Tracker	Here's where you define VoiceTracker resources and configuration. (Voice Tracking component must be installed for this tab to appear)
Reconciliations	This tab allows you to set up Reconciliations, which compare by category what was scheduled (the CSAW file) against what was played.
Log Checking	Allows you to set Log Check options and define Vaults used by AVAir.
Auto Sched	This tab gives you access to Auto Scheduler options and configuration. Once configured, the "Log Automation" application must be active for Auto Scheduler to operate. (Log Automation component must be installed for this tab to appear)
Security	Allows you to set access passwords.

Once you have established the Data Directory for your new station, we can complete the configuration.

The first step is to define the AVAir Directories. Click on the AVAir Directories tab.



Browse to AVAIR.EXE file on the on-air machine and click "Open." The EXE is located in the audiovau\avair directory.

Once the EXE is defined, the default path will be filled in for you.

If you want to send a second EVT file to a backup machine, specify that directory here.

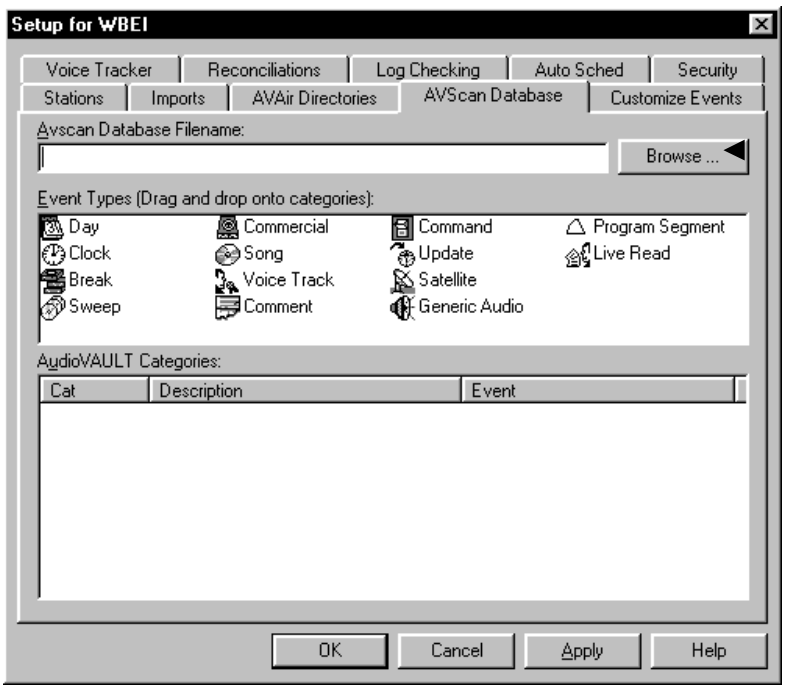
Usually, this default is OK.

This should match the Category your commercials are in.

This will define the Filename used for Avails by your traffic software.

Once you've filled in each field, click Apply. Next, we'll tackle the AVScan Database tab.

The c-drive of the computer hosting the AVScheduler Data Directory MUST be fully shared with NO password restrictions.



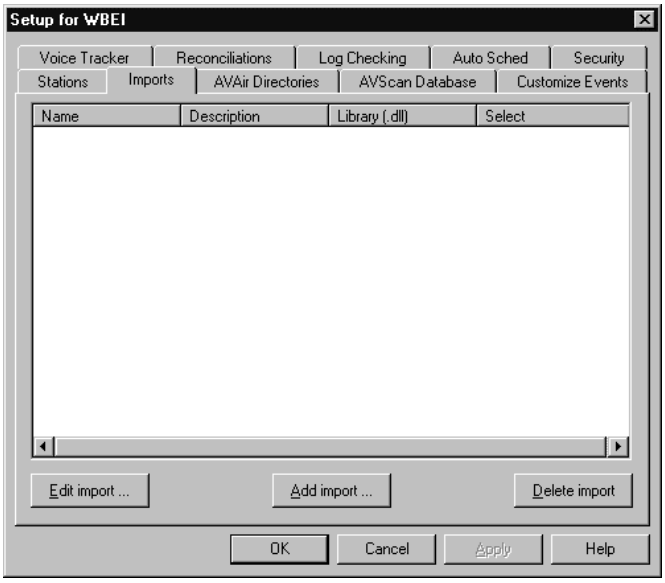
Browse to AVAIR.MDB file on the on-air machine and click "Open." The MDB is located in the audiovau\avair directory.

If you get an error that indicates "No Current Record" or a similar error, it's possible that your AVAir Database may not contain a Category or Class file. As of version 6.6x, ONLY AVScan can add those files to the AVAIR.MDB. To get Category and Class files into the database, you MUST run AVScan on a new Database at least once.

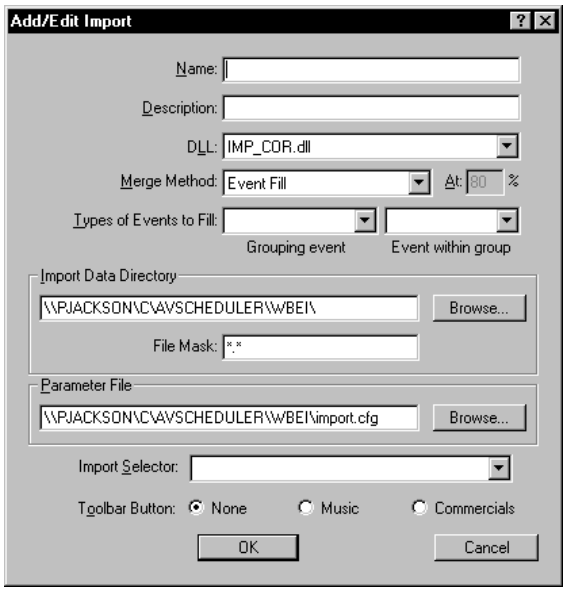
Once the AVAir paths have been defined, the only thing left to do to make AVScheduler functional is to set up the Imports.

SETTING UP AVSCHEDULER IMPORTS

Imports are set up in AVScheduler's Options/Setup dialog on the Imports tab.



The buttons are self-descriptive.for our example, we'll click Add import ... and walk through a new Import.



The **NAME** of the Import is how it appears in the Import menu option.

The **DESCRIPTION** is another string that can further identify this Import.

The **DLL** is important. There are a few choices:

IMP_COR.DLL
IMP_Selector.DLL
IMP_SelectorSAL.DLL
IMP_MusicMaster.DLL
IMP_MusicMaster2.DLL

Your selection of DLL will also affect the **Merge Method**.

Type of Events to Fill is where you define what kind of Import this will be. for Traffic, choose a **Grouping Event** of Break and Commercial as **Event within group**.

By browsing to the correct **Import Data Directory**, you won't have to hunt for the import file every time you want to schedule a log. By setting the path here, that directory will automatically open up when you go to import a file. You can make you job even easier by

using a **File Mask** filter. For example, by setting the file mask to "*.at2" you would see only files with an "at2" extension.

The **Parameter File** setting is the path to and including the IMPORT.CFG. Normally, this is located in the station data directory. The **Import Selector** field will let you select which section of the IMPORT.CFG will apply to this particular import.

DLL DESCRIPTIONS

DLL	Available Merge Methods	Description
IMP_COR.DLL	Event Fill Nearest Time Fill Duration Fill	This is the basic DLL. It compares the information in the import file created by your scheduling software against an IMPORT.CFG. Based on the CFG file, it pulls the correct information out of the import file and inserts it into a skeleton created from information stored in the Formats and Days Collections.
IMP_Selector.DLL	Schedule Build	Requires a specific output file format from Selector. Instead of creating a skeleton from information stored in AVScheduler, the skeleton is read directly from the Selector file.
IMP_SelectorSAL.DLL	Schedule Build	Requires a specific output file format from Linker. Instead of creating a skeleton from information stored in AVScheduler, the skeleton is read directly from the Linker file.
IMP_MusicMaster.DLL	Schedule Build	Requires a specific output file format from Music Master. Instead of creating a skeleton from information stored in AVScheduler, the skeleton is read directly from the Music Master file.
IMP_MusicMaster2.DLL	Schedule Build	Requires a specific output file format from Music Master. Instead of creating a skeleton from information stored in AVScheduler, the skeleton is read directly from the Music Master file.

MERGE METHOD DESCRIPTIONS

Merge Method	Description
Event Fill	Once a skeleton is created from information stored in the Formats and Days collections, the skeleton contains a number of "slots." Event Fill simply takes the first valid line in the import file, and puts the information in the first "slot." **It is important that the number of valid lines in the import file matches exactly the number of available slots.**
Nearest Time Fill	Once a skeleton is created from information stored in the Formats and Days collections, the skeleton contains a number of Breaks for commercials or Sweeps for songs. Based on the scheduled time of the event in the import file, Nearest Time Fill puts the event in the appropriate Break or Sweep. This merge method will add events regardless of the duration of the Break or Sweep.
Duration Fill	Once a skeleton is created from information stored in the Formats and Days collections, the skeleton contains a number of Breaks for commercials or Sweeps for songs, each with a specified duration. Duration Fill will put in enough events to fill a Break or Sweep to the specified duration.
Schedule Build	This merge method reads the skeleton information directly from the Import file itself. Once the skeleton is created using Schedule Build, traffic must still be imported.

WHAT IS "SCHEDULE BUILD?"

As you build the Formats templates, it's very important that the number of empty containers matches the number of events scheduled in your traffic and music programs. For example, if Programming schedules 15 songs an hour, you need to set aside 15 empty song containers every hour to not only accept all the import data, but also to make sure each event is written to the Event File in the right place.

So what happens if Programming decided to start scheduling 16 songs overnight? Not only do they have to tell their music software to start scheduling 16 songs overnight, the AVScheduler Formats will have to be modified to reflect the change with the additional containers for the extra songs. We need to make the change in two places.

To avoid this, it's possible to store all of the information we normally store in the Formats Collection within the Music Scheduling software instead. **PowerGold**, **Music Master** and RCS' **Selector** and **Linker** products are capable of creating a file that allows us to do a Schedule Build import.

With the Schedule Build import, programming information is stored in the music output file. When we import the file, the CSAW or skeleton file is created on the fly based on that information. The advantage is that when a change is made, it only has to be made in one place. The disadvantage is that until the music file is imported, containers don't exist to accept

traffic information, so music **must** be imported before traffic. The output file must be in a specific format for Schedule Build to work. Contact Digital Customer Service for more information.

THE IMPORT.CFG

Each IMPORT.CFG section is similar in structure:

```
.
"DARTS Import"
// The following assumes that Darts has be customized to generate records
// which resemble:
//|12:22:00A| |1150|WEATHER - WRYV\\OVERNIGHT|       0100
//|12:22:00A|+|1109|*MCDONALDS BREAKFAST\    |       0100
//12345678901234567890123456789012345678901234567890123456789012345678901234567890123
//          1           2           3           4           5           6           7
Desired_Import  =  Commercial_Import
Category  =  COM
Field_Name     = (SOURCEID, SHELFID   , PARMS        , DURATION             , START_TIME           )
Field_Format = ("\"1\"" , "%14A%4[]", "%19A%24[]" , "%50A%4[0123456789]", "%2A%9[:0123456789AP]")
```

A period separates each section, which is labeled in quotation marks. Double slashes remark out a line. We also have lines defining the **Desired_Import** and the AudioVAULT **Category** of these events.

The remaining two lines are the meat of the CFG file.Field_Name and Field_Format work together to control the parsing of the import file.

Field_Name sets the fields that will be filled from the text file's information. The "(" begins the comma separated list of fields. This list may exist on different consecutive lines within the import.cfg file. The ")" sets the end of this list.

The Field_Format line defines acceptable values for each of the fields. The "(" sets the beginning of this comma separated list. This list may exist on different consecutive lines within the import.cfg file. The ")" sets the end of this list.

There must be a matching comma separated definition setting for every field.

The text file will be read in one line at a time, and if all of the database fields return valid information then the line is added to the skeleton. If any of the fields do not contain acceptable values, the line will be ignored and the next line will be tested. This will continue until the end of the import file.

In the example above, we've decided were going to pull five fields out of the import file: SOURCEID, SHELFID, PARMS, DURATION, and START_TIME. Field_Format definitions can be either hard coded or dynamic:

Hard Coded:

"\"*(value)*\""

Dynamic:

"% *(column begin)*A%*(number of columns)*[*(accepted values)*]"

COMMON FIELDS IN THE IMPORT.CFG

Field	Alternate Name	Max Length	Comments
Parms+30	Artist, Client	25	This is the Artist Field for music events, and the Client Field for commercial events.
Parms	Title, Description	55	This either a Song Title, or the Commercial Description
SourceID		1	Must be hard-coded to a value of 1.
ShelfID	Source, FileName	20	This is the AudioVAULT file name.
Intro		2	Intro time in seconds
Duration		Special	
Start_Time		Special	

SPECIAL NOTES ON DURATION VALUE

Using the DURATION field in the IMPORT.CFG assumes a format of hh:mm:ss. If that's not the format found in the import file, you can use the following values instead:

Special **Duration** values

Duration+2	This field is typically used to read tens of minutes.
Duration+3	This field is typically used to read the minutes of the duration.
Duration+4	This field is typically used to read the seconds of the duration

SPECIAL NOTES ON START_TIME VALUE

The START_TIME field in the IMPORT.CFG assumes one of the following formats:

SAM/PM
SSAM/PM
MSSAM/PM
MMSSAM/PM
MMMSSAM/PM
HHMMSSAM/PM
MM:MM:SSAM/PM
MMM:SSAM/PM
H:MM:SSAM/PM
HH:MM:SSAM/PM

H= Hours
M= Minutes
S= Second
AM/PM= AM or PM (Note: A could also be used for AM, P could also be used for PM)

If none of those formats are found in the import file, you can use the following values instead:

Special **Start_Time** Values

Start_Time+0	This field is typically used to read the hour.
Start_Time+2	This field is typically used to read the 10's of minutes.
Start_Time+3	This field is typically used to read the 0-9 minutes.
Start_Time+4	This field is typically used to read the seconds.

Using our example,

```
"DARTS Import"
// The following assumes that Darts has be customized to generate records
// which resemble:
//|12:22:00A| |1150|WEATHER - WRYV\\OVERNIGHT|       0100
//|12:22:00A|+|1109|*MCDONALDS BREAKFAST\    |       0100
//12345678901234567890123456789012345678901234567890123456789012345678901234567890123
//          1         2         3         4         5         6         7
Desired_Import = Commercial_Import
Category = COM
Field_Name   = (SOURCEID, SHELFID   , PARMS        , DURATION              , START_TIME             )
Field_Format = ("\"1\"" , "%14A%4[]", "%19A%24[]" , "%50A%4[0123456789]", "%2A%9[:0123456789AP]")
```

Field_Name	Field_Format	Translation
SOURCEID	"\1\""	Give this a value of 1
SHELFID	"%14A%4[]"	Go to column 14, take the next 4 columns, and accept any character.
PARMS	"%19A%24[]"	Go to column 19, take the next 24 columns, and accept any character.
DURATION	"%50A%4[0123456789]"	Go to column 50, take the next 4 columns, and accept only the defined characters. If there are other characters in that field, this line is not valid.
START_TIME	"%2A%9[:0123456789AP]"	Go to column 2, take the next 9 columns, and accept only the defined characters. If there are other characters in that field, this line is not valid.

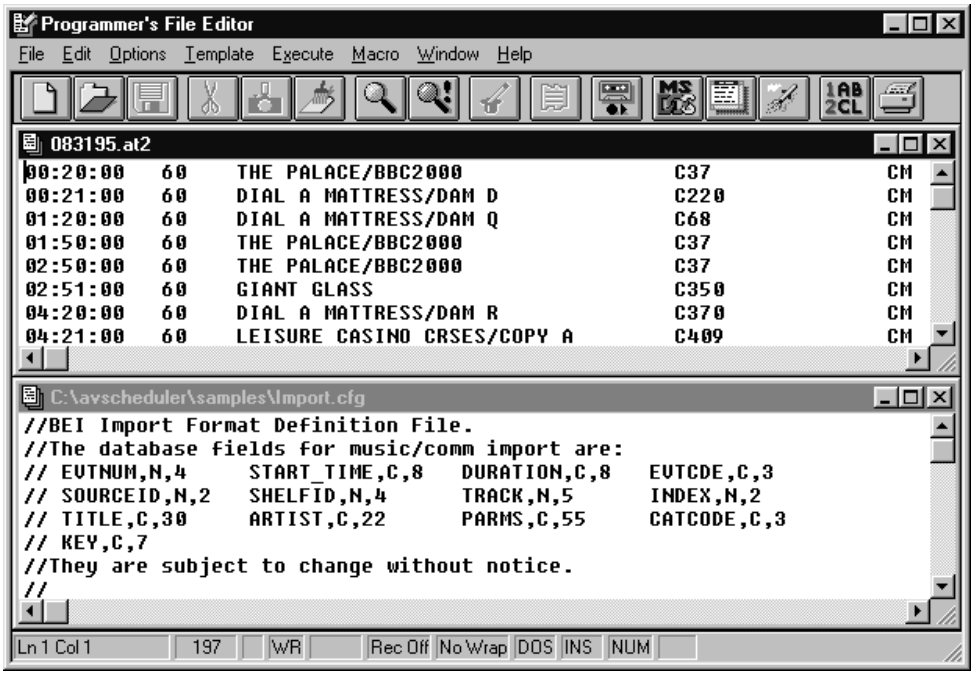
EXAMPLE 1: SETTING UP MARKETRON ACTII

> The first step in setting up any import is to get a file from the scheduling program. Most are capable of writing a file to disk.that's that file we need.

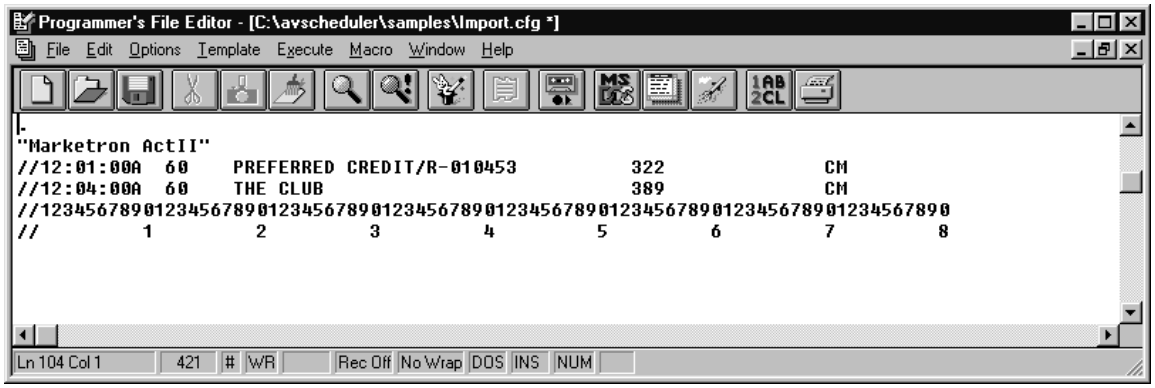
The two most common merge methods with traffic programs are **Event Fill** and **Nearest Time Fill**. Either will work, but remember that Event Fill is simply 'slot' based, which makes it important that the number of valid lines in the import file matches exactly the number of available commercial slots in the skeleton. Each break in Marketron must have the same number of lines as the skeleton has slots. Obviously, you won't have the same number of commercials each break, so we can pad with dummy lines called AVAILS.

Nearest Time Fill is a bit more flexible. Instead of matching both programs exactly, AVScheduler can fill in commercial breaks based on the time Marketron assigns to each commercial. With Nearest Time Fill, it is not necessary to pad with AVAILS.

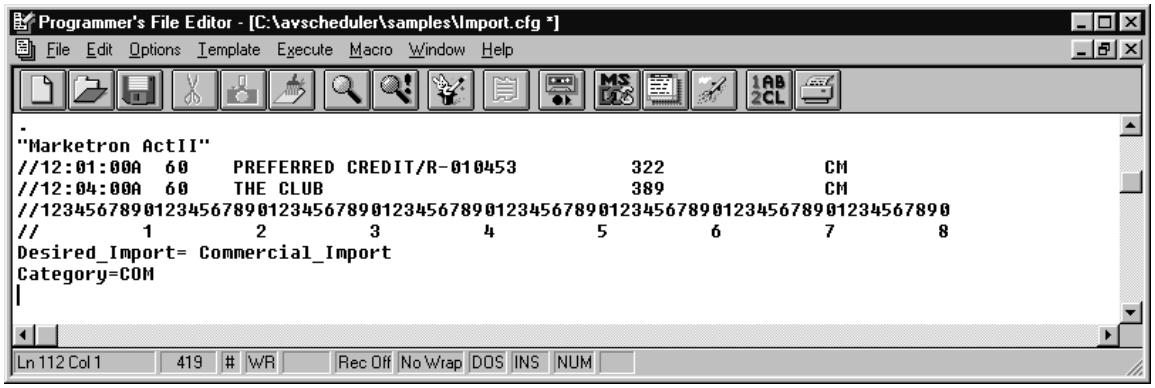
Now that we have our file from Marketron, and we know we want to use Nearest Time Fill, we can write the IMPORT.CFG file. Of course, you can contact Broadcast Electronics Customer Service for assistance - we have sections already written for most scheduling programs. Open both the import file from Marketron and the IMPORT.CFG in a text editor like PFE32:



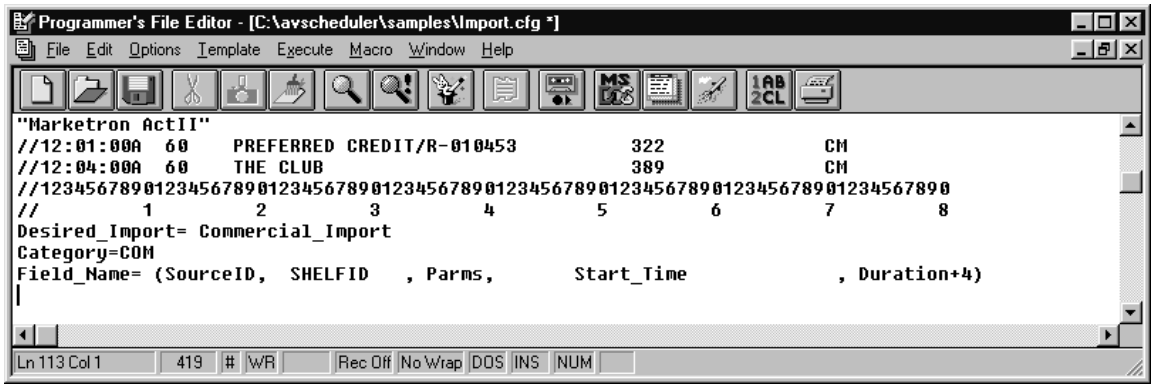
Create a new section in the IMPORT.CFG and call it "MARKETRON ACTII." Typically, we'll copy a couple of lines from the file into remmed out lines in the IMPORT.CFG along with numbers indicating the columns.



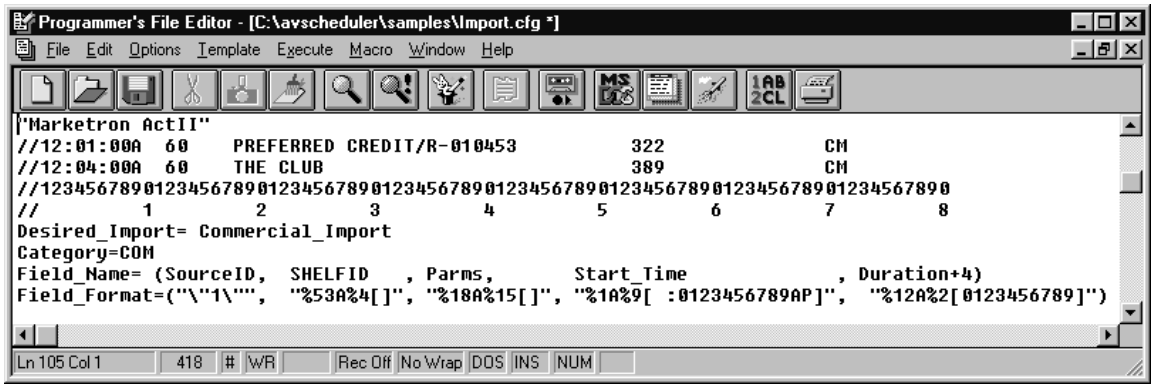
We'll add in the lines defining this as a Commercial Import using the COM category:



The Fields we need are: SOURCEID, SHELFID, PARMS, START_TIME, and seconds of DURATION.



Next we define where each of those values are located within the import file, and what values we want to accept.

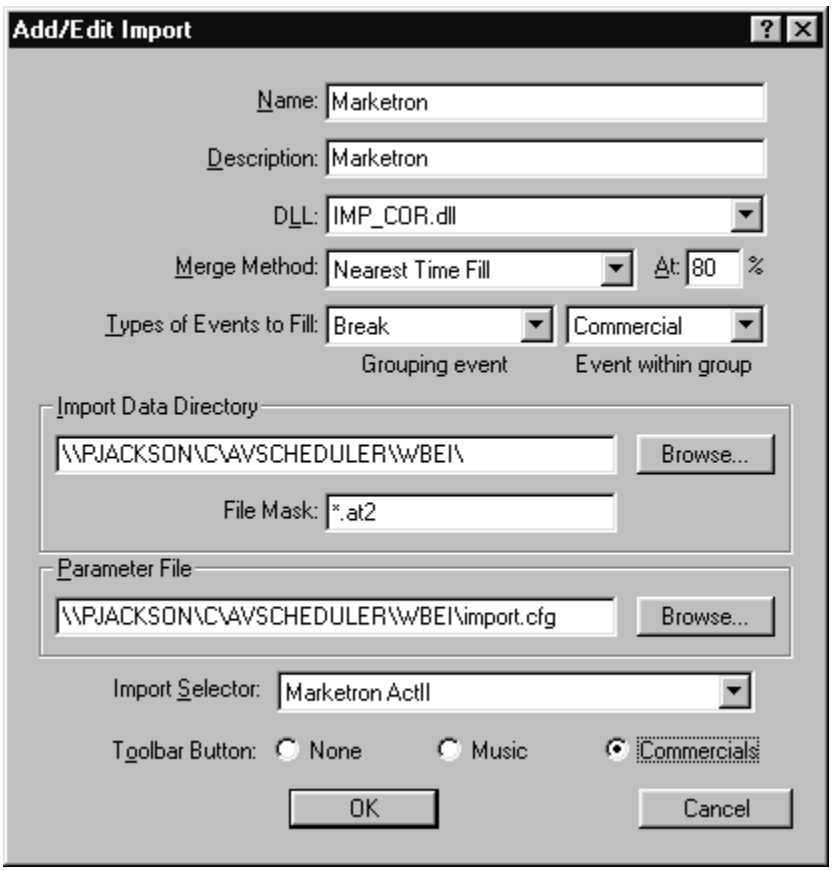


Using our Marketron example:

Field_Name	Field_Format	Translation
SOURCEID	"\1\""	Give this a value of 1
SHELFID	"%53A%4[]"	Go to column 53, take the next 4 columns, and accept any character.
PARMS	"%18A%15[]"	Go to column 18, take the next 15 columns, and accept any character.
START_TIME	"%1A%9[:0123456789AP]"	Go to column 1, take the next 9 columns, and accept only the defined characters. If there are other characters in that field, this line is not valid.
DURATION+4	"%12A%2[0123456789]"	Go to column 12, take the next 2 columns, and accept only the defined characters. If there are other characters in that field, this line is not valid.

Now that our IMPORT.CFG is set up, we can add the import in AVScheduler.

1. Open AVScheduler, and cancel out of the Calendar.
2. Click Options, and Setup.
3. Open the Imports tab and click Add Import.
4. Fill in the blanks, choosing the correct "Import Selector."

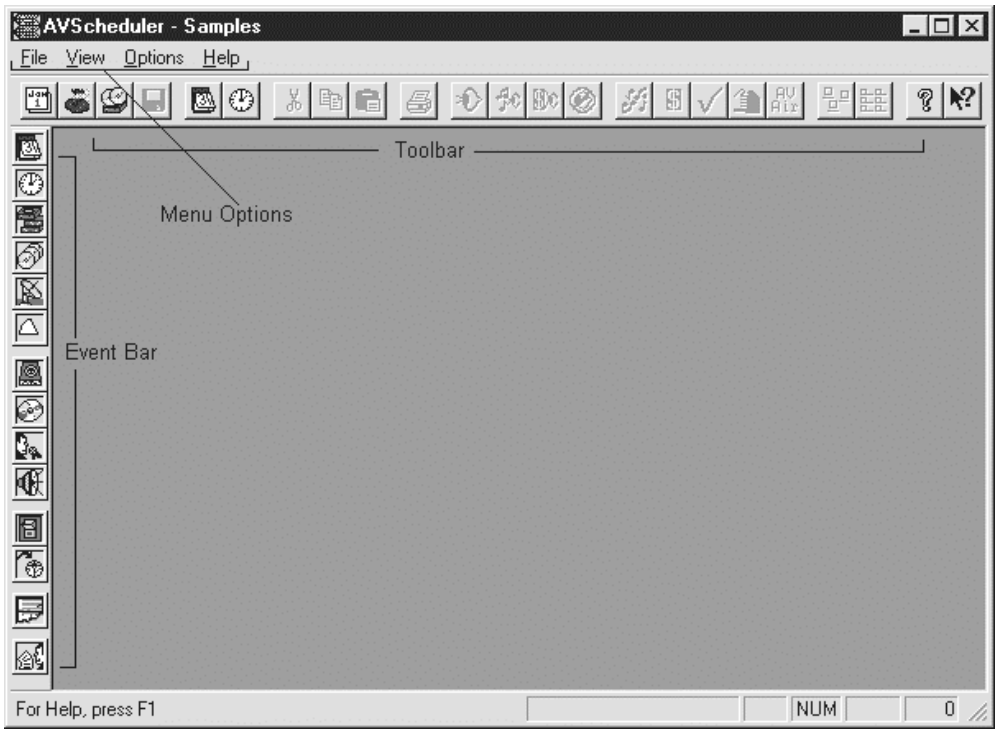


Click "OK," get out of the Setup screen and you're done!

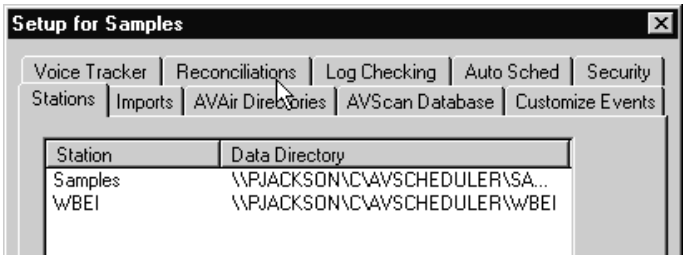
CONFIGURING RECONCILIATIONS

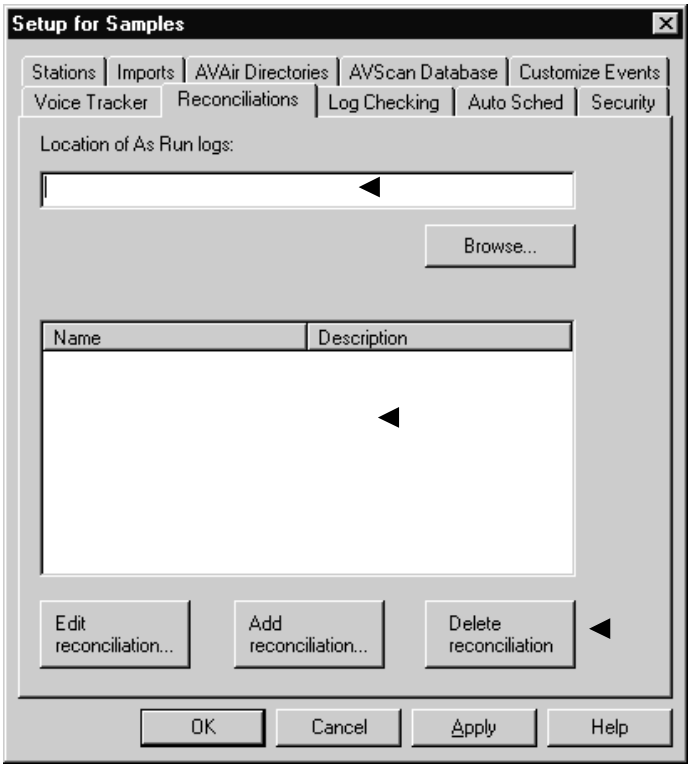
AVScheduler has the ability to compare what was scheduled for a specific day, compare that information to what actually aired and create a reconciliation report.

Reconciliations are performed on specific categories and can report information needed by the user. To set up a reconciliation, open AVScheduler, and click the "Options" menu option. Select "Setup."



Once the Setup dialog is up, click on the Reconciliations tab.





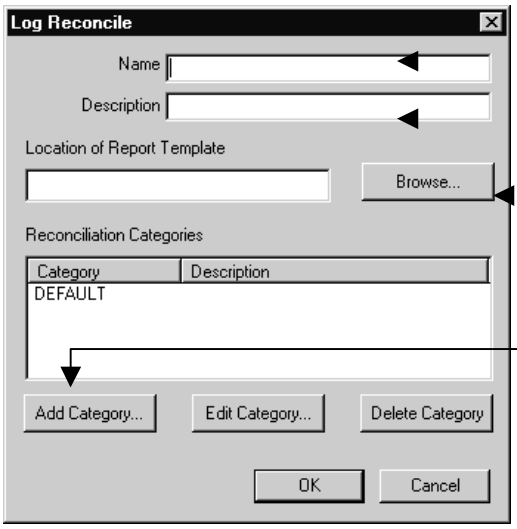
This is the location of this station's as-run MDB files. Browse to this station's AVAir directory.

This will contain a list of all reconciliations that have been set up for this station.

We can Edit, Add, and Delete reconciliations with these buttons.

SETTING UP A RECONCILIATION STEP-BY-STEP

1. Browse to the location of this station's As-Run Logs.
2. Click "Add Reconciliation."
3. From the new dialog, fill in the appropriate information:



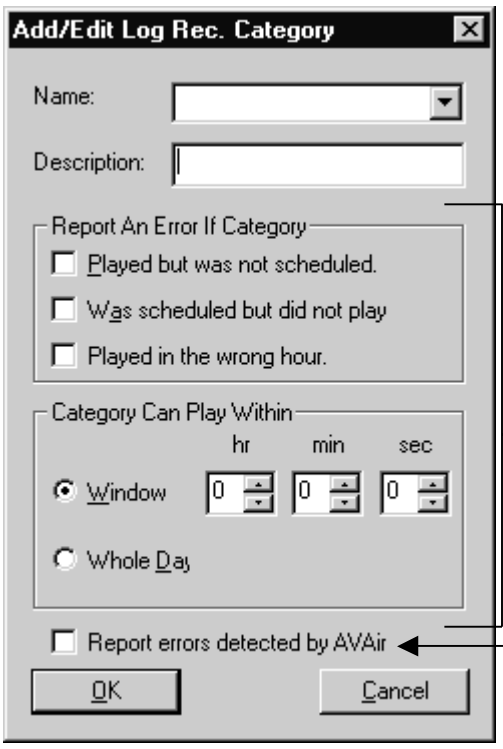
The NAME of the reconciliation

The DESCRIPTION (usually the same as NAME)

Click Browse, go up a level  , double-click on the REPORT folder and choose "landscape log rec.rpt"

We're ready to determine which categories we want to reconcile. Click ADD CATEGORY.

4. When you click "Add Category," we'll see a new dialog.



This box drops down to show a list of available categories.

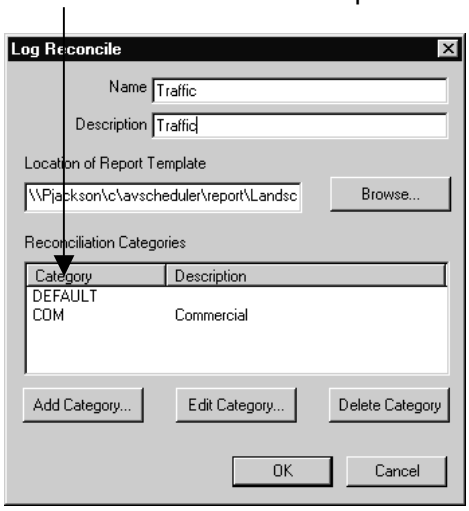
The Description will fill in from the Category file.

Set your options. What do you want to see in your report?

Make sure this is unchecked.

5. Once you've clicked OK, you'll see your category listed in the "Log Reconcile" dialog.

6. One more tip.double click on DEFAULT and uncheck "Report errors detected by AVAir."

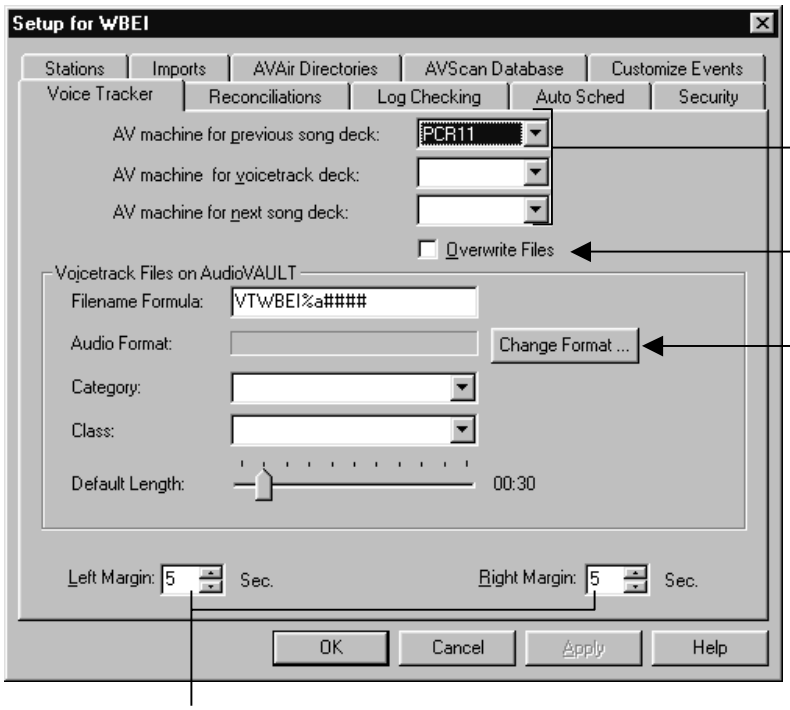


CONFIGURING VOICE TRACKER

Once the basic configuration of AVScheduler is complete, you can configure the Voice Tracker component. For the Voice Tracker configuration tab to be present, the Voice Tracker component must be installed on the workstation.

Voice Tracker allows a user to listen to, in cue or audition, the end of the previous song, their voicetrack, and the beginning of the next audio event. On-screen buttons that can be remote controlled, control the record process. Voice Tracker requires two separate playback channels in addition to a record/play channel.

To configure Voice Tracker, open AVScheduler. Cancel out of the Calendar, and access the configuration tabs by clicking on **Options** and **Setup** on the AVScheduler menu.



These drop-down boxes contain all of the AV-100 channels available to this workstation. Select the decks for each Voice Tracker deck.

Voice Tracker can either overwrite existing files, or create brand new files using a Filename formula.

The sample/compression rate of the voice tracks, their category, class and default length are all set here.

How many seconds of the previous song and the next song does the user need to hear? Left Margin applies to the previous song, Right Margin applies to the next song.

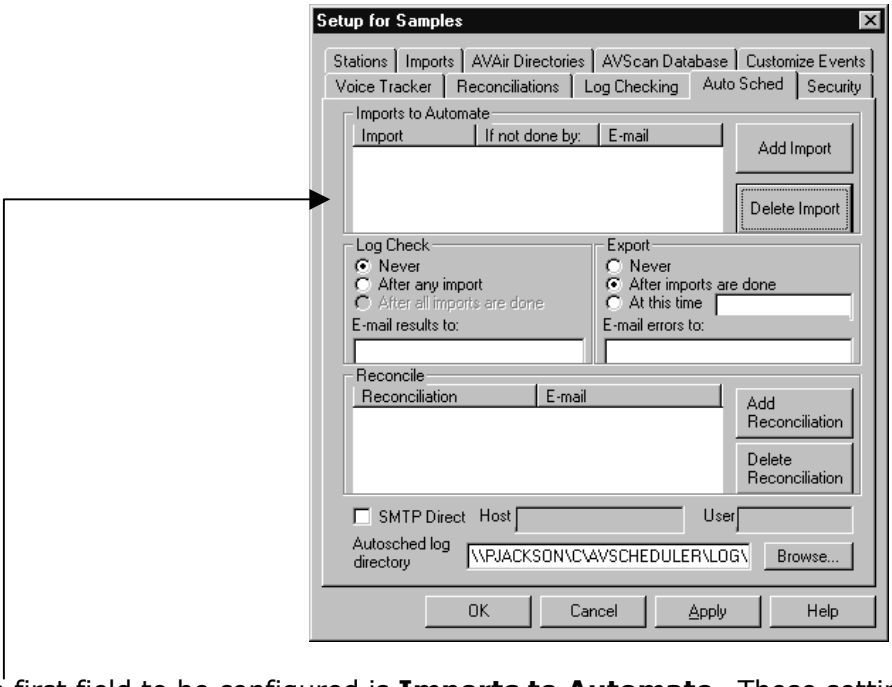
Voice Tracker prefers that all three decks are on the same server. This is to maximize efficiency.

CONFIGURING AUTOSCHEDULER

AVScheduler has the ability to automatically import Music and Traffic log files into AVScheduler using a utility called AutoScheduler. This feature can also perform log checks, log reconciliation, and notify a list of people when tasks are completed or when they are not completed. One AutoScheduler can automate any number of stations, provided that all necessary information is provided for each station on the workstation AutoScheduler is running. AutoScheduler checks for new information every 10 minutes.

AUTOSCHEDULER CONFIGURATION STEPS

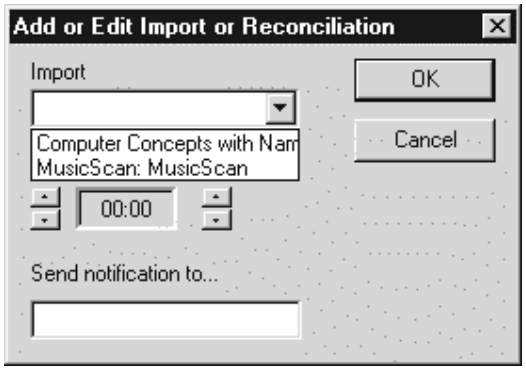
1. Start AVScheduler.
2. Move cursor to Options Setup and single click with the left mouse button
3. Move the cursor to the AutoScheduler tab and single click with the left mouse button. This will bring up the configuration settings for AutoScheduler.



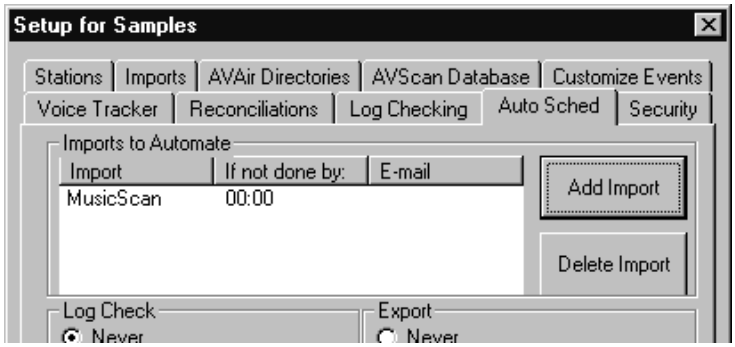
The first field to be configured is **Imports to Automate**. These settings determine what files will be imported and merged together automatically.

ADDING IMPORTS TO AUTOMATE

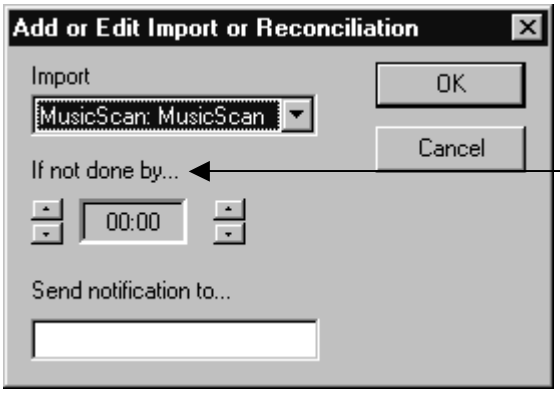
1. Click on **Add Import**. This will bring up a drop-down list of available imports, as defined in the Imports Tab fold in AVScheduler. The dialog box will look like this:



2. Select the import you want to automate and click on OK. You should see the selected import in the list of **Imports to Automate.** (The import you want to use must have a valid filename formula defined in AVScheduler.)



3. Now that you have defined an Import to Automate, define the time to notify someone via e-mail by changing the "If Not Done By:" time



Set the time (in military time) when AutoSched needs to notify someone if the logs have not been imported. Also type in the e-mail address you want to send notification to. For example "*ProgramDirector@WBEI.COM*."

Note: If the station is using Windows Messaging provided by Microsoft, the email address must include SMTP: in the front of the e-mail address. Example:

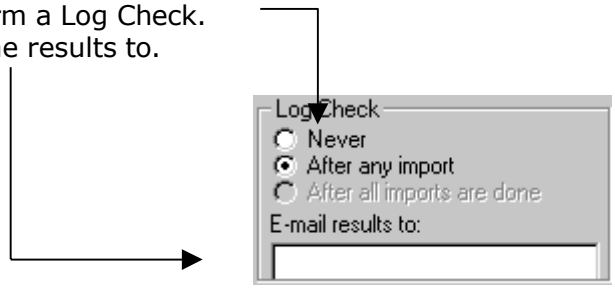
SMTP: *ProgramDirector@WBEI.COM*

Move the cursor to the bottom of the tab and click on APPLY. This will make the settings take effect, and the tab will reflect the changes.

CONFIGURING AUTOSCHEDULER LOG CHECK

Configuring AutoScheduler to run automatic Log Checks is pretty simple. It only needs to know two things:

1. When to perform a Log Check.
2. Who to send the results to.



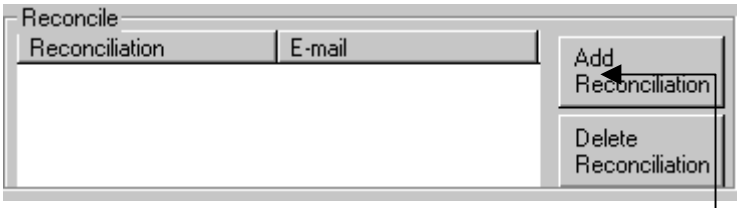
Select whether or not to export the results each time an import occurs or after all of the imports for the day are competed. Also type in the e-mail address you want to send notification to. For example "*ProgramDirector@WBEI.COM*."

Note: If the station is using Windows Messaging provided by Microsoft, the email address must include SMTP: in the front of the e-mail address.
Example:

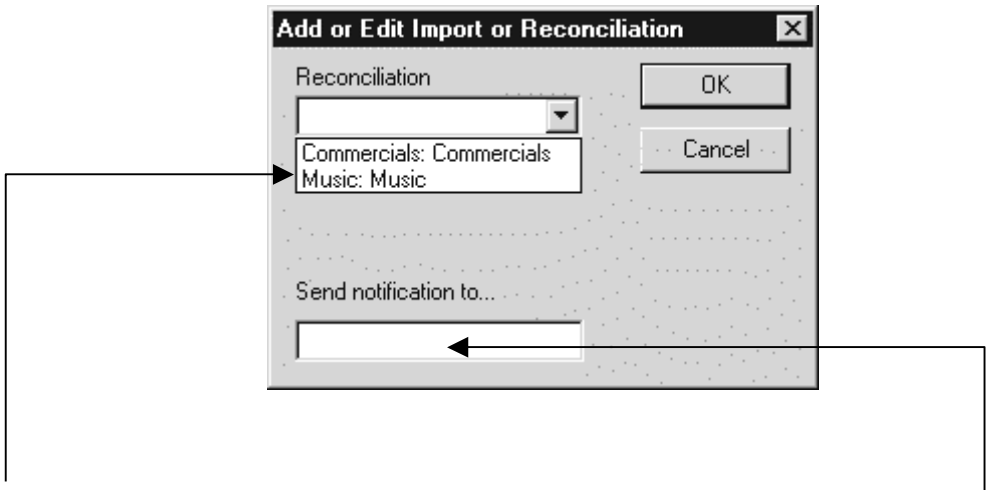
SMTP: *ProgramDirector@WBEI.COM*

CONFIGURING AUTOSCHEDULER LOG RECONCILIATIONS

The log reconciliation component of AutoScheduler is configured based on Reconciliations that have already been configured in AVScheduler. If you haven't set up Reconciliations in AVScheduler yet, do that before you configure AutoScheduler.



Click "Add Reconciliation" to display the available Log Reconciliation definitions that have been configured in AVScheduler.



Move the cursor to the appropriate log reconciliation item and single click with the left mouse button. Also type in the e-mail address you want to send notification to. For example "*ProgramDirector@WBEI.COM*."

> Note: If the station is using Windows Messaging provided by Microsoft, the email address must include SMTP: in the front of the e-mail address.
> Example:
>
> SMTP: *ProgramDirector@WBEI.COM*

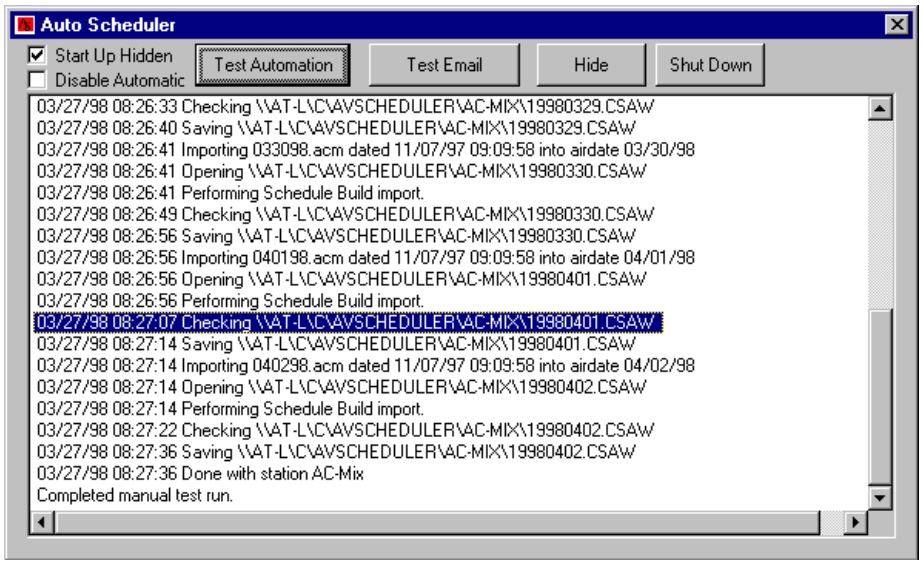
Click OK, and you'll see your changes reflected in the tab.

AUTOSCHEDULER CONTROLS

StartUp Hidden- When checked, AutoScheduler runs as an Icon in the tool tray.

Disable Automatic- When checked, all automation is stopped. Its purpose is to allow the user to ensure proper setup. Once you're sure everything is working like it should, this checkbox should never be checked.

Test Automation- This button allows the user to do a manual run of the automation tasks that will be performed. The list of what occurred will appear in the AutoScheduler Main Dialog..



Hide- Hides the AutoScheduler icon in the tool tray. AutoScheduler remains running

Shutdown- Exits the AutoScheduler Program.

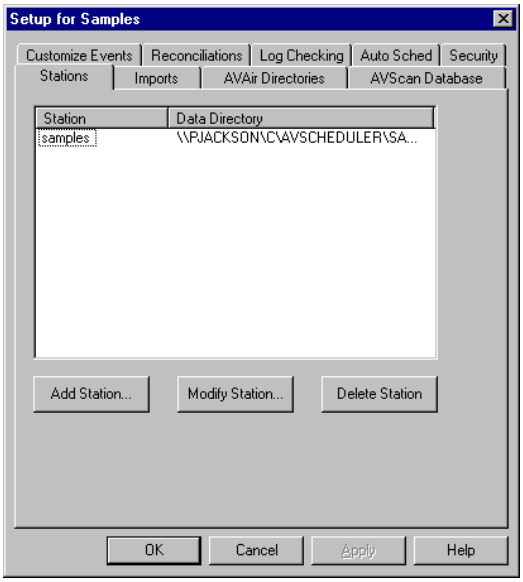
AUTOSCHEDULER LOGGING INFORMATION

AutoScheduler provides detailed information on the tasks that it has performed. The log provides the user with the date and time of the actions, as well as both the name and the date of the file being imported and which date the information is being imported into. AutoScheduler also informs the user which station it is performing the automation tasks for.

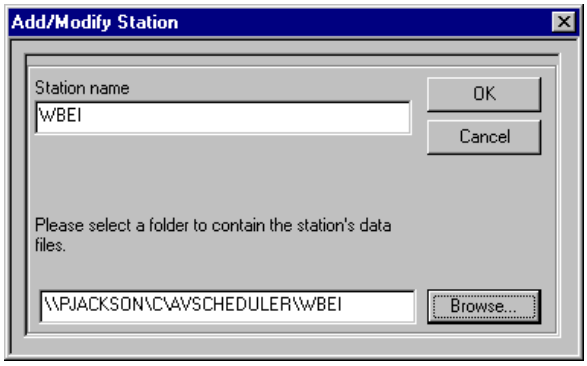
CONVERTING FROM COREUI: CORETRANSITION.EXE

CoreTransition.EXE is a small utility included with AVScheduler designed to convert Format/Days information stored in CoreUI into the AVScheduler format. The executable is located in the C:\AVSCHEDULER\BIN folder. Before using CoreTransition, create the station in AVScheduler and create empty Formats and Days Collections to store the CoreUI data.

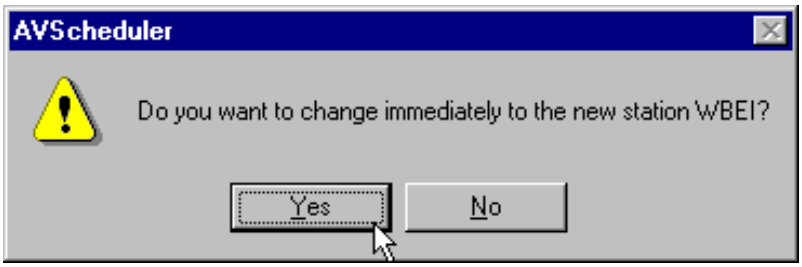
1. Open AVScheduler. Click "OPTIONS" and "SETUP."



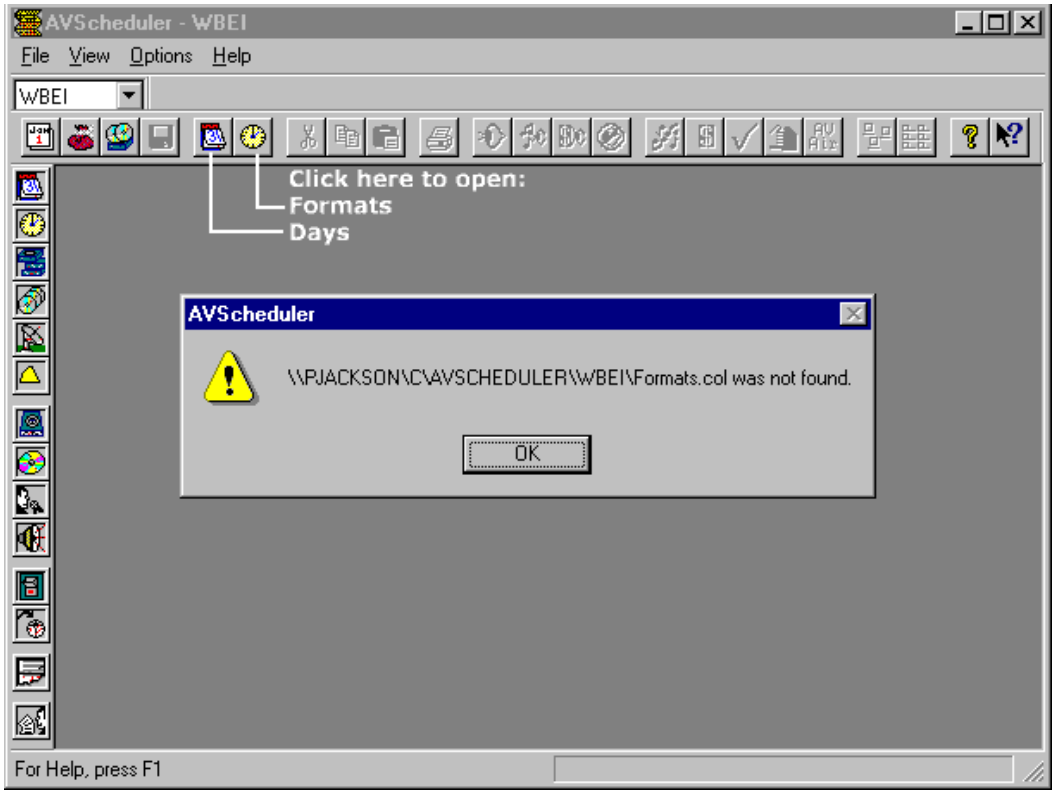
2. Click "Add Station." You will see the Add/Modify Station dialog box. Type in the name of the new station. Browse to the folder that will hold the station's data. It is recommended you create a new folder in the AVScheduler directory for each new station.



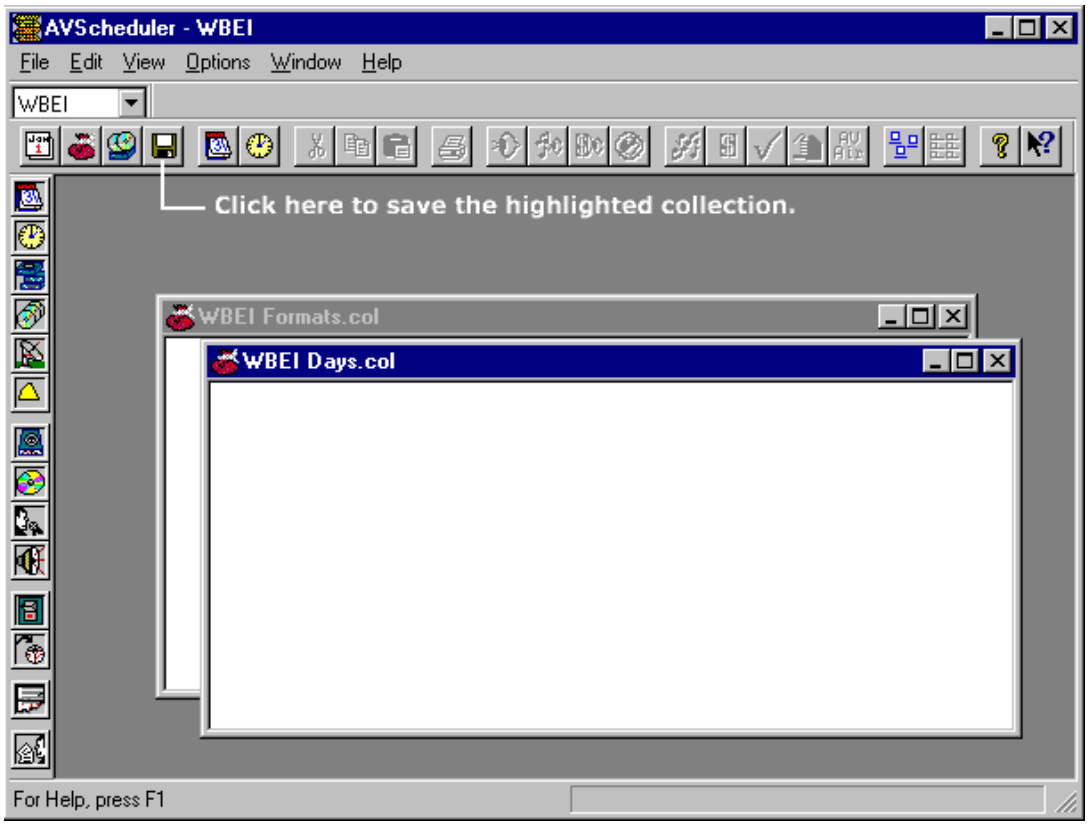
3. Once the station has been created, AVScheduler will prompt you to switch immediately to the new station. Click YES.



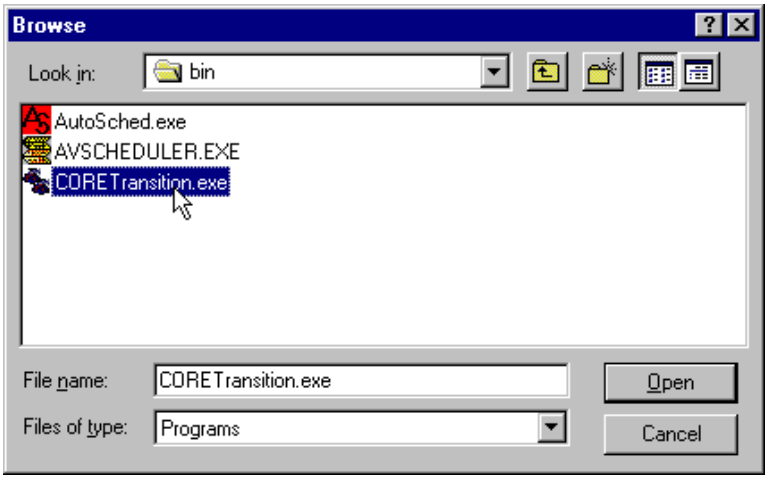
4. Next, we create new Days and Formats Collections. Click on the "OPEN DAYS" and "OPEN FORMATS" buttons. You will get messages saying the collections aren't found. Click "OK" to create the collection.



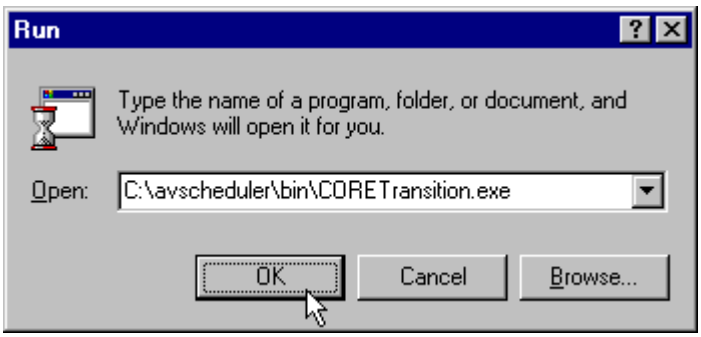
5. Once the collections are created, save them. Click on a collection and click the "SAVE" floppy disk icon. Then click on the other collection and save it too.



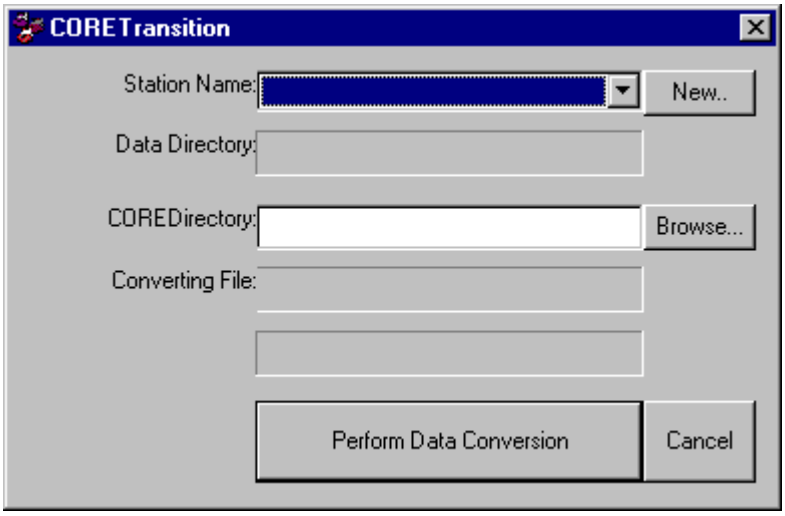
6. Now that we've created the new station and the collections, we can convert the CoreUI data. Click on the Windows START button and choose RUN. BROWSE to the AVSCHEDULER\BIN directory and select the CoreTransition file.



7. Once you've selected the program, click "OK."



8. Once the CoreTransition box comes up, select the station you're working with and browse to the CORE directory you want to grab information from. The CORE directory can be on the local drive or accessed over the network.



9. Once you've selected the station and set the CORE directory, click "Perform Data Conversion." It will read the CoreUI data and convert it exactly to an AVScheduler format. Once the process is complete, you can continue to use AVScheduler as normal.

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Section 11: AVMaint, Security and AVExplorer

By the end of this section you should understand these key concepts:

- The role of AVMaint
- How to check Drive Information
- How to Format hard drives
- How to configure Category and Class files
- How to take advantage of the AudioVAULT security model
- How to set up and use AVExplorer
- How to take advantage of the Compression feature and set up AutoImport Directories

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AVMAINT OVERVIEW

AVMaint is one of the utility programs included with the AudioVAULT software package. AVMaint can be used to perform a number of functions, including:

- Mounting/Unmounting SCSI drives (AV100)
- Formatting SCSI drives (AV100)
- Checking SCSI drives for errors (AV100)
- Checking contact closures with Paratest (ISA BEI GPI Card)
- Creating/modifying Category and Class files (All Platforms)
- Configuring AudioVAULT security options (All Platforms)

AVMAINT'S DISK MENU (AV100)

The **Format** option of AVMaint's **Disk** menu allows users to mount and unmount AV100 systems' SCSI disks and to perform low level and high level formats on the disks; it also allows users to view the status of the disks. Before we begin describing the different features the Format option, let's describe some common terms we'll use throughout the discussion of the options:

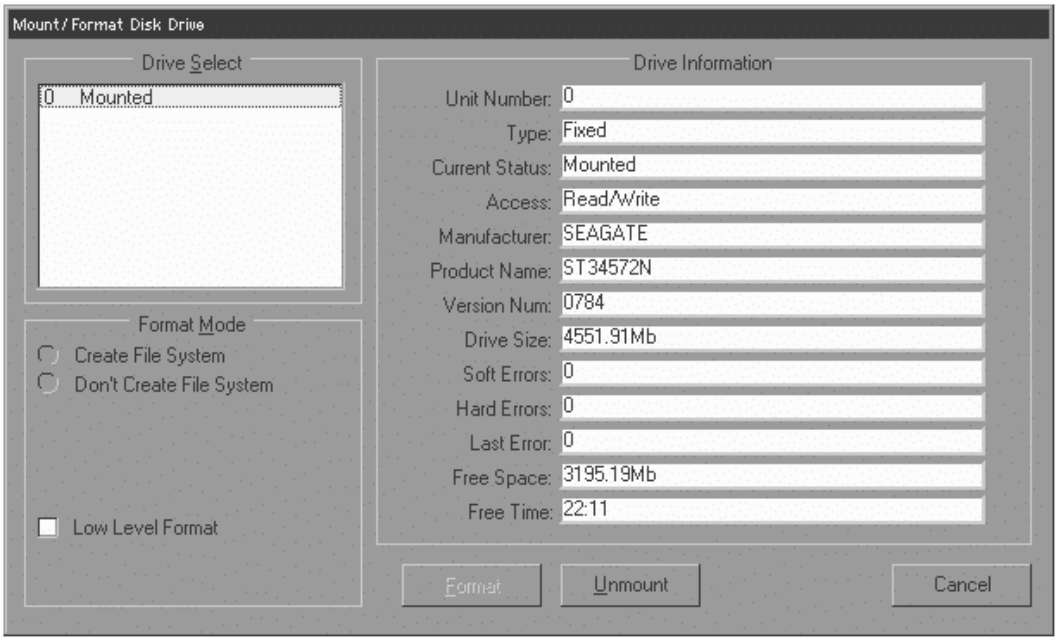
Mounting a disk makes the disk accessible for reading/writing. The process of **mounting** an AV100 AudioVAULT system's SCSI disk causes the High Performance File System Checker (FSCK) to run on the disk. It also makes the data on the disk accessible to the system. The AudioVAULT very rarely reads data from an unmounted AudioVAULT SCSI disk. One case would be during the AV100 boot process. The code file (PCR.RAM) begins downloading into the AV100 cards in the computer system soon after the AV100 cards receive power. Another case would involve a disk-to-disk copy.

Unmounting a disk makes the disk inaccessible for reading/writing. Unmounting an AudioVAULT system's SCSI disk is necessary in order to format the disk. All files must be closed before the drive can be unmounted, so the unmount function closes all on-card client sessions. As a result, all users would be temporarily disconnected from that server until the unmount is complete (about 3-4 seconds). This would stop recording and playback as the unmount process suspends other tasks. Therefore, only unmount drives when the system is down for maintenance!

Formatting a disk makes the disk usable for computer systems. There are two levels of formatting that need to be placed on all types of magnetic disk storage media: low level, and high level. A low level format forms the tracks and sectors on a disk that divide the disk into a series of addresses, which can then be used to keep track of where data is stored and to reference the stored data. SCSI drives come pre-formatted (low level) from the factory. For any type of hard disk, no matter what type of computer system is using the disk, the low level (a.k.a. "physical") format is the same. A high level format establishes, on a disk, such things as file allocation tables that are specific to the type of computer system using the disk. In order for a high level format to be placed on a disk, the disk must first have a low-level format written on it. This is not a problem for customers, because hard disk drive manufacturers always place a low-level format on all hard disks they sell before they sell the disks. What this means for AudioVAULT customers is that they must make sure a high level AudioVAULT format

has been performed on each new hard disk drive before they use the disk with their AudioVAULT systems.

Now that we've discussed what the terms "mounting" and "unmounting" and "formatting" mean, we can discuss the features the Format option of the Disk menu has for the AudioVAULT system.



MOUNT/FORMAT DRIVE DIALOG DESCRIPTIONS

Drive Select--The Drive Select list box shows all disk drives accessible by the currently opened vault. If there are no drives shown, yet you know the currently opened vault should be able to access drive(s), there is probably a SCSI bus problem--such as improper termination, incorrectly set SCSI IDs, a loose SCSI cable, or a drive power problem.

When an AV100 SCSI drive in the Drive Select list box is highlighted, then the Drive Information fields are filled in. Only one drive can be selected (highlighted) at a time; therefore the Drive Information fields can display information on only one at a time.

Notice at the bottom of the Mount/Format Disk Drive dialog, there are three buttons: Format, Mount/Unmount, and Cancel. The middle button can have one of two captions--Mount or Unmount. When a mounted drive is selected, the middle button becomes the Unmount button; when an unmounted drive is selected (or no drive is selected), the middle button becomes the Mount button. AudioVAULT SCSI drives can be mounted and unmounted using the Mount/Format Disk Drive dialog.

The Drive Select list box shows the SCSI IDs and current status of the recognized (listed) drives. The possible values for the current status listed in the Drive Select list box are:

- Mounted-Files may be accessed, modified, created, deleted, etc
- Unmounted-Files will be accessible once mounted
- Formatting-The AV100 file system is being created

Unit Number--The Unit Number list box displays the SCSI ID of the drive selected (highlighted) in the Drive Select list box. The SCSI ID listed may be 0-7 for SCSI bus A; it may be 8-15 for bus B.

Type--The Type list box lists the type of the drive selected (highlighted) in the Drive Select list box.

Current Status--The Current Status list box displays the current status of the currently selected in the Drive Select list box. The Current Status list box can display one of "Mounted," "Unmounted," "Making FS (Making File System)," and "Formatting: 100%."

- **Mounted** means the disk drive selected (highlighted) in the Drive Select list box is Mounted.
- **Unmounted** means the disk drive selected (highlighted) in the Drive Select list box is Unmounted and is not being formatted.
- **Making FS** means the selected disk drive is having a high level format placed on it.
- **Formatting**: 100% means the selected disk drive is having a low-level format placed on it. Do not interrupt a low-level format, or the drive's capacity will be wrong. If interrupted then repeat the low-level format. As SCSI drives don't indicate low level format progress, AVMaint simply displays FORMATTING 100%.
- **Unformatted**: The drive's capacity is 0 sectors or there is SCSI bus/termination problems. The drive may also simply be failing, as in:

Access--The Access list box displays the type of access allowed with the currently selected disk drive in the Drive Select list box. The possible values that can be listed in the Access list box are:

- **Read Only**--The drive's write protect jumper is probably mistakenly enabled
- **Read/Write**--The drive can be both read from and written to.

Manufacturer--The Manufacturer list box displays the manufacturer of the currently selected disk drive in the Drive Select list box. The value displayed is read from the disk (so any typos displayed in the Manufacturer list box are not BEI's fault).

Product Name--The Product Name list box displays the manufacturer's model number for the disk drive that is currently selected in the Drive Select list box. The value displayed is read from the disk.

Version Num--The Version Num list box displays the version of the firmware located on the disk drive that is currently selected (highlighted) in the Drive Select list box. The value displayed is read from the disk.

Drive Size--The Drive Size list box displays the size in MB. If the value in the Drive Size list box is equal to zero, users can unmount the currently selected disk drive and low level format the disk drive. Once the low-level format is complete, the value in the Drive Size list box should display a positive number (a number greater than zero). If the displayed capacity is a fraction of the drive's true capacity then low-level format the drive and reboot the server to get the drive's new capacity.

Soft Errors--The Soft Errors list box displays the number of errors that occurred, on the currently opened vault that the AudioVAULT system was able to recover from. The value displayed indicates the number of errors the AudioVAULT system recovered from since the last time the currently opened vault was booted. The counter that keeps track of the number of errors a vault has recovered from is stored in the vault's RAM, and is therefore reset to 0 every time the vault is booted.

Hard Errors--The Hard Errors list box displays the number of errors that occurred, on the currently opened vault that the AudioVAULT system was not able to recover from. The value displayed indicates the number of errors the AudioVAULT system was unable to recover from since the last time the currently opened vault was booted. The counter that keeps track of the number of non-recoverable errors that occurred since the vault was last booted is stored in the vault's RAM, and is therefore reset to 0 every time the vault is reset.

Last Error--The Last Error list box displays a hexadecimal (base 16) number indicating the last SCSI error that occurred, since the currently opened vault was last booted. For more information on LAST ERROR, see the "System Info" topic in the AudioVAULT On-Line Help File.

Free Space--The Free Space list box displays, in MB, the amount of space still available for storing data that is left on the currently selected (highlighted) disk drive in the Drive Select list box.

Free Time--The Free Time list box displays an estimate of the length, in time, of audio that could be recorded and stored on the currently selected disk drive. It must be greatly emphasized that the figure listed here is an estimate based on **BytesPerSecond** and not a precise measurement.

FORMATTING SCSI DRIVES

Users of the AudioVAULT (and any other type of computerized system) should be aware that both low level and high level formats destroy all the data on a disk that is being formatted.

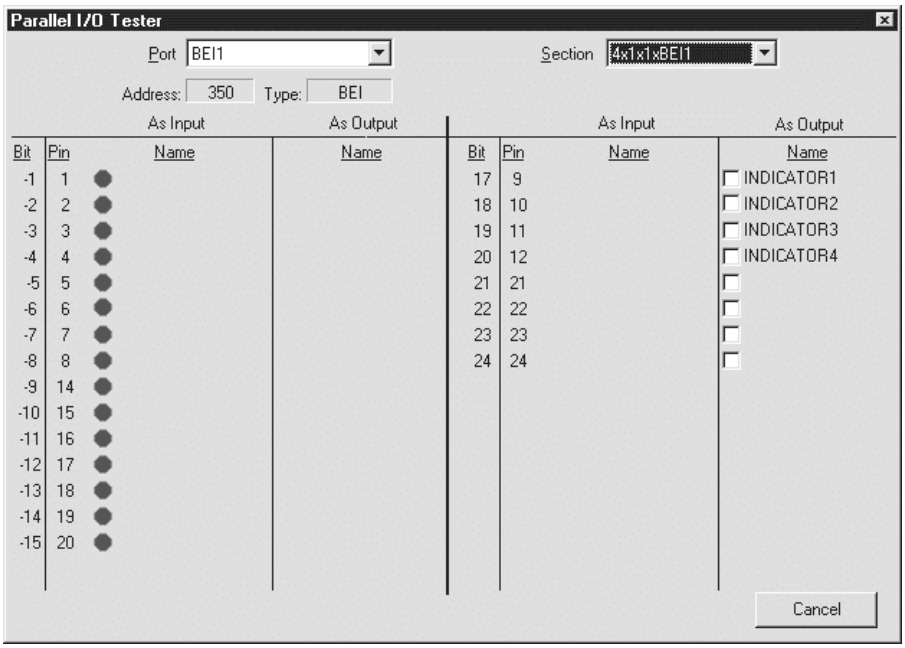
The Format button formats the selected disk according to the selected Format Mode criteria. A disk drive must be unmounted before it can be formatted and either the Create File System option or the Low Level Format Mode option must be checked. A much more reliable format can be obtained by booting the server with the /NoMount switch in the AVINIT section of the AUDIOVAU.INI. The AV100 cards will boot, and the server apps will launch, but none of the drives will mount. Go into AVMaint and mount the existing drives, and format the new device. You will be able to access all information normally while the format is in progress.

It is not possible to perform both a Low Level format and a Create File System (high level) format in one step on a drive. If a drive needs both types of formats, the drive should first be formatted using the Low Level Format Mode option; then, it should be formatted using the Create File System Format Mode option. The main reason users might need to low level format a disk drive is if the drive is reporting read/write errors. All SCSI drives are low-level formatted from the drive manufacturer's factory.

With the AudioVAULT system, it is possible to format more than one disk drive at the same time. **Expect to spend approximately twenty minutes to high level format one GB of SCSI disk drive space and approximately fifty-five minutes to Low Level format one GB of SCSI disk drive space**. The drive's file system is created by the drive's owner card; if two drives are owned by the same card and are formatted simultaneously then the format will be slower.

AVMAINT: PARATEST

Paratest is designed to allow viewing and setting the bits at various ports and addresses corresponding to devices of interest. Paratest is found on the Setup menu of AVMaint. The main display allows the selection of a known port with the pins displayed in correspondence with the bits that are connected to them. The user also has the option of selecting a section from the INI file. The information in this section will be used to match names to the pins. Once a port or an address is selected, lights will show the value of input and input/output pins on the display. The user also has the option of using check boxes to set the state of output or input/output pins.



CHECKING INPUTS

- Select an input Port, PCR1 through 7, or BEI1 through 4.
- Press Enter
- Optionally, select a section name from AUDIOVAU.INI of the already-existing remote control map.
- Force the external closure to close and open. ParaTest's LEDs go GREEN when the input is on and are RED when off.

CHECKING OUTPUTS

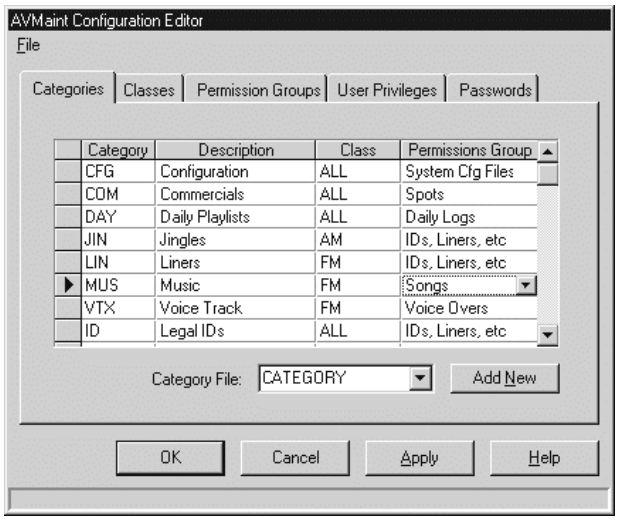
- Select an input Port, PCR1 through 7, or BEI1 through 4.
- Press Enter
- Optionally, select a section name from AUDIOVAU.INI of the already-existing remote control map.
- Click the check box to turn on the remote control driver and uncheck the box to turn off the remote control driver.

When a Port is selected Paratest attempts to verify the hardware is actually present. If not present, a warning is presented. PCR remote control is only available for AV-100's located in that PC running Paratest on. BEI hardware has an on-card switch to select BEI1 through 4, or none. An attempt to access a remote control port that is not actually present may crash the PC.

CHANGING CATEGORY AND CLASS FILE

Editing the Category and Class has been moved from AUDIOVAU (AVRPS, AVSAT, etc.), and is now handled by AVMaint's SETUP-CONFIGURE dialog.

Adding Categories

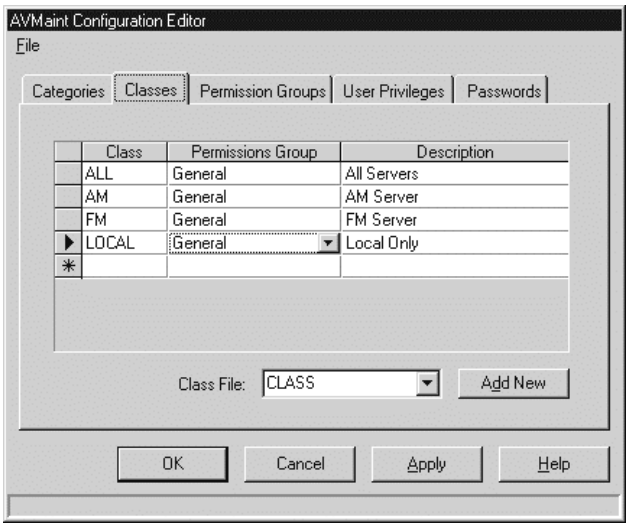


First some general guidelines:

- Each category can be 1 to 3 upper-case letters. Lower case letters are converted to upper case. The category names must be unique.
- The description field cannot include commas and should not include numbers.
- The Class field is a pull-down list of class names that you have defined on the **Classes** tab.
- The Permissions Group field is a pull-down list of permission groups that you have defined on the **Permission Groups** tab. The group's description is listed (not the GroupID itself).
- If the Category file doesn't exist, the grid will contain the BE factory-default settings.
- The C**ategory File:** field (and its **Add New** button) is only used for AudioVAULT systems configured for multiple category files. Only a few sites use multiple category files (the biggest of the biggest).

To add a new category, simply select the last row's cell and start typing. To delete a category, select the row with the mouse by clicking the row's header, then press the DEL keyboard key. **DO NOT CLICK THE ADD NEW BUTTON.** Instead of adding a new category, you'll add a new Category File, overwriting your existing file with the BE factory defaults.

Adding Classes



First some general guidelines:

- Each class may be 1 to 7 upper-case letters or digits. Lower case letters are converted to upper case. The classes must be unique.
- The description field cannot include commas.
- The Permissions Group field is a pull-down list of permission groups that you have defined on the **Permissions Group** tab.
- The CLASS FILE field (and its ADD NEW button) is only used for AudioVAULT systems configured for multiple class files. Only a few sites use multiple class files (the biggest of the biggest).

To add a new Class, simply select the last row's cell and start typing. To delete a class, select the row with the mouse by clicking the row's header, then press the DEL keyboard key. **DO NOT CLICK THE ADD NEW BUTTON.** Instead of adding a new class, you'll add a new Class File, overwriting your existing file with the BE factory defaults.

AVMAINT: SECURITY CONFIGURATION

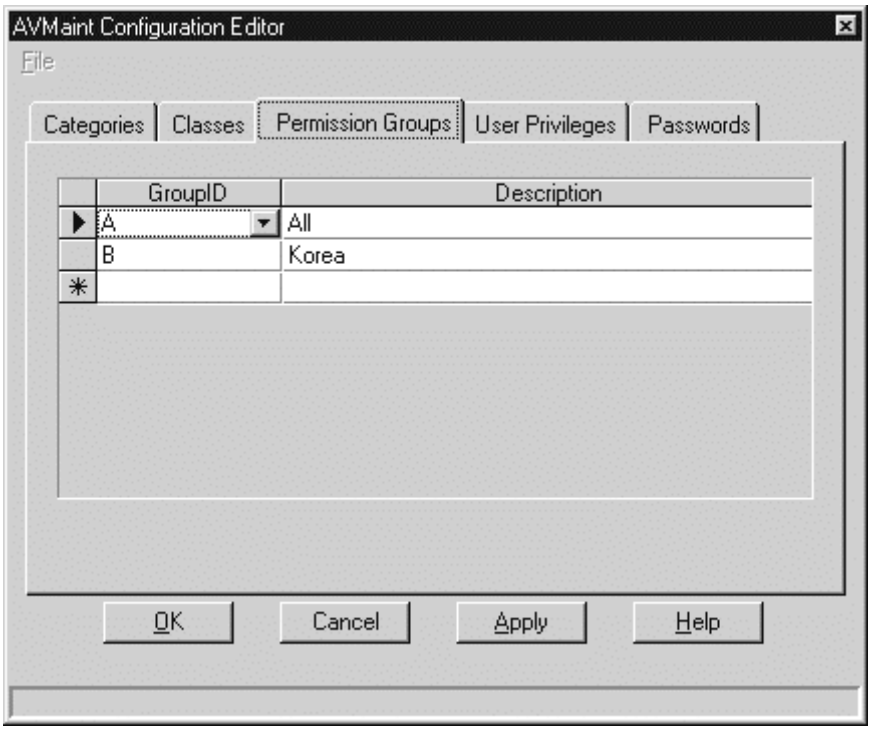
Security options can be configured for AudioVAULT and AVExplorer. AudioVAULT security options include delete restrictions and user interface locking. If you use AVExplorer, valid accounts **must** be created with AVMaint to grant users access to files.

> **If security is used, every user must have access to a valid account and password. However, more than one person can use the same account.**

As you implement security options, follow this basic procedure:

1. Create a new Permission Group.
2. Assign Categories to your new Permission Group.
3. Grant Users access to your new Permission Group.

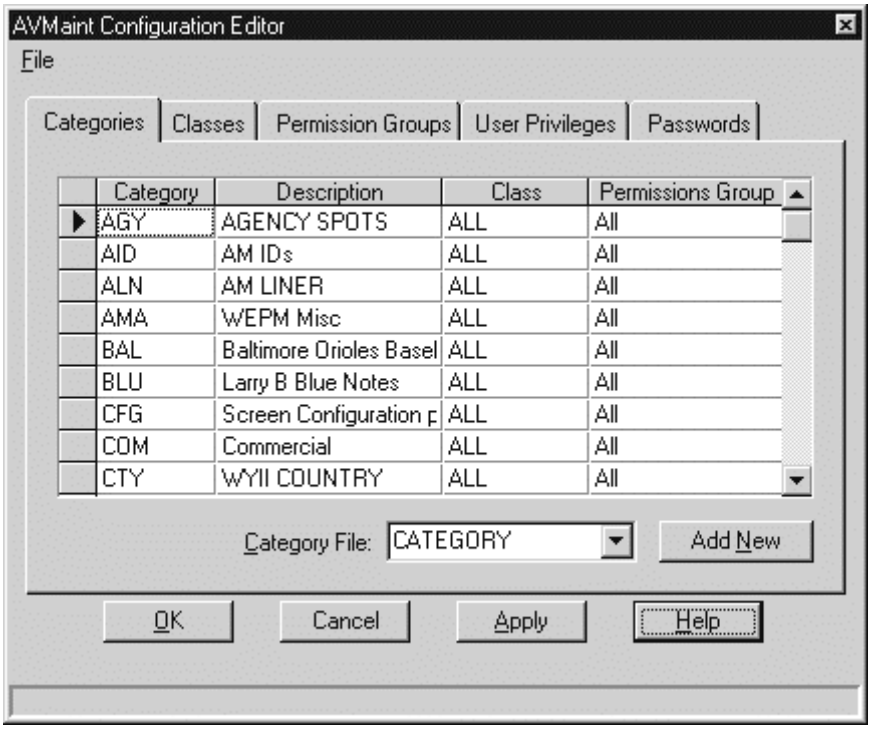
To create a new Permission Group, launch AVMaint. Open a Vault, click "Setup," and choose the "Configure" option. Then select the "Permission Groups" tab.



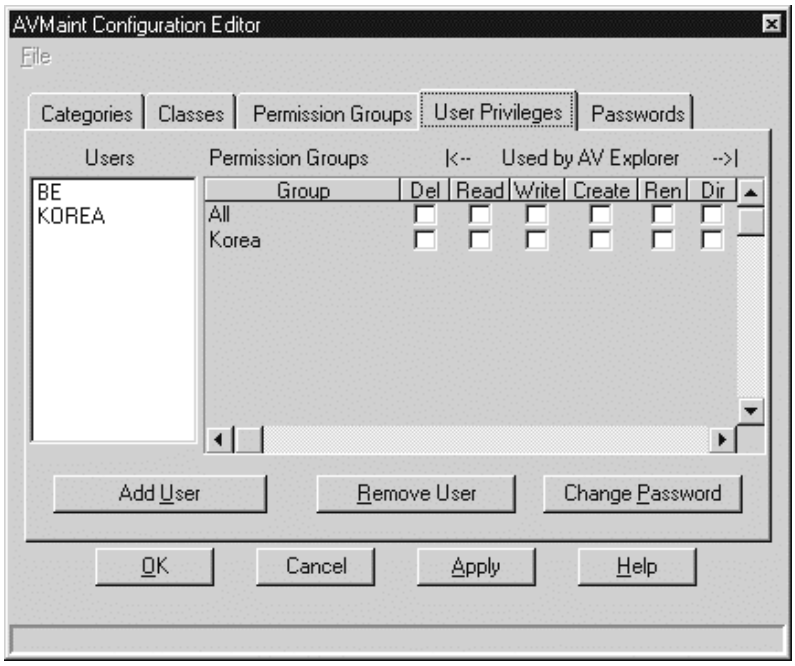
As you create your new Permission Group, remember some basic guidelines:

- "GroupID" will be a single letter between A and X. You can select the Group ID using the drop-down box.
- The "Description" you assign the group will appear on the Category, Class, and User Privileges tabs so make it descriptive, yet concise. The descriptions must be unique. The description field cannot include commas.
- Typically GroupID "A" is reserved for a group that has no delete restrictions.

Now that you have created a new Permission Group, assign categories to the Group. Click to the "Categories" tab. Click on the field under the "Permissions Group," and there will be a drop-down box listing all the defined Permission Groups.

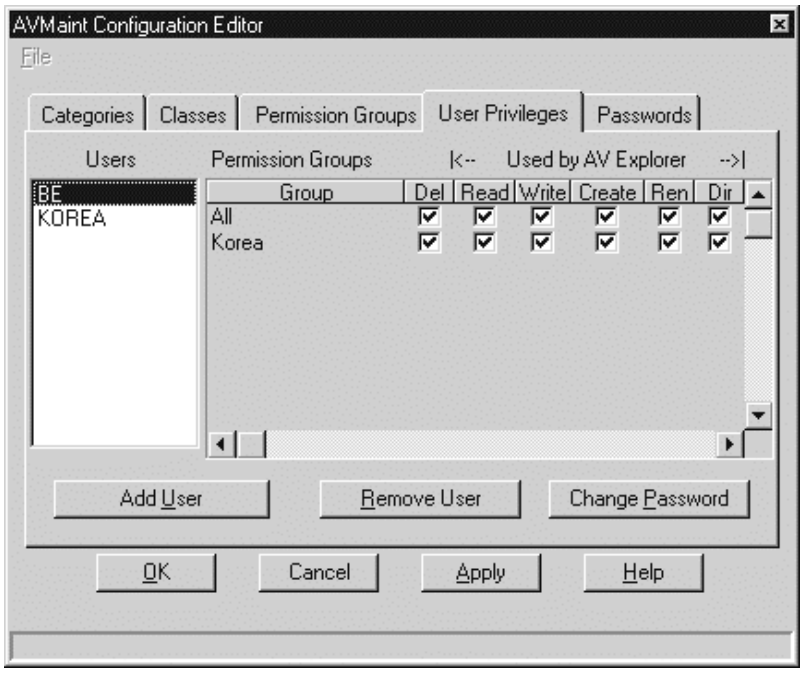


Now it's time to give Users access to the Categories in the Permission Group. Click to the "User Privileges" tab.

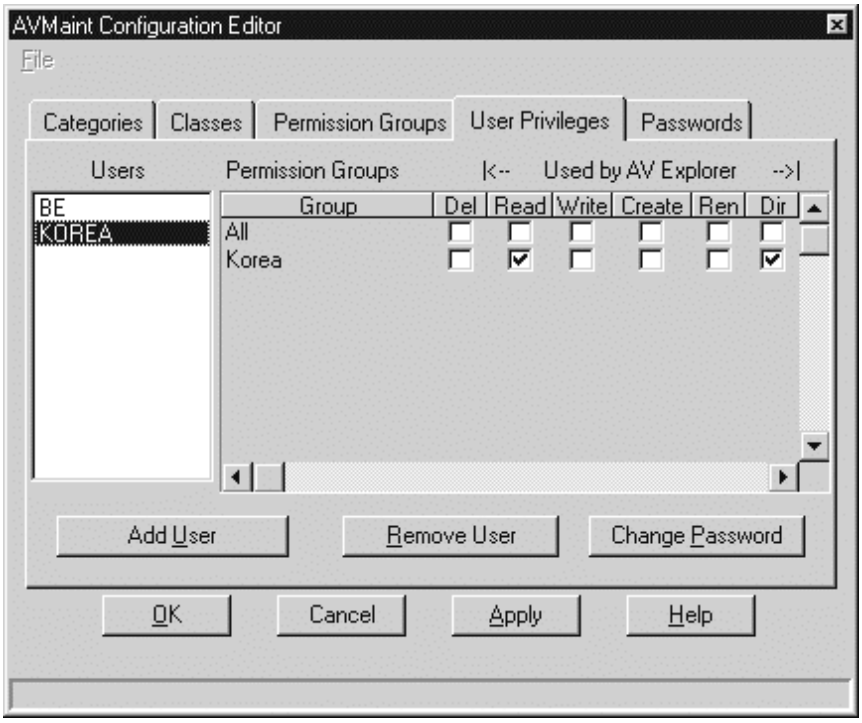


Highlight a User, or click on the "Add User" button to create a new User.

Once a User has been highlighted, define the User's rights to the established Permission Groups.



On the User Privileges tab, the "Del" check box will give the User rights to Delete files from AudioVAULT File Maintenance screens. The remaining boxes give users the ability to access and manipulate files using AVExplorer. In the example above, the User "BE" is an administrative account.BE has full access to categories assigned to the groups "All" and "Korea." The User "Korea," on the other hand:

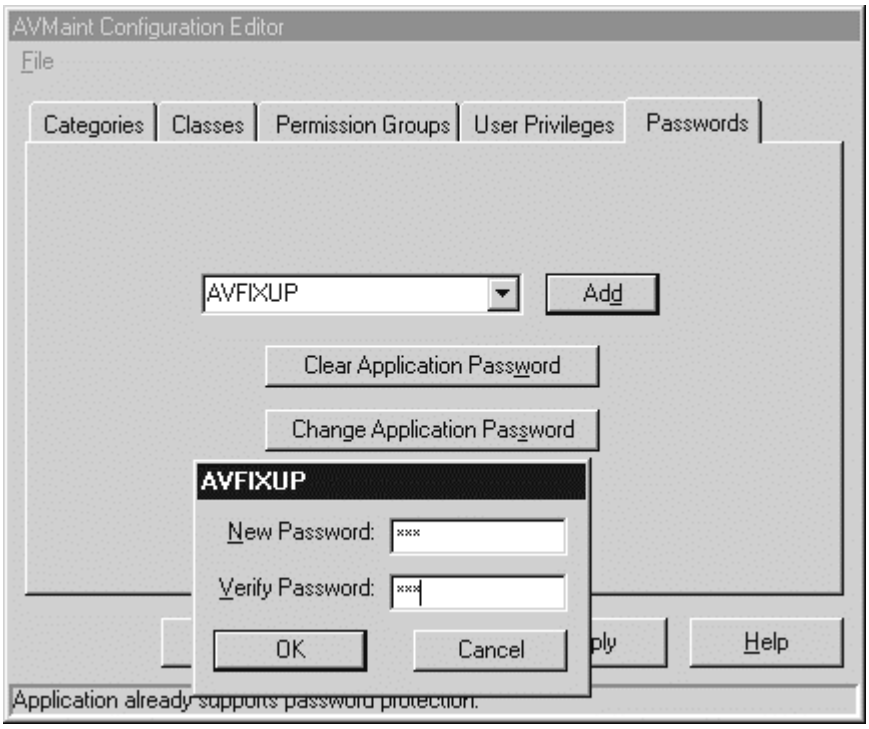


The User "KOREA" can only use AVExplorer to view and read files in categories in the "Korea" Permission Group, and cannot delete files using AudioVAULT File Maintenance screens.

All User information is stored in the AudioVAULT system as "User Profile" AudioVAULT files.

THE PASSWORDS TAB

AVMaint and AVFixUp can both be password protected. These passwords are stored in the application's INI section ([AVMaint], [AVFixUp]) as AVACSTATE= in THAT PC's AUDIOVAU.INI file. They are encrypted. You need to configure every PC that you want to protect.



This tab applies to AVMaint and AVFixUp. The application prompts for the specified password when starting.

This tab also applies to AVAir's configuration password. Note that AvAir has native (built-in) set/change functions.

These startup passwords only affect the current PC.

Passwords are case insensitive.

To enable a startup password on AVMaint, for example, type AVMAINT into the combo box, click ADD, then type in the password.

The passwords are saved in AUDIOVAU.INI in a section named the same as what was typed into the combo box. They are saved in an INI key named AVACSTATE=, in upper case. They are encrypted.

AVACSTATE ENCODING

Character	Encrypted Code	Character	Encrypted Code
0	30	I	49
1	31	J	4A
2	32	K	4B
3	33	L	4C
4	34	M	4D
5	35	N	4E
6	36	O	4F
7	37	P	50
8	38	Q	51
9	39	R	52
A	41	S	53
B	42	T	54
C	43	U	55
D	44	V	56
E	45	W	57
F	46	X	58
G	47	Y	59
H	48	Z	5A

SHUTDOWN CONFIRMATION

To turn off the "Mission Critical Shutdown" dialog, add the following line in the Audiovau.INI in each screen's application section ([AVSAT], [AVAIR],[AVRPS], etc.):

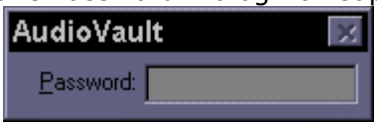
ShutdownDialog=FALSE

USER INTERFACE LOCKING

To activate the lock, the **IDD_UILock** hot key must is defined in AUDIOVAU.INI. It is defined just like all other IDD_xxx remote control assignments. For example:

IDD_UILock=,Key:Ctrl+F2

The UILock function is invoked from the user via the assigned hot key.the application will report "Application Locked" and have Password Dialog Box superimposed on the application:



To be able to **Un**lock the application, you MUST set up an encrypted password in the [AudioVAULT] section of the INI via the AVACState= statement.

You can also have the application default to a locked state upon startup, by executing the UILock macro in the dialog's xxx_Load=statement. For example:

[AVNet]
...
AVNET_Load=UILock

DELETE RESTRICTIONS AND AUDIT LOGGING

This safety feature is enabled via each PC's [AudioVAULT] section of the AUDIOVAU.INI file. It works in conjunction with the Passwords and User Groups Permissions defined with AVMaint. If you do not have delete-permission for every selected file's category and class, delete access is denied for all files. Then the password prompt is displayed. There are three options:

DeleteAreYouSure=YES
Shows the Delete YES/NO confirmation dialog box when deleting files through AUDIOVAU.EXE. This is the default.
DeleteAreYouSure=NO
Turns off the delete confirmation dialog box when deleting files through AUDIOVAU.EXE.
DeleteAreYouSure=PROMPT
Enables password prompting when deleting vault files. This turns off the other normal prompt for Delete Confirmation.

Each time File Maintenance is accessed, it will only display the confirmation dialog the first time DELETE is pressed -- your user name and password are cached until you exit File Maintenance. Be sure to exit File Maintenance even if you step away for an instant! AUDIOVAU's Cut- and List-Modify dialog's DELETE function also prompts. However, AVFixUp does not support deletion prompting.

AUDIOVAU.EXE has a new AuditLogFile= setting to log file deletions. This log includes one entry per file deleted. To enable the Audit Log, include the following line in either the [AudioVAULT] or [Machine.xxx] section:

AuditLogFile=C:\Audiovau\Log\0/oy0/om0/odA.Log

APPLICATION CONFIGURATION PASSWORD

This is only supported by AVAir. This is configured via AVAir's SET PASSWORD option. The password is converted to upper case and then stored in [AudioVAULT] as AVACSTATE= in the PC's AUDIOVAU.INI file. It is encrypted.

AVEXPLORER CONFIGURATION AND OPERATION

AVExplorer facilitates the movement of around an AudioVAULT network. It is based on the FTP protocol, and can move audio files between AudioVAULT servers, audio files between an AV server and a Windows folder (with integrated WAV conversion), or text files between two Windows folders.

All machines running AVExplorer must have TCP/IP installed and configured. AVExplorer reads User Names, Passwords and Permissions as defined by AVMaint, so those items must be configured before using AVExplorer as well.

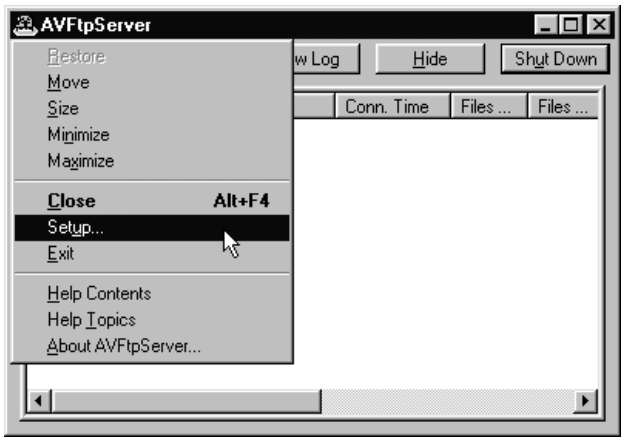
AVExplorer includes two applications, the AVExplorer Client and the AVFTPServer. AVFTPServer must be running on all machines that share resources. The Client is then configured to access those resources.

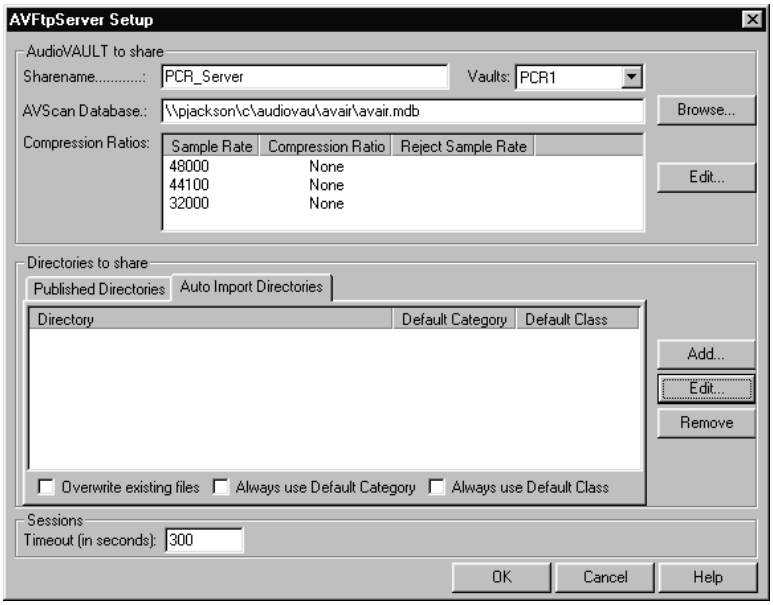
AVExplorer requires very little configuration. The majority of the configuration is done on each of the AVFTPServer sites. The AVExplorer Client sites are simply configured to see each of the AVFTPServer sites' shared items.

AVFTPSERVER SETUP

The AVFTPServer program needs very little information to get running.

1. Start AVFTPServer
2. Move the cursor to the top left corner of AVFTPServer and single click with the left mouse button on the AVFTPServer icon.
3. Move the cursor to **Setup** and single click with the left mouse button.





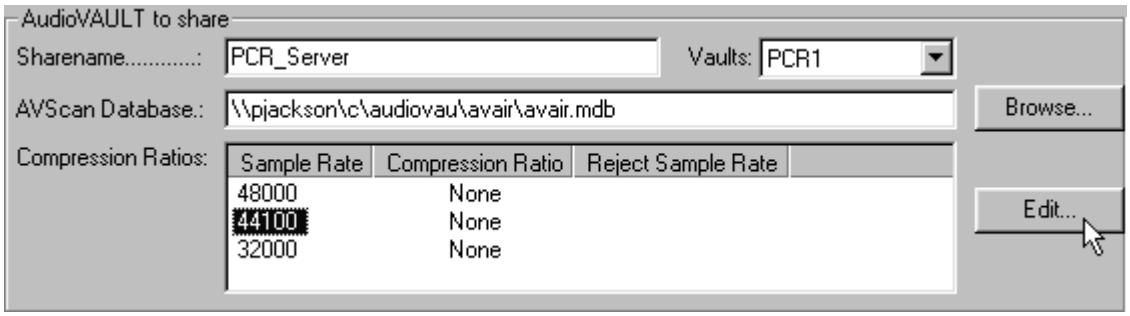
ITEMS FOUND IN SETUP

Sharename	This is the name of this FTP Site as it will appear in the "AudioVAULT Neighborhood."
Vault	If access to AudioVAULT audio files is intended, an AudioVAULT server containing audio files must be specified. A Vault must also be specified to take advantage of the AudioVAULT Security Model.
AVScan Database	This is the name and location of an AVAir.MDB file on the local network. This is a necessary item in order for AVExplorer to display the listing of available files.
Compression Ratios	With the addition of a hardware key, AVExplorer can compress incoming WAV files. Compression rates for files with sample rates of 48K, 44100 and 32K can be compressed as they are imported. Without the hardware key, files are imported at their original compression rate. A linear 48K WAV file, for instance would be a linear 48K AudioVAULT file.
Published Directories	This allows AVFTPServer to make available non-AudioVAULT files. Typically, the directories that are shared are the Station Directories for AVScheduler, Music Log directories, Traffic Log Directories, and the AVAir directories of the On-Air workstation. The mapping of published directories can be local "C" drive on the computer, a mapped network drive, or UNC.
Auto Import Directories	AVFTPServer can be configured to "watch" a specified directory. If a WAV file is dropped into that directory, it is automatically imported into the AudioVAULT.
Sessions: Timeout	This is the time after which AVFTPServer will report loss of activity.

SETTING UP THE COMPRESSION FEATURE

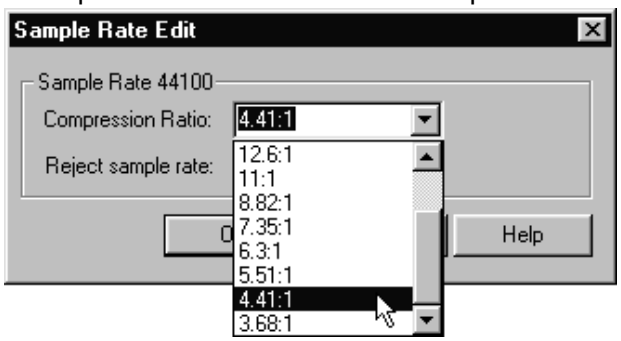
To enable the Compression feature, the computer doing the import must be equipped with a hardware key. The dongle can be purchased from Broadcast Electronics. Without the key, AVExplorer can still import files, but it will leave their initial compression rate unchanged.

Once the hardware key is attached to the computer's parallel port, enter AVFTPServer's setup dialog. Highlight a sample rate and click **Edit**.



In this example, we'll tell AVExplorer how to compress files that have a sample rate of 44100. AVExplorer can only change Compression rates - it cannot change a file's Sample Rate.

After clicking **Edit**, select the compression rate from the drop-down box. This will define how AVExplorer treats files of this Sample Rate. All files at 44100 will be imported into the AudioVAULT at 4.41:1.



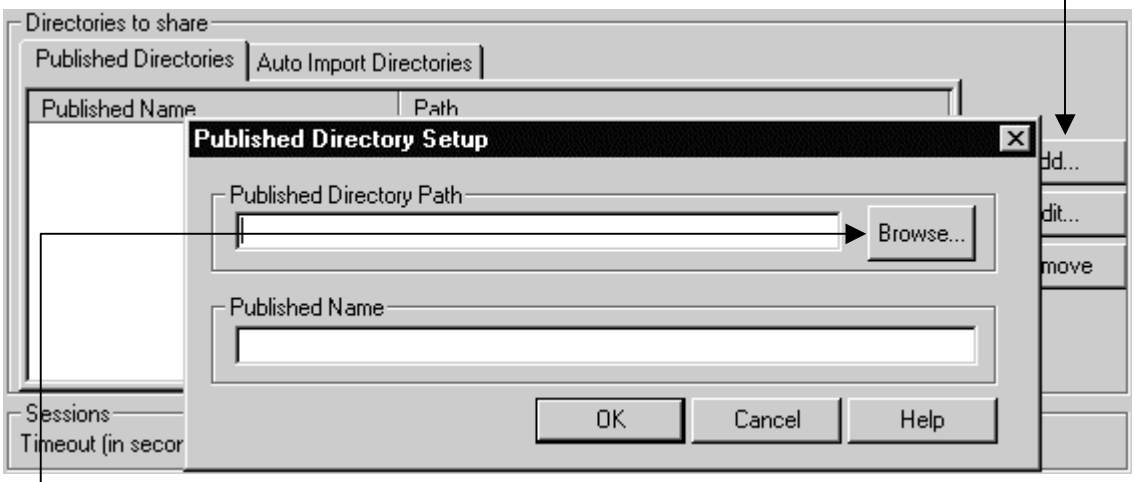
Set the Compression Rate for the other sample rates, and click OK.

If you want to refuse files of a specific rate (48K, for instance) simply **Edit** that Sample Rate and click the **Reject Sample Rate** checkbox.

SETTING UP PUBLISHED DIRECTORIES

A Published Directory is simply a Windows folder that can be accessed by AVExplorer Clients. For example, if you wanted to use AVExplorer to transfer Music Schedules from one computer to another, you could publish the directories that contain the files. Those Published Directories can be viewed and browsed in the AudioVAULT Neighborhood with the AVExplorer Client. To set up a Published Directory, enter AVFTPServer's Setup Dialog and click on the Published Directories tab.

Move the cursor to the **Add** button and single click.

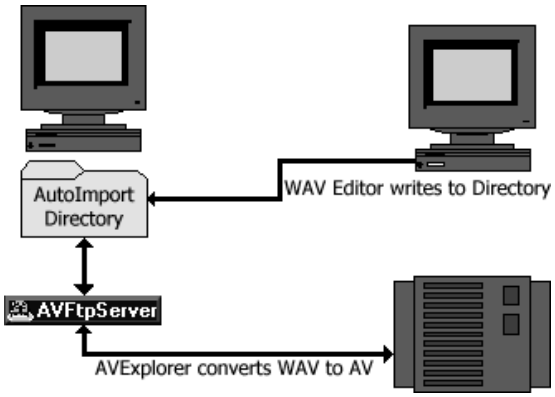


Move the cursor to the browse button, then single click to locate the proper directory to publish or share.

Finally, enter the Published Name. This is how the folder will appear in AVExplorer.

SETTING UP AUTOIMPORT DIRECTORIES

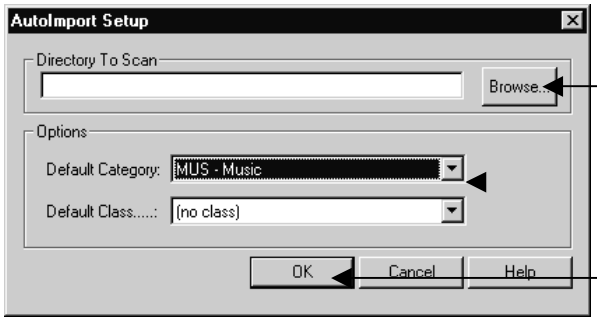
By configuring AutoImport, you can tell AVExplorer to "watch" a specified directory for new WAV files. When AVExplorer sees a new WAV file, it automatically imports it into the AudioVAULT, using the original WAV file's name as the new AudioVAULT file name. AVFTPServer scans these directories periodically for files to be imported into the AudioVAULT.



AutoImport can be used in conjunction with the Compression Agent if the computer is equipped with the correct hardware key, or as a pure import device if no key is present.

To configure AutoImport, simply tell AVExplorer which directories to scan, and what AudioVAULT Category and Class the resultant AudioVAULT files should go into.

To set up an AutoImport Directory, enter AVFTPServer's Setup Dialog, click on the AutoImport Directories tab, and click **Add**. You'll see the **AutoImport Setup** dialog.

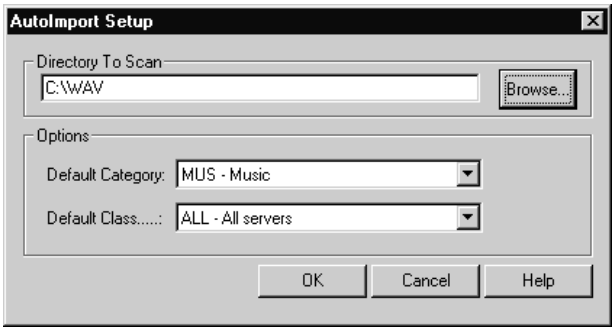


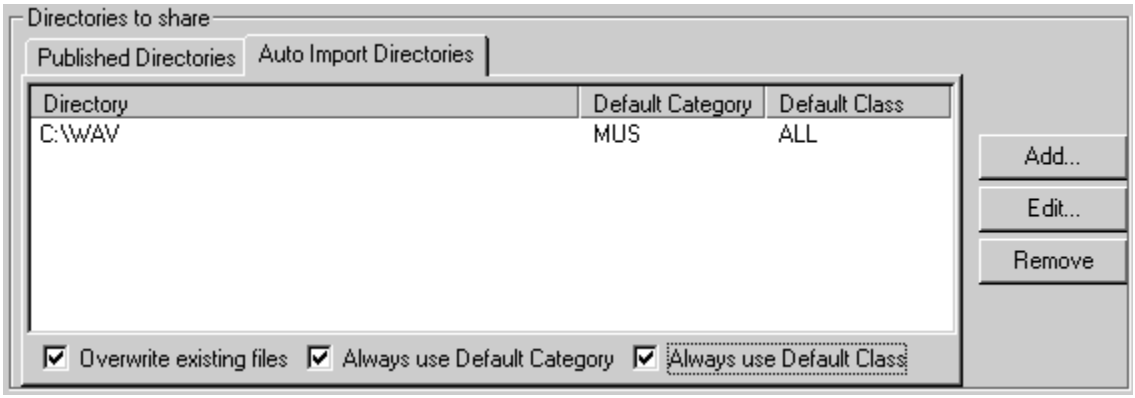
Simply browse to the directory you want AVExplorer to watch,

set the Category and Class for files to be imported from that directory,

and click OK.

The Auto Import directories can be local drives on the computer, mapped network directories, or mapped UNC directories. Different directories can be configured to import files of differing formats. For example, separate directories may be configured to import country music while another directory is used to import rock music.



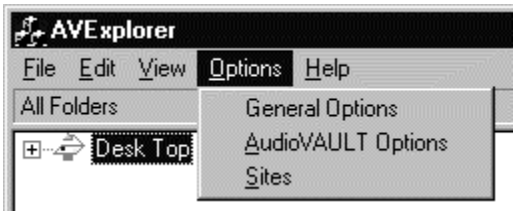


The last step is to tell AVExplorer if you want it to **Overwrite existing files**, **Always use the Default Category**, and **Always use Default Class**. Imported AudioVAULT files will have the same name as the original WAV file.

AVEXPLORER CLIENT SETUP

Configuration options in the AVExplorer Client application can be accessed through the **Options** Menu.

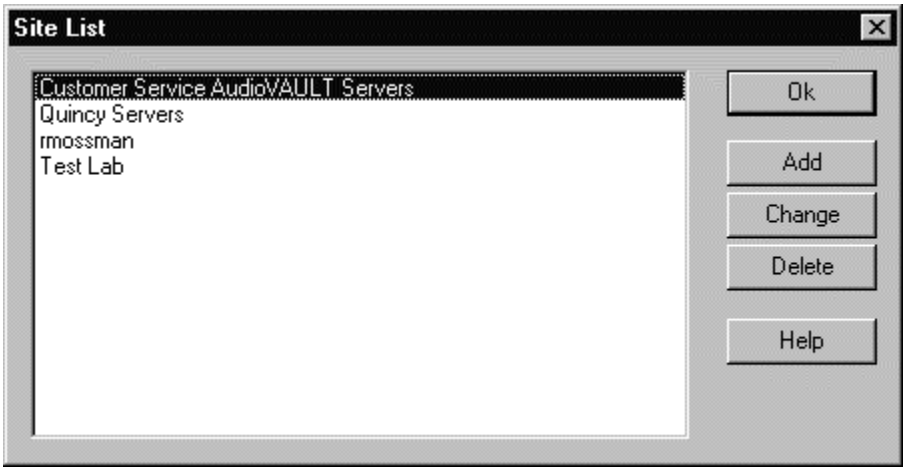
When the user clicks on Options they will find three choices: General, AudioVAULT, and Sites.



- The General Options allows the user to set the connection timeout. The default is 60 seconds.

- The AudioVAULT Options allows the user to customize the views within AVExplorer as they relate to elements stored in AudioVAULT.

- The Sites allows the user to configure AVExplorer to see the individual AVFTPServer Sites and the Shared Directories they make available.

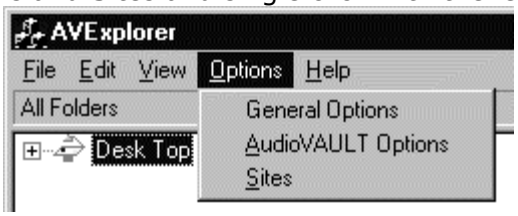


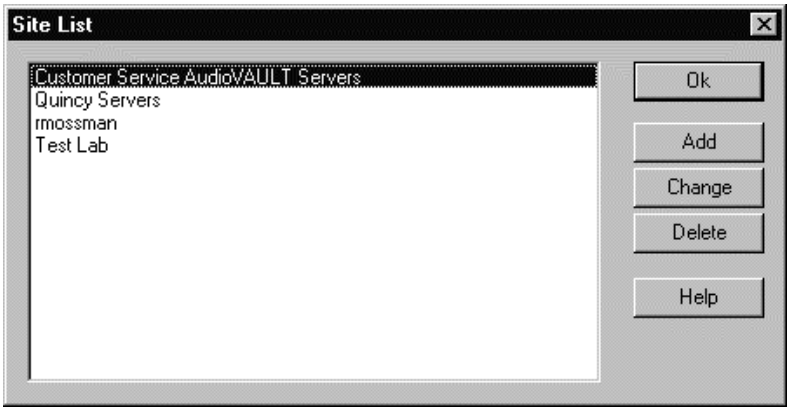
ADDING SITES

Adding a Site to AVExplorer is essential in order to be able to see other AVFTPServer Sites. By adding a site AVExplorer will be able to recognize all the available shares at that particular AVFTPServer site, whether they are AudioVAULT audio files or Windows directories.

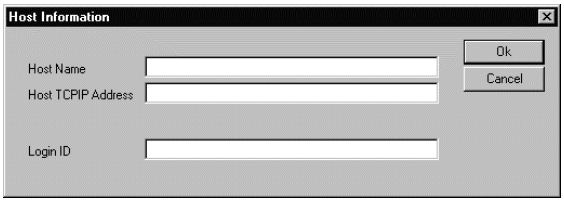
To add a Site:

- Start AVExplorer.
- Move the cursor to Options and Sites and single click with the left mouse button.





- After clicking on Sites the list of sites will appear on the screen.
- Click on the "ADD" button. The Site Edit dialog will appear on the screen.
- Type in the Name of the site in the space provided. Move the cursor to the "ADD" button and single click. This is how the site will appear in this AVExplorer Client's "AudioVAULT Neighborhood."
- The Host Information dialog will pop up. This dialog requires the AVFTPServer HostName, its TCP/IP Address, and the default Login ID (Name) to be used when accessing the site.

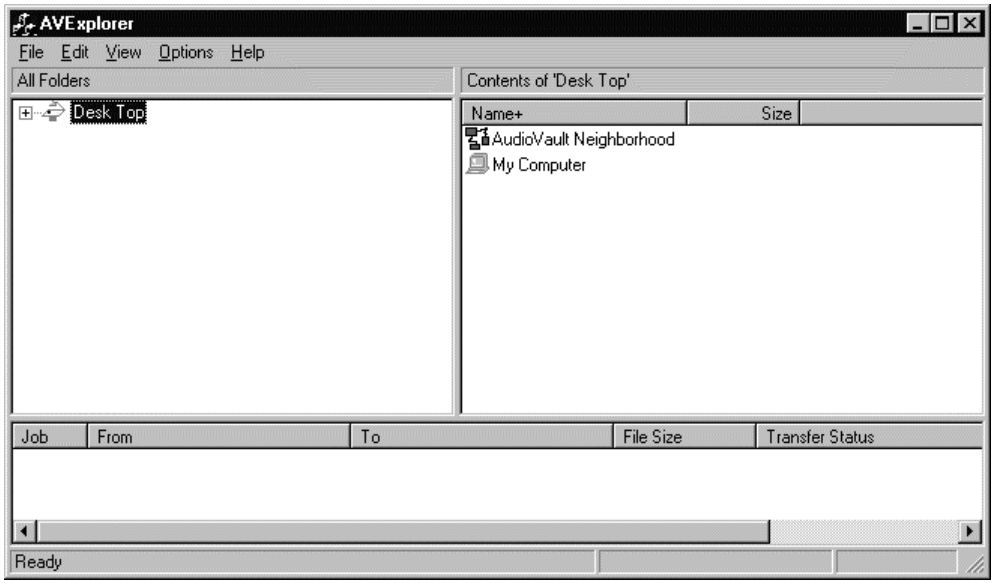


Once the appropriate information has been filed in, move the cursor to OK and single click with the left mouse button. This will take you back to the Site Edit dialog, which now lists the Site you've just added, along with the other AVFTPServers you've configured. To configure multiple sites, simply repeat the above steps.

After you've configured all your sites press OK. This will take you back to the Site List.

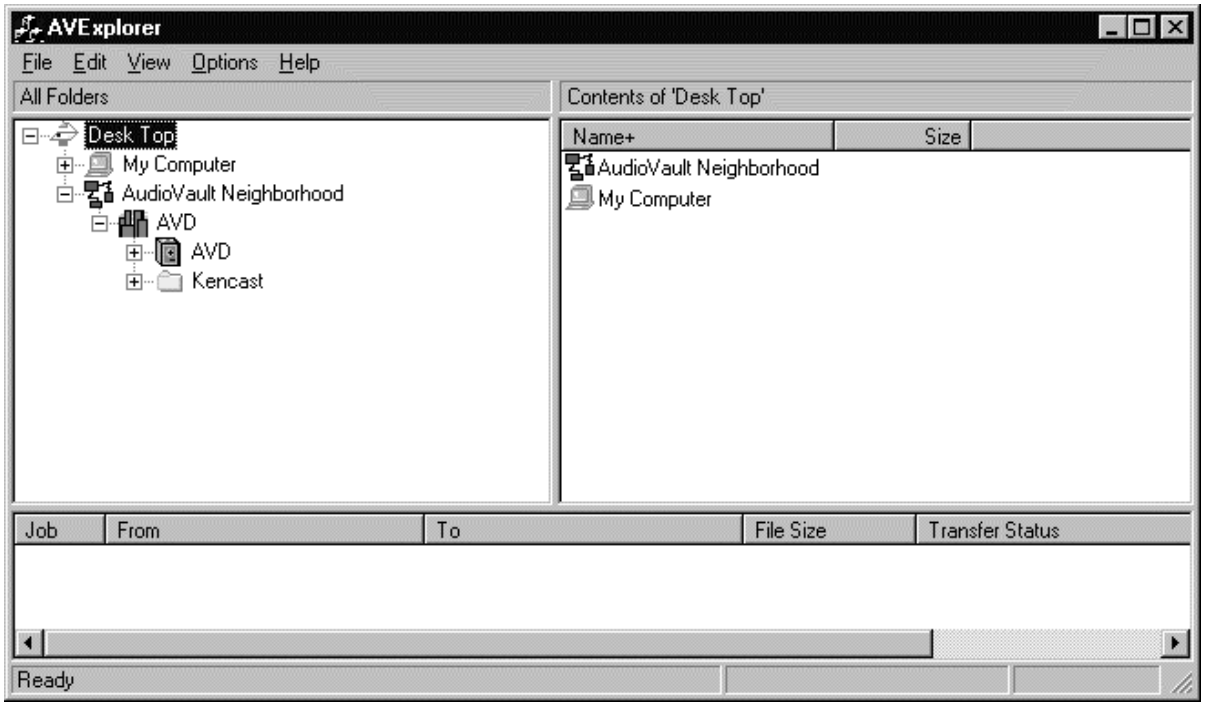
USING AVEXPLORER

Launch AVExplorer from the Desktop or Start Menu Icon. When the window first comes up, all items will be collapsed.



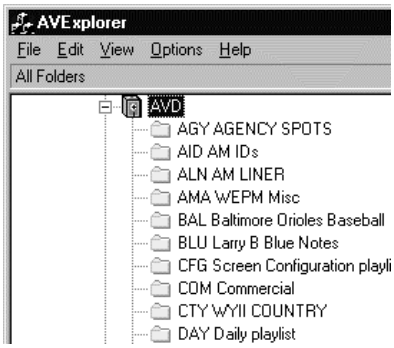
Expand (click on the "Plus" sign) the DeskTop, then expand the AudioVAULT Neighborhood. The system will prompt you for your User Name and Password as defined in AVMaint's Security dialogs. **Security settings must be configured before using AVExplorer.** When the Logon screen pops up, enter your User Name and Password:

Expanding the items listed under AudioVAULT Neighborhood will show AudioVAULT Categories represented as "folders" and Published Windows Directories on the computer hosting the AVFTPServer. In the example below, we can access AudioVAULT categories by expanding AVD, or access the Windows folder "Kencast" by clicking on Kencast.

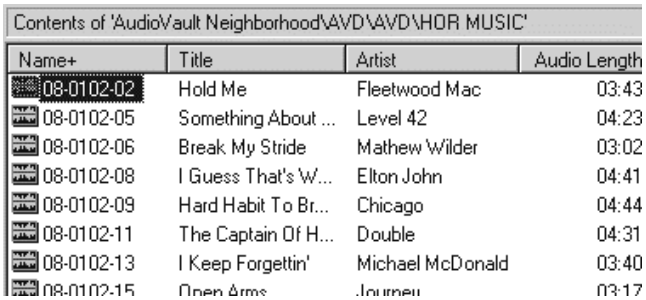


Once we expand AVD, we see the Categories on AVD represented as "folders."

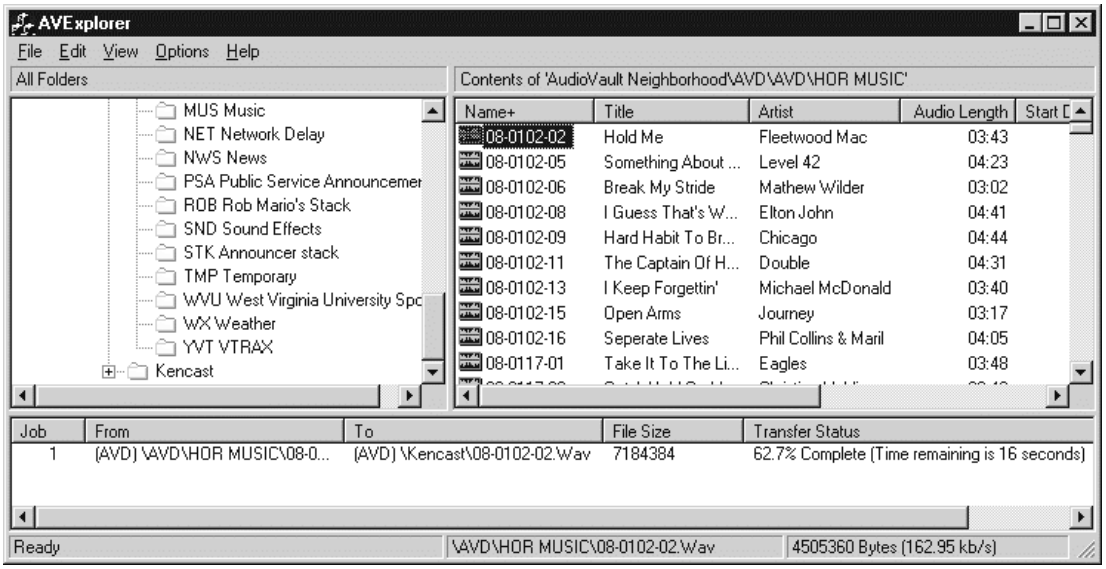
Category names and their descriptions cannot contain numbers. While AudioVAULT technically allows this, AVExplorer will not recognize them.



Highlight a Category, and we see the AudioVAULT files in that category:



If more than one Site is configured, you can drag and drop files between Sites. If a directory is "published," like Kencast, then you can drag a file from the AudioVAULT categories, drop it on the published directory and an automatic WAV conversion will be performed. In this example, we dropped "08-0102-02" on Kencast. The Status pane at the bottom of the AVExplorer window shows the Transfer Status and Estimated Time to completion. The bottom Status Bar shows the current transfer status in bytes, and the current transfer speed.



AudioVAULT files converted to WAV files can be edited in any WAV editor. The process works both ways. WAV files can be dragged from a Published Directory to an AudioVAULT category.

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Section 12: AudioVAULT Utility Programs

By the end of this section you should be familiar with these utilities:

- AVTime
- AV95ToNT
- AVImportExport
- AVRename
- AVFixUp
- AVFileMaint

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AVTIME

AVTime keeps the PC clocks synchronized by broadcasting time-of-day over the Ethernet network. Accuracy is within 100mS. You must designate each PC on the LAN according to the following rules:

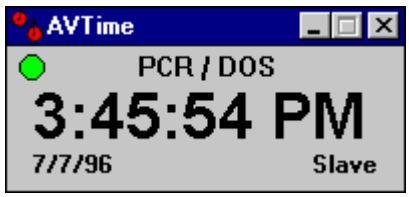
- There must be one and only one Master time source.
- There may be one and only one Backup time source. This is optional.
- All other instances must be Slaves.

The primary time source may be a PC's DOS clock, or a direct link to an ESE-185 GPS (Global Positioning System). For the DOS clock source, any typical PC time reference should function (WWV, NAVY Atomic Clock, IDD_SETCLOCK contact closure, SMPTE, PC GPS); when purchasing such hardware be sure to get the PC clock software drivers as well.

AVTime uses NetBIOS to interface to the LAN.

AVTIME MAIN WINDOW

You will see these indicators on the AVTime window:
Sync state LED.



This shows at a glance the current state of AVTime, as indicated below:

Master

 If getting time from the serial port--GREEN

 If getting time from the network (Backup time source's serial clock)--YELLOW

 If getting time from local DOS (unsynchronized)--RED

Backup

 If getting time from the Master serial port or Master DOS via the network then--GREEN

 If getting time from the local serial clock--YELLOW

 If getting time from local DOS--RED

Slave

 Synchronized to anything--GREEN

 unsynchronized--RED

The HostName / Time Source from the PC which time is being received from.
Time-of-day, formatted per Windows Control Panel's Regional Settings.
Current date, formatted per Windows Control Panel's Regional Settings.
Mode, which may be one of: Slave, Master, Backup

TIME ZONE SETTINGS

If you don't have a TZ= setting in the environment, AudioVAULT assumes "TZ=LOC0" which causes all times to be local standard time.

AVTIME MENU OPTIONS

Minimize	AVTime gets small.
Close	The icon goes away, but AVTime is still running in the Icon Tray. Launching AVTime (by double clicking the AVTime icon, for example) causes AVTime to reappear in a normal window. AVTime cannot be terminated by ALT+F4, or by selecting Close from the System menu. This simply minimizes AVTime. To terminate AVTime, right click on the icon and select "Terminate."
Force	Force all slaves to accept the current time. The Force menu option will cause all PCs Synchronized to this reference to set their clocks automatically even if the time value exceeds their local ReferenceTolerance. The LED panel becomes RED when a Force is received. Force toggles off after 10 net broadcasts.
Help	View this on-line help information.
Properties	View the property (configuration) sheet.
Exit	Terminate AVTime altogether.
Help-About Menu Option	This option simply shows the program's version.

SETTINGS

Most settings are configurable via the built-in property sheets. The only exception is Protected=, which prevents casual users from modifying AVTime's settings.

You must terminate -- not close -- AVTime before manually editing any AVTime INI settings, or they will be overwritten when exiting AVTime. Upon termination, AVTime always saves its settings.

AVTIME SAMPLE INI SECTION

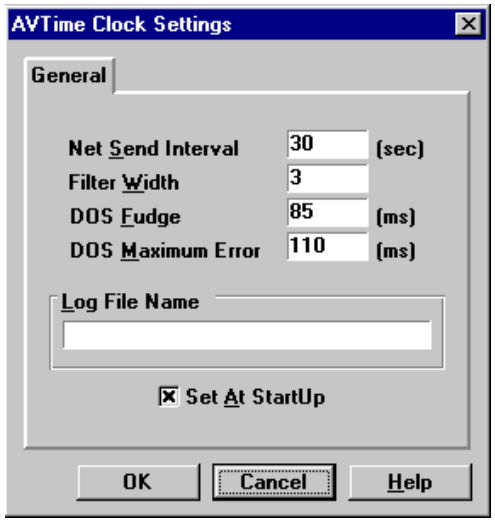
```
[AVTime]
Mode=Slave
Protected=True
ReferenceName=
ReferenceSource=NONE
SyncedState=Hide
UnsyncedState=OnTop
SerialPort=
SerialSettings=9600,n,8,1
SerialType=ESE185
SerialDelay=-7
SerialPollInterval= 10
NetSendInterval= 30
FilterWidth= 3
SetAtStartup=True
NetDelay= 1
DOSFudge= 85
DosMaximumError= 110
SyncDOS=True
SyncPLL=False
LogFilename=
ReferenceTolerance= 5400
WindowState= 0
Left= 90
Top= 120
```

INI KEY DESCRIPTIONS

NetDelay=ms	Total network latency. The delay between actual time and the time that the network message is received (milliseconds). The default is 1.
SyncDOS=b	If True, the DOS clock will be synchronized to the reference clock. The default is True.
SyncedState=state	Hide I Background I OnTop. The default is Hide.
UnSyncedState=state	Hide I Background I OnTop. The default is Hide.
ReferenceTolerance=s	The maximum tolerance for time differential between local and reference. If the source's time value differs more than this amount then the slave will not be time synchronized. Setting this to a value of -1 forces AVTime to accept the incoming time regardless of the differential. The default is 5400 (seconds). This is 1.5 hours, and more than accounts for the normal worst-case time difference produced via daylight savings.
SyncedStratum=n	The priority value which is broadcast on the LAN if AVTime is currently Synchronized to its ReferenceSource. For Mode=Master, the default is 1. For Mode=BackUp, the default is 3.
UnSyncedStratum=n	The priority value which is broadcast on the LAN if AVTime is currently out of sync to its ReferenceSource. For Mode=Master, the default is 5. For Mode=BackUp, the default is 7.
DebugMode=b	True I False. If True, the main dialog shows additional (diagnostic) information. The default is False.
Protected=b	True I False. Determines whether a user has access to setting the advanced features. Specifically, if True, the Advanced tab in

	the Properties dialog is hidden. The default is False. You must exit -- not close -- AVTime before manually adding any settings.
Top=n	Startup screen coordinates.
Left=n	Startup screen coordinates.
WindowState=s	The state of the main AVTime dialog upon startup. Use 0 for a normal/visible window (the default), or 1 for a minimized icon. Some of AVTime's on-screen controls can flicker significantly with Win95 running in a Normal window; use WindowState=1 to hide it.
SetAtStartup=b	If true and there is a valid log name entry (in LogFilenane=), then AVTime will log when it starts, as opposed to waiting for an hour and then logging to the disk.
SerialDelay=ms	The delay between actual time and the time supplied by the serial clock (milliseconds). This value accounts fro the data latency involved with reading the time. The default is -7, and assumes 10 bits (8 data, 1 parity, 1 stop) per word, at 9600 BAUD.

AVTIME CLOCK FORM GENERAL TAB

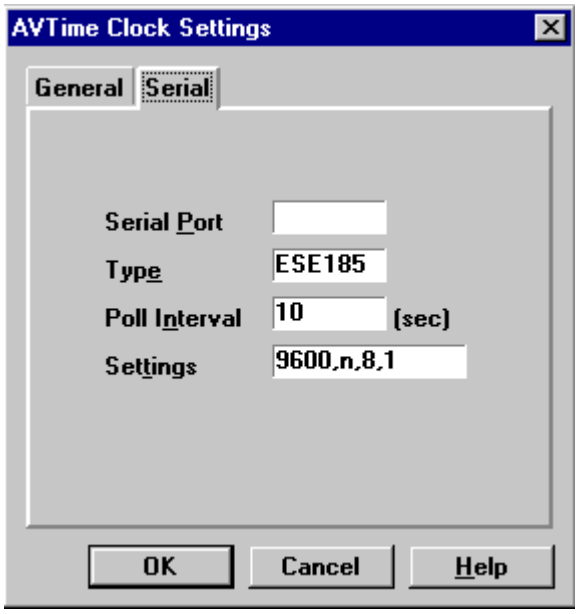


NetSendInterval=s	The period at which new times are broadcast on the network (seconds). The default is 30.
FilterWidth=n	The number of time samples used for filtering. This number of network time values must be received before considering them "valid". The default is 3.
DOSFudge=ms	The fudge factor in setting DOS time (milliseconds). This value accounts for the overhead required to read or write the PC's DOS clock. The default is 85 (about 1.5 DOS 55mS clock ticks).
DosMaximumError=ms	The number of milliseconds that the DOS clock must be off by (with respect to the time source) before it will be adjusted. The default is 110.
LogFilename=s	The filename for logging AVTime statistics once per hour.

The default is no logging.

SetAtStart=b Set the local clock to the reference the first time that a valid reference is received. The default is True.

AVTIME CLOCK FORM SERIAL TAB



Serial Port: The selects the PC COM port to which the external serial clock is feeding. An example is COM3.

Type: Specifying this type internally defines the expected serial data format. Specifying ESE185 makes AVTime look for:

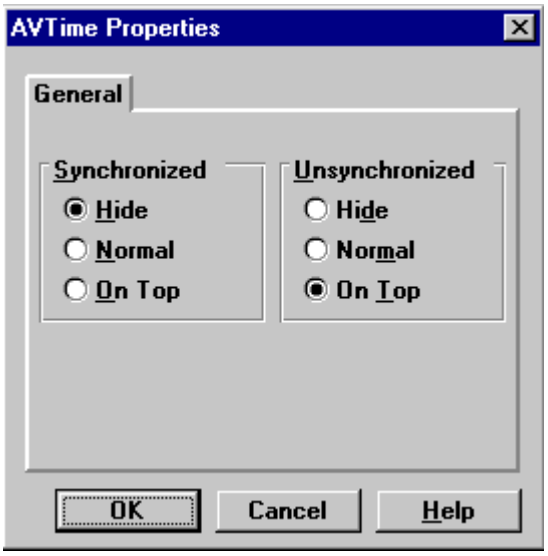
mm:dd:yy<space><space>ddd:hh:mm:ss<cr>

ddd is the Julian date (day number, 1-365), and is ignored, while hh is the hour-of-the day and is in 24-hour format. Note that any time source providing that serial format can be used.
There are currently no other serial format choices.

Poll Interval: The interval, in seconds, to request time from the serial clock source.

Settings: The BAUD, parity, databits, and stopbits which the serial clock source is configured.

AVTIME CONFIG FORM GENERAL TAB



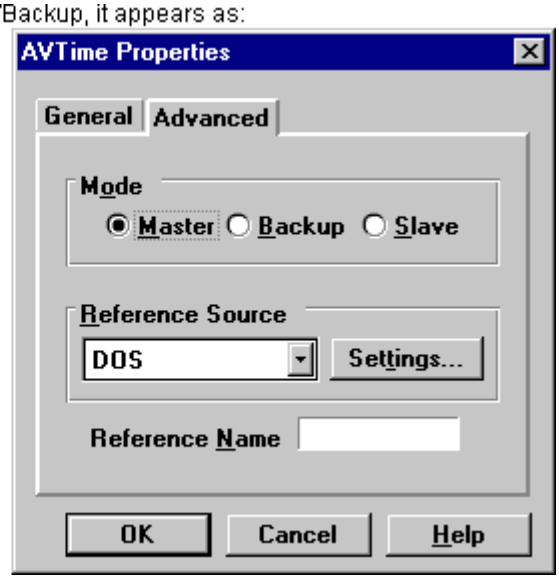
AVTime can operate in one of three states:

- **Hidden** - When Hidden and NOT Minimized, AVTime does not appear in the Windows Task List but it can be switched to using ALT+TAB. When Hidden and Minimized, AVTime is invisible to both; ALT+TAB is disabled.
- **Normal** - NORMAL will pop to the front in certain error conditions, but will NOT grab Focus. When moving from ONTOP to any other state, the window will go to BOTTOM of the Focus Order.
- **OnTop** - Normal and OnTop work as usual. To retrieve AVTime while it is invisible, double click its icon and the current State will be changed to Normal, and the window will reappear. These states are available for both Synced and UnSynced operation.

AVTIME CONFIG FORM ADVANCED TAB

For Slave, the tab appears as:

For Master/Backup, it appears as:



Clicking Settings shows the respective DOS or Serial properties sheet, per the selected REFERENCE SOURCE.

These INI settings are set in the [AVTime] section:

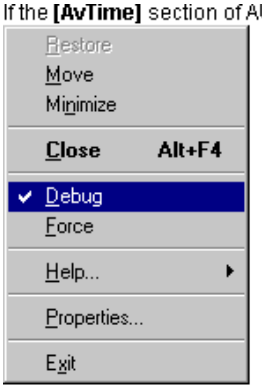
Mode=mode Master I BackUp I Slave. The default is Slave.

ReferenceSource=s NONE I DOS I PARALLEL I SERIAL I SIMULATE. Defines the type of local reference with which AVTime will attempt to sync. The default is NONE if Mode=Slave; the default for all other modes is DOS.

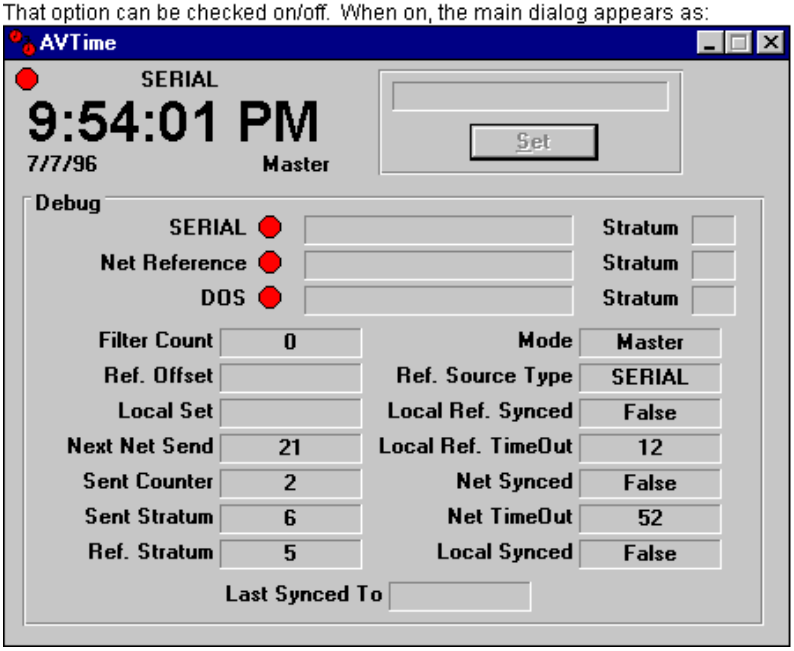
ReferenceName=s The name that is displayed when PC's are Synchronized to this clock. There is no default.

AVTIME DEBUG MODE

If the **[AvTime]** section of AUDIOVAU.INI contains **DebugMode=True**, then a Debug check option is added to the menu:



That option can be checked on/off. When on, the main dialog appears as:



USING THE DEBUG INFORMATION TO "TUNE" AVTIME

It is possible to adjust a slave's DOSFudge setting to improve accuracy. DOSFudge is the fudge factor in setting DOS time (milliseconds). This value accounts for the overhead required to read or write the PC's DOS clock. The default is 85 (about 1.5 DOS 55mS clock ticks). DOSFudge should NEVER be >= DosMaximumError. If it is, the time can "oscillate" +-(DosMaximumError+DOSFudge).

1. Ensure your AvTime Master is properly operating.
2. Shutdown the slave AvTime and edit [AvTime] in AUDIOVAU.INI. Be sure AvTime is not iconized in the Windows tool tray.
3. Enable the DebugMode=True setting in [AvTime]. Save the INI file and restart AvTime. On the system menu, select the DEBUG choice.
4. Go to Window's tool tray and double click the clock as to show the Data/Time Properties dialog. Change the time's minute field by 1 either up or down and click OK.
5. Switch back to AvTime's debug window and wait for the Ref. Offset to jump up to about 60 -- this indicates AvTime now knows the PC's clock is off by a minute.
6. Wait for the Filter Count value to count from 0, 1, 2, and then back to 0 (assuming your INI [AvTime] FilterCount=3). AvTime should then set the PC's clock to the best time received from the master (of the 3 that it just received). "Best" means that which is closest to the slave's DOS time.
7. Watch the Ref. Offset value for about 20 iterations. This is updated whenever Filter Count changes. Write each of the values down. Be sure to record the sign/polarity (-), and all decimal points accurately.
8. Calculate the average of those 20 samples. Do this by adding them up and dividing by the number of samples.
9. Close down AvTime and edit the [AvTime] section in the INI again. Look at your current DOSFudge value, and adjust it by the average from the above step. It is okay for DOSFudge to end up negative, if needed. Experimentation has shown that a value of about 30 works pretty good for Windows 95 with decent CPUs, RAM, etc. (the default is 85, for history reasons).
10. Save the adjustment in the INI file and restart AvTime.
11. Repeat the above process until the Reference Offset values are centered around 0, with about an equal number of the values greater than 0 (such as 0.025, 0.055, 0.057) as are less than 0 (such as -0.035, -0.045, -0.043).

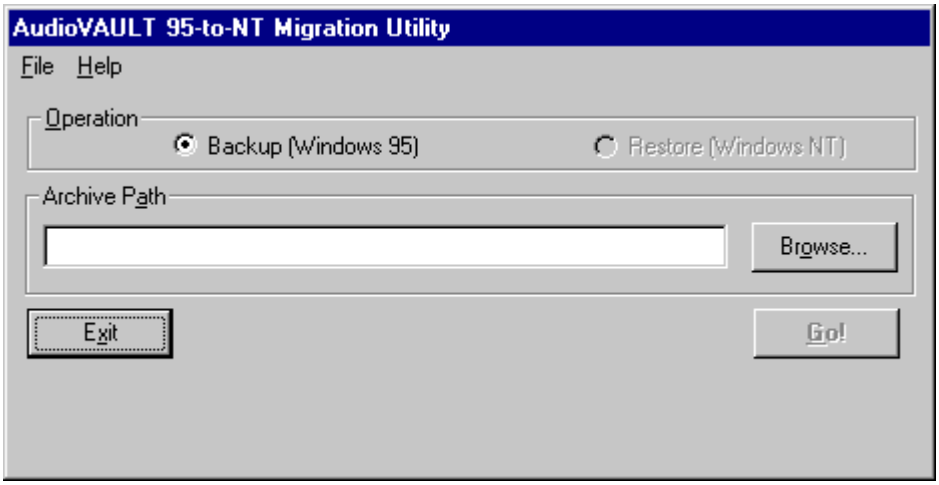
If your Master source is an ESE 185 then you should be able to tune the slaves better than if the Master's source is DOS. This is because a source of DOS itself has jitter of about 55mS, and that jitter will be reflected in the slave's Ref. Offset.

Reminder

The Slave's PC's clock is only adjusted when the Ref. Offset is greater than the DosMaximumError value in [AvTime] (which defaults to 110mS). This is why we change the PC's clock by a minute after each INI adjustment -- it lets us sync the slave to the master and then see what difference/drift remains afterwards.

AV95TONT

AV95ToNT is a utility designed specifically to create a backup of the necessary files needed when upgrading a computer from Windows 95 to Windows NT 4.0 Workstation. This utility copies all the necessary INI files, Registry Settings, Icon groups, database information for NewsBoss/AirBoss, and much more.



AV95ToNT has two basic modes of operation: **Backup** and **Restore**.

BACKUP (FROM WINDOWS 95)

When AV95ToNT is in the **Backup** mode its primary responsibility is to copy all the necessary settings from the workstation this application is being run on to a location on the network.

Note: This application is new with **AudioVAULT Suite Version 6.60** and is to be run before upgrading a workstation from Windows95 to Windows NT4.0/SP 3.

Command Line: C:\Audiovau\AV95ToNT.Exe /Mode=Backup

RESTORE (TO WINDOWS NT)

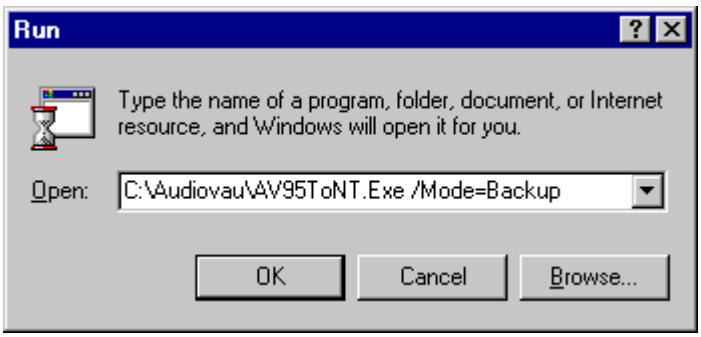
When AV95ToNT is in the restore mode its primary responsibility is to copy all the necessary settings from its stored location to the workstation this application is running from.

Note: This application is to be run from the computer that has been upgrade to Windows NT4.0 SP3.

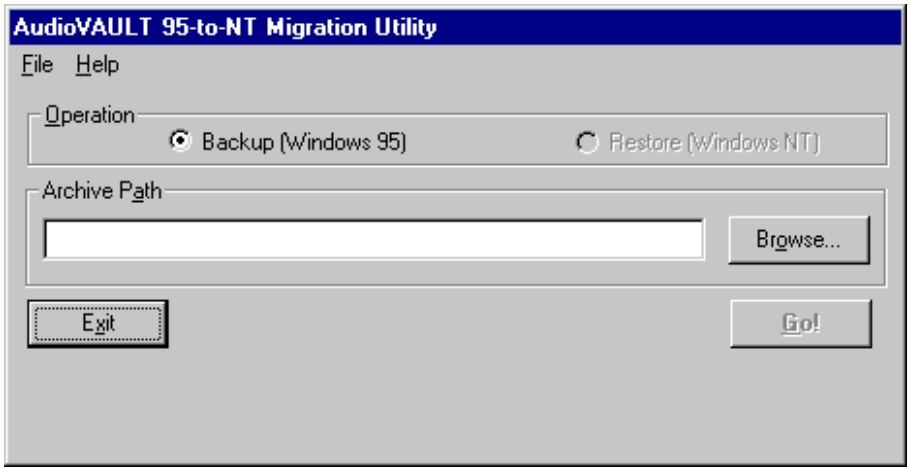
Command Line: C:\Audiovau\AV95ToNT.Exe /Mode=Backup

STEPS TO ACCOMPLISHING AN NT MIGRATION

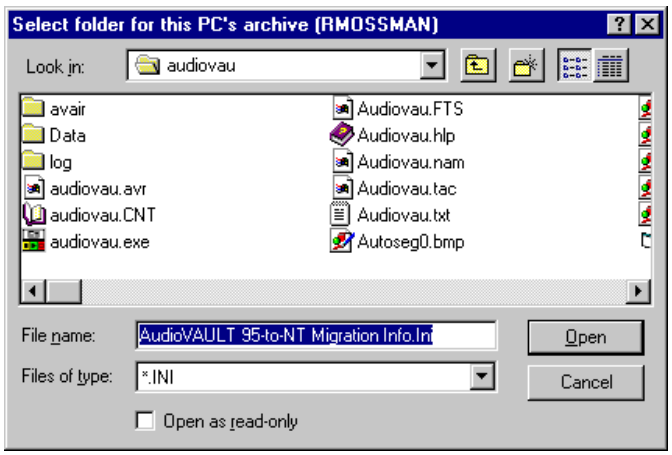
1. Move the cursor to the Windows95 Start Button and click with the left mouse button
2. Move the cursor to the Run option and single click with the left mouse button.
3. Type the following line in command line:
   C:\Audiovau\AV95ToNT.Exe /Mode=Backup



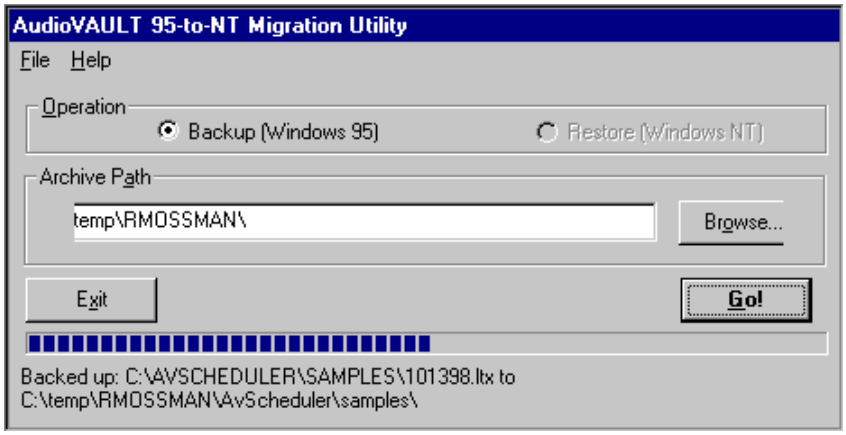
4. Move the cursor to OK and click with the left mouse button. AV95ToNT will start up and click the Browse button. Browse to the destination of the backup files.



Once the OK button is clicked, AV95ToNT will display a dialog for the user to define the location of the backup directory. Once a directory is selected or created click on Open.

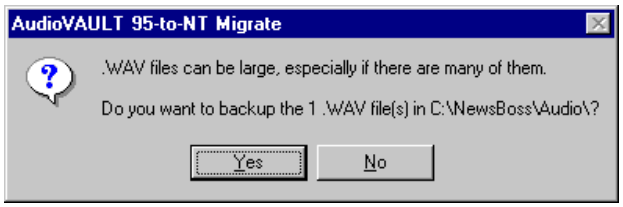


5. Once the Open button is clicked, AV95ToNT is ready to Go. Move the cursor to the GO button and single click with the left mouse button.
6. As AV95ToNT starts backing up, the information backed up will be displayed on the bottom of the screen.



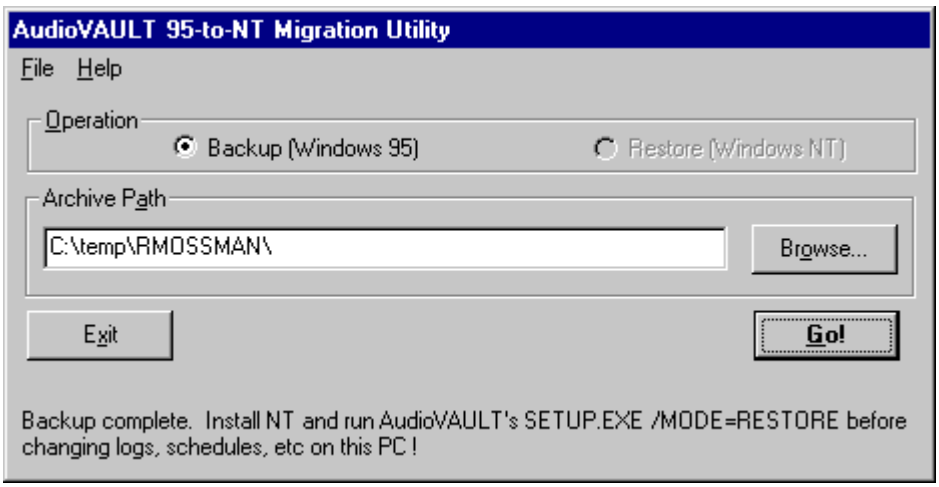
SPECIAL NOTE FOR NEWSBOSS USERS

If the utility sees a NewsBoss audio directory it will display a prompt explaining that WAV files take up a great deal of hard drive space. Select either **Yes** or **No** if backing up audio for NewsBoss is necessary.



Note: This option is useful only when NewsBoss is used with standard WAV files instead of AudioVAULT Audio files.

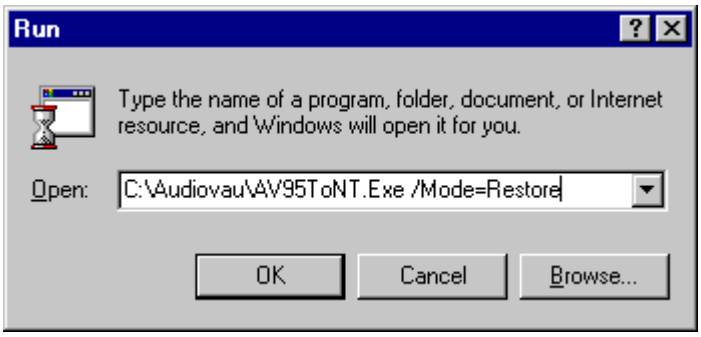
Once the backup is finished AV95ToNT will prompt the user how to restore the settings when restoring to a Windows NT4.0 SP3 computer.



Move the cursor to Exit and single click with the left mouse button.

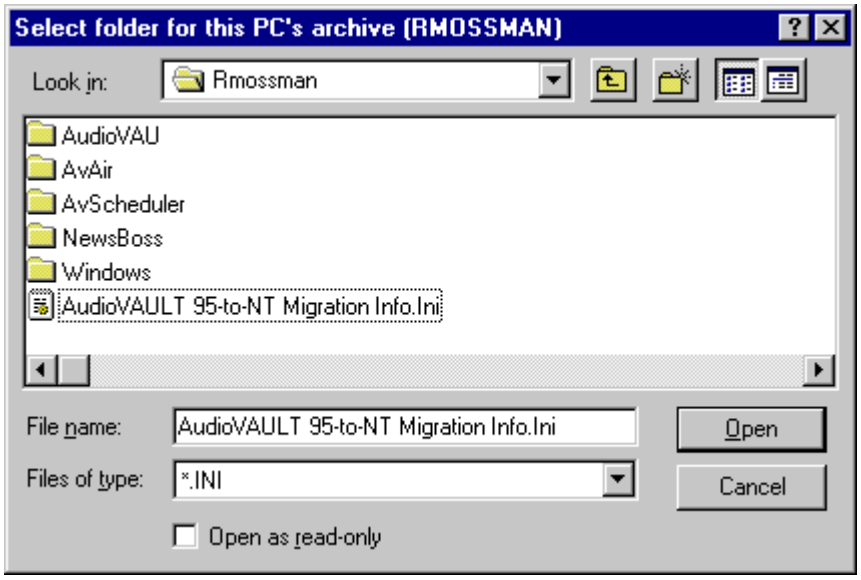
STEPS TO PERFORMING A RESTORE

1. Upgrade the computer to Windows NT4.0 SP3 and install AudioVAULT Suite Version 6.6x
2. Move the cursor to the Windows NT Start Button and click with the left mouse button.
3. Move the cursor to the Run option and single click with the left mouse button.
4. Type the following line in command line:
   C:\Audiovau\AV95ToNT.Exe /Mode=Restore



Note: This process will not work on a Windows95 machine.

5. Move the cursor to the browse button and single click with the left mouse button. Locate the Directory on the network was the backup was created and select: **AudioVAULT 95-to-NT Migration Info.INI**



Select the AudioVAULT 95-to-NT Migration Info.INI and click the Open button with the left mouse button.

6. AV95ToNT is ready to Go. Move the cursor to the GO button and single click with the left mouse button. The Restore will begin to place the back information onto the local computers hard drive.

7. Once the restore is complete move the cursor to Exit and single click with the left mouse button.

BONUS TRIVIA

AV95ToNT was designed to perform a Backup from a Win95 system and a Restore to a WinNT system. As the program was being developed, a special Debug Mode was added to facilitate a Backup from a Win95 system and a Restore to a Win95 system. As the developers performed this type of Backup/Restore, they did a normal Backup, then a restore with this command line:

```
C:\audiovau\av95tont.exe /DebugMode /mode=restore
```

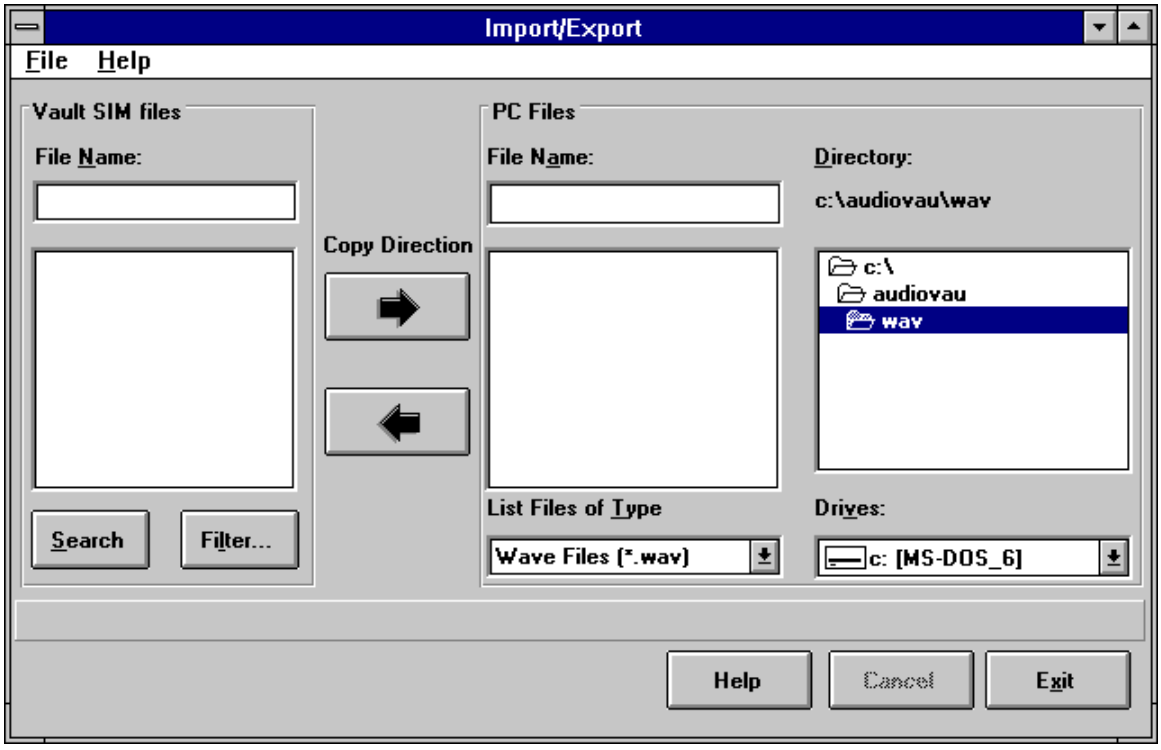
This was not officially released as an approved backup method. It has not been extensively tested, but allowed the developers to continue their work without reconfiguring the machine.

AVIMPORT/EXPORT

The AudioVAULT Software Suite offers a .WAV import/export utility called **AvImpExp.Exe**. AVImport/Export can work with WAV files with 44100, 22050, or 11025 sample rates. AudioVAULT WAV import/export:

- Facilitates cross-platform audio file transfers.
- Allows use of low-cost multi-media hardware and software such as SAW.
- Is compliant with the Microsoft MPEG-II audio storage standard.
- Supports and maintains full AudioVAULT header information.
- Allow multiple files to be tagged for import/export, complete with overwrite protection.
- Does not require a dedicated AV-100 board, just a network/data connection to an AudioVAULT.

AvImpExp.Exe does not convert files types (from Compressed to Uncompressed, for example), and only supports 16-bit files. It only copies the file from PC-to-Vault or from Vault-to-PC.



FORMATS SUPPORTED

- WAV files 11025, 22050 or 44100K
- TM Century (*.tmc) file format
- MPEG (*.mpg) file format

COMMAND LINE ARGUMENT

AvImpExp.Exe requires a single command line argument--the machine/vault AUDIOVAU.INI section name to transfer files to/from. An example command line is:
C:\AUDIOVAU\AVIMPEXP.EXE PCR11

PLAY/RECORD

AvImpExp.Exe itself does NOT play or record AudioVAULT or .WAV files. Those functions are performed by an AudioVAULT record screen or your .WAV editor/sound card.

AVIMPEXP LOG FILE

This program creates a log called AVImpExp.log, which looks like:

```
**********************************************
AVImpexp successfully loaded on 6/16/98 9:42:47 AM
Importing D:\Temp\CART7958.MPG failed.
Copy completed:  0 file(s) copied,  1 files skipped.
```

BROADCAST WAVE FILE IMPORT

Since BWF files are .WAV files they can be imported, but the data in the BWF chunk will be ignored. **Note:** BWF chunks are not created by AVImpExp.

TECHNICAL INFO ON .WAV/.SND FILES

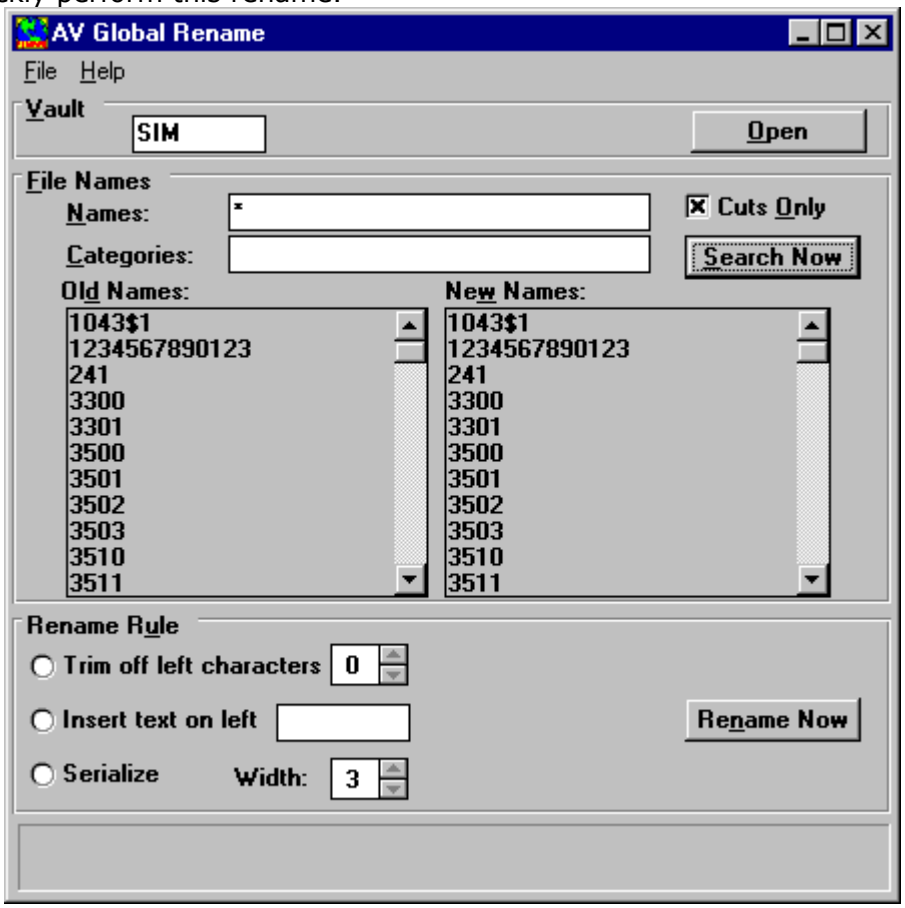
When you export in .WAV format, you get a RIFF-formatted file, as defined by Bill Gates and company. RIFF supports both uncompressed and MPEG compressed. The RIFF format starts off with a header "chunk" (that's a RIFF term); it lists the title, etc. A second header chunk is output (to the file) which is a binary copy of the AV's text header; this provides for a 100% symmetrical import to another AV system. Then the RIFF stream has a single audio chunk; if its uncompressed then this is PCM data otherwise, it's MPEG data.

The spec states that .WAV players should enumerate through the header chunks and use the "best" one for the application -- each has a name just for this purpose. However, there are a few .WAV readers that report dumb errors like: MULTIPLE HEADER CHUNKS -- CAN'T CONTINUE.

If you export in .SND format then there is no header at all -- just audio. Again if this is uncompressed then the data is PCM, else it is MPEG. Note that MPEG blocks start with a word of FF FD or FF FB or something, so that satellite-type MPEG decoders can re-sync to the next block in the stream.

AVRENAME

The AVRENAME utility allows AudioVAULT files to be easily renamed in bulk. It can come in especially handy if you are adding a second station to an AudioVAULT system, or integrating multiple systems and have the possibility of cut name conflicts. For example, all existing files can be renamed by prefixing a 0 to the left (i.e., change 2310 to 02310). AVRename.Exe can easily and quickly perform this rename.



1) First type in the vault name, such as PCR1 or FM2 that you wish to connect to, then click the OPEN button. There must be valid [Vault.xxx] and [Port.xxx] sections in the PC's AUDIOVAU.INI file.
2) Second, if all files are to not be renamed then select an AVFixUp-like filename filter that matches the desired files. You may refine the selection further by selecting individual filenames in the OLD list. If any names are selected then just the selected names are renamed. If none are selected then all files are renamed. Double click the name to unselect all names.
3) Third, select the rename operation

Trim	Remove characters from the left-hand side of the file name.
Insert	Add the specified character(s) to the left of the file names.
Serialize	Name the cuts 0001 - xxxx.

4) Set corresponding value/quantity. The NEW list shows in real-time what the files will be renamed to.
5) To actually initiate the rename, click the RENAME NOW button. Always search first, and select the rename operation second.

If a rename operation is such that a file of the NEW name already exists, you will be prompted if that rename should be skipped or not. If you choose YES then there will be duplicate files--AVFixUp.Exe can search for them (and optionally delete the older file). Or you can simply load and rename those files manually in an AudioVAULT screen.

If the rename operation trims/inserts too many characters for a given filename, then that file is NOT renamed. For example, if an attempt is made to rename a file named 0 via the trim 1 character operation, 0 will not actually be renamed (an empty filename is invalid). Or if the new name is more than 13 characters, the rename will not be performed.

The program is password protected so that inventory is not accidentally renamed. That password is AvReName (letter case is important). That must be placed on the command line of the program.

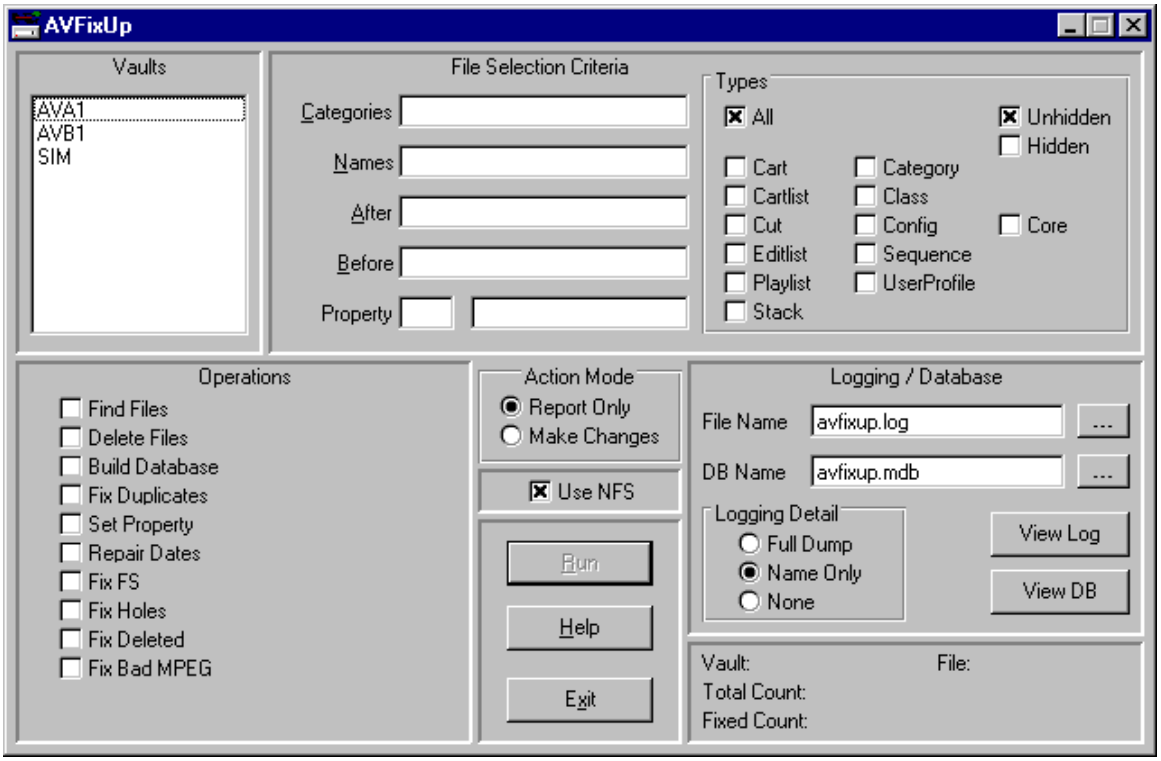
USENFS WARNING

If the selected vault has its UseNFS setting enabled, then the rename operation will be global in nature--that is to say that the same files on other server will also get renamed (via NFServer.Exe). Be very careful when performing multiple rename operations and UseNFS is on--NFServer is only capable of handling one rename operation per file per NFServer scan/pass. The choices are:

1) Disable NFServer, perform the renames manually on every server, and re-enable NFServer. You have to either set UseNFS=Off so that delete records don't get created, or use AvFixUp to delete them--before restarting NFServer.
2) Perform one rename, wait for NFServer to process all the rename records, then perform the next rename.

AVFIXUP

AVFixUp is a powerful maintenance utility that allows you to perform diagnostics and repair operations on your AudioVAULT files. To use AVFixUp, launch the application, connect to at least one valid Vault by highlighting the available vaults in the "Vaults" field, choose the desired operations, set any search criteria, and click "Run."



Multiple Operations can be selected, although some are more useful than others:

Find Files

Finds all files that match the File Selection Criteria on the highlighted vault(s). If multiple vaults are selected, Find Files will find and list in the log file all files that match the File Selection Criteria from one vault, followed by all files that match the File Selection Criteria from each additional vault. Find Files does not alter any AudioVAULT files regardless of Action Mode or UseNFS setting.

Delete Files

Deletes all files that match the File Selection Criteria.

Cautionary Notes: BE recommends when using this option to use it first with Report Only, then viewing the log file to be sure it will delete only the desired files. Files are deleted immediately, and cannot be undeleted. The UseNFS option should only be checked if the user is on an NFServer AudioVAULT NFS system and wants to delete all vaults' copies of the file. There are times when the user may want to delete a file from only one server (when one file from one server is damaged, for example); here, the user should intentionally uncheck UseNFS and select only the one vault that contains the file to be deleted. UseNFS is ignored when deleting hidden files (delete records).

Build Database

Builds a Microsoft Access compatible database of files that match the File Selection Criteria. The Make Changes option must be selected to generate a database; be careful to not mistakenly select DELETE FILES and MAKE CHANGES.

The database has the following fields:

- File Name
- Vault Name
- UFN (Unique File Number)
- Category
- Class
- Description
- Disk Drive ID
- Cut Length
- Disk Space (file size in bytes)
- Time Last Accessed - Header
- Time Last Modified - Header
- Time Last Accessed - Body (the audio portion of cuts)
- Time Last Modified - Body (the audio portion of cuts)
- File Type
- Number of Tracks (1 or 2 for stereo or mono)
- Sample Rate
- Compression Ratio
- Outcue
- Start Date
- Kill Date
- Default Duration
- Client ID
- Audio (trimmed length of audio)
- New Name
- Old Name
- Creating User ID (the host ID of the workstation that created the file)

Fix Duplicates

Deletes the oldest file of any files with duplicate filenames that match the File Selection Criteria. Broadcast Electronics recommends running Fix Duplicates in "Report Only" Action Mode first to make sure the desired results will occur before deleting any files. The UseNFS setting is ignored (forced off). If the user has multiple vaults selected, the Fix Duplicates Operations option grays out so that it cannot be selected. If the user wishes to fix files with duplicate filenames on multiple vaults, the user must perform the operation for each vault individually.

Set Property

Allows the user to change the specified string property of the files that match the File Selection Criteria.

Broadcast Electronics recommends using "Report Only" Action Mode first with logging detail set to Full Dump to be sure that the desired results will occur before instructing AVFixUp to Make Changes. The UseNFS setting is ignored.

Among the more useful properties:

C Category Code (3 chars)
CI Client ID/Artist Name (40 chars)

CL Class (7 uppercase chars)
D Description (40 chars)

Fix FS

Compares the directory entry of files that match the File Selection Criteria to their respective file headers. If the directory entry and file header are inconsistent, AVFixUp sets the directory entry information equal to the information contained in the file header. Specifically:

- Filename length is zero characters long
- Filename in the directory is not equal to the filename in the file's header
- File type in the directory is not equal to the file type in the file's header
- File category in the directory is not equal to the file category in the file's header

If the file is corrupt, and Fix FS fails, then the fail can be manually deleted via its UFN.

Fix Holes

Looks for a hole in the middle of files.

A "hole" is a missing block the file's chain of blocks. For files that match the File Selection Criteria that are MPEG cuts, AVFixUp also looks for a hole at the beginning of the file. If AVFixUp determines that a file contains any holes, and the "Make Changes" Action Mode is selected, AVFixUp then deletes the file.

Broadcast Electronics recommends that users shut off the UseNFS option when using Fix Holes. By shutting off the UseNFS option, a user could delete only the corrupt copy of a file. NFServer could then transfer a non-corrupt copy of the file to the server that had contained the corrupt file.

Broadcast Electronics also recommends that customers first use the Fix Holes Operations option with the Report Only Action Mode first to ensure that the desired behavior will occur before using the Make Changes Action Mode. Reboot the server after "fixing holes".this will cause the File System Checker to run, which will attempt to fix low-level file system errors.

Fix Bad MPEG

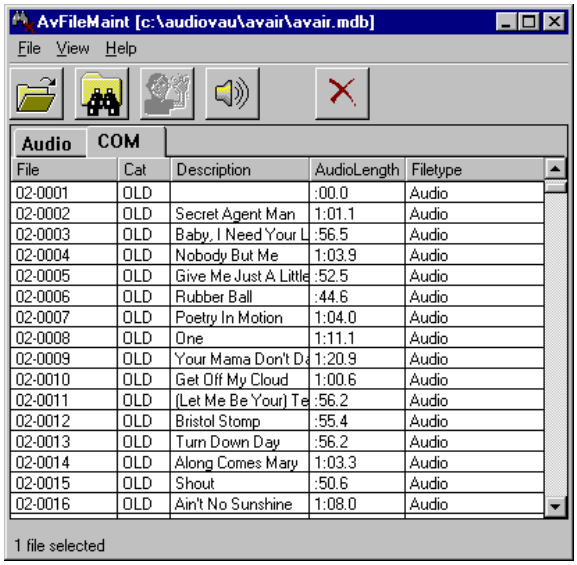
MPEG files are stored in blocks, and each block begins the 2-byte signature of FF FD (hexadecimal). This AVFixUp operation finds MPEG cuts that don't start with FF FD; those MPEG cuts would probably cause MPEG DECODER UNLOCKED errors when played, and should be re-recorded or deleted. First run AVFixUp with REPORT ONLY. Then sample the resulting files to see if they cause errors when played back (try them trimmed and untrimmed). Then re-run AVFixUp with MAKE CHANGES, which will delete those files.

A WORD ABOUT LOGGING DETAIL:

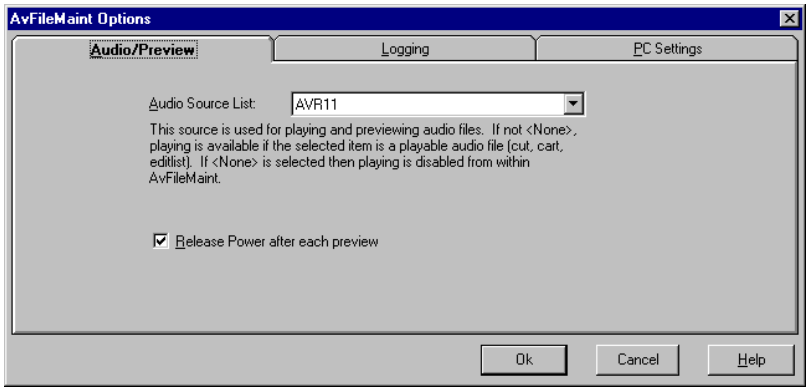
When **FULL DUMP** is selected, the last three digits of the UFN represent the SCSI ID number of the drive that file is on. That can be helpful in diagnosing file-related problems.if all the files are on the same drive, that information may provide a new direction for your troubleshooting.

AVFILEMAINT

AVFileMaint is a new application as of AudioVAULT version 6.62. It was designed to make file maintenance tasks a little easier with advanced sorting options and audio preview capability. AVFileMaint is installed any time the AudioVAULT options are installed through the Setup program. The utility attaches to an AVAir database, so it is very fast and very flexible.



To configure audio playback, go to "VIEW" and "OPTIONS," and define the playback source.



Other tabs in the OPTIONS dialog allow you to view the utility used to view the log created by AVFileMaint deletions and view the settings that affect AVFileMaint.

AVFileMaint uses the same type of file browser as AVScheduler.setting up additional tabs is very simple. AVFileMaint uses the user level security model that is setup in AVMaint, so each person performing file maintenance using the utility must have access to a valid User account.

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Section 13: Troubleshooting and File Maintenance

By the end of this section you should be familiar with these issues:

- How to interpret AudioVAULT error codes
- How to gather information necessary for Customer Service
- How to read basic log files
- The need for regular hardware maintenance
- The need for regular backup and software maintenance
- Some of the issues surrounding Anti-Virus protection

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TROUBLESHOOTING AND FILE MAINTENANCE

Even the healthiest AudioVAULT system will occasionally report errors and spit out a cryptic message. Some of the messages are warnings or purely informational, others are errors that require more attention. Most error/informational messages can be researched in the AudioVAULT Help File. If you need to call Customer Service, please have as much of the following information handy as you can:

- The Error Message.
- The version of AudioVAULT software you are running.
- What applications are installed on the machine that reported the message?
- When exactly was the message reported?
- What was going on at the time the message was reported?

When troubleshooting your AudioVAULT, just like any piece of equipment, first identify the **real** problem. If a jock reports an application "doesn't work," does that mean it's not passing audio? It's not recording? The hotkeys don't work as expected? Investing in identifying the real problem will save you valuable time.

Once you've identified the problem, determine the affected components. Errors can be broken down in to several major groups:

Network errors

The AudioVAULT system simply works over the standard Windows peer-to-peer networking components. The AudioVAULT does not modify the network protocols. Generally, if NetBEUI is installed correctly and is the default protocol (LANA 0), AudioVAULT components will connect. When troubleshooting, always verify the network is correct first.

Windows errors

Obviously, Windows must be working properly for the AudioVAULT to work. The Microsoft Knowledge Base is a surprisingly good tool when you're researching Windows errors. In addition to general Windows troubleshooting, be aware that installing non-AudioVAULT software (including Internet browsers) can jeopardize your AudioVAULT installation. Most applications share files to run, and expect those files to be certain versions. If the files are overwritten, the program can't operate.

AudioVAULT File System Errors

FS errors have to do with the data stored on your SCSI drives. They can include things like Bad FS, Bad Block Magic, or MPEG-related problems. Most can be fixed with AVFixUp or with the File System Checker.

AudioVAULT SCSI Bus Errors

SCSI Bus errors can include Gross Errors (GE), Parity Errors (PE), Bus Resets, or other errors. While SCSI Bus errors are generally tracked down to things like loose cables, termination or ID conflicts, they can be related to a failed SCSI device.

AudioVAULT SCSI Drive Errors
Look in AVMaint or System/Info for Soft or Hard Errors. Also check for the Last Error, which can be trace back to a problem description. Console logs will also contain sense codes if a particular drive is reporting a problem.

AudioVAULT AV100 Card errors
These errors include DSP errors or DMA timing errors. It's important to find out which DSP is affected.DSP(0) is the base R/P AV100 card. DSP(1) and DSP(2) are daughtercard channels.

GATHER INFORMATION:

- Symptoms
- Software Versions:
  - AudioVAULT
  - Operating System
  - Other installed software
- Any Recent Changes?
  - Hardware
  - Software
- Hardware in PC:
  - IRQ information
  - I/O Address information
- Time and Date settings.
- INI files:
  - AUDIOVAU.INI
  - SYSTEM.INI
- Registry information

TROUBLESHOOTING STEPS

- Check network operation. This should be the first place to check for errors. Check the simple stuff first.
  - Are all cables securely seated?
  - Is the hub turned on?
  - Are there link lights on the NIC and the hub?

  Once the hardware appears sound, check the software:
  - Are the correct network components installed? You should only see:
    Client for Microsoft Networks
    Network card
    NetBEUI
    TCP/IP
    File and Printer Sharing
    (Windows Family Logon may appear on some Win98 machines.)
  - If TCP/IP is installed, is NetBEUI the default protocol/LANA 0? If not, is the NetBEUI LANA properly identified in the **audiovau.ini**?

  Does the computer see itself in Network Neighborhood? If it does, the NIC is working properly and you should check again for a cable/protocol problem. If not, you may need to uninstall the network components, reboot, and reinstall.

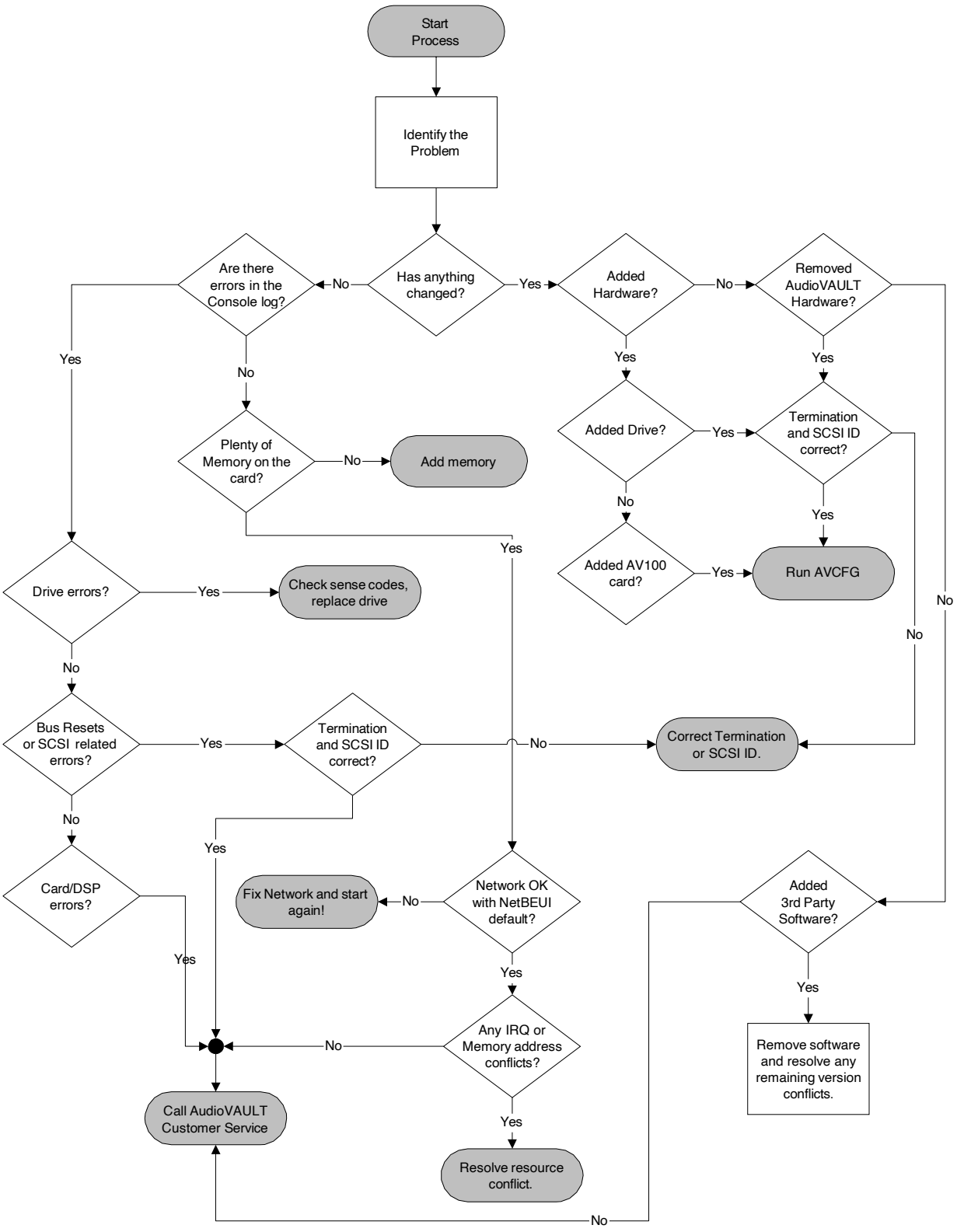
- If you can, remove the server's cover and check for blinky lights on the AV-100 cards.

- Check for IRQ problems

- From the registry, find out which IRQ the cards are using. Valid IRQs for AV-100 cards are 10, 11, 12 and 15. You'll find this in this key:
  \\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\AudioVAULT
- Using Device Manager, make sure no Windows device is using that IRQ. If a Windows conflict exists, use an alternate IRQ or reserve the IRQ in Device Manager.
- If no conflict exists, check BIOS to make sure that IRQ is set to Legacy ISA.

- Check for Shared Memory Address problems
  - From the registry, find out which Memory region each card is using. You'll find this in this key:
    \\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\AudioVAULT
  - Using Device Manager, make sure no Windows device is using that region. If a Windows conflict exists, rectify the conflict.
  - If no conflict exists, check BIOS to make sure that Shadowing is disabled.

- Check for I/O Address problems
  - From the registry, find out which I/O Address each card is using. You'll find this in this key:
    \\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\AudioVAULT
  - Using Device Manager, make sure no Windows device is using that address. If a Windows conflict exists, rectify the conflict.


Start Process
Identify the Problem
Has anything changed?
No
Are there errors in the Console log?
Yes
Added Hardware?
No
Removed AudioVAULT Hardware?
Yes
Yes
Yes
No
Plenty of Memory on the card?
No
Add memory
Yes
Added Drive?
Yes
Termination and SCSI ID correct?
No
Yes
Added AV100 card?
Yes
Run AVCFG
Drive errors?
Yes
Check sense codes, replace drive
No
No
No
Bus Resets or SCSI related errors?
Yes
Termination and SCSI ID correct?
No
Correct Termination or SCSI ID.
No
Yes
Card/DSP errors?
Fix Network and start again!
No
Network OK with NetBEUI default?
Added 3rd Party Software?
Yes
Yes
Yes
Yes
Any IRQ or Memory address conflicts?
No
Remove software and resolve any remaining version conflicts.
Call AudioVAULT Customer Service
Yes
Resolve resource conflict.
No

If all else fails

- Reseat (remove and replace) AV100 cards.
- Reseat (remove and replace) inter-board sync cable and SCSI cables.
- In BIOS, turn off all unnecessary devices, including PS2 Mouse support and USB Support
- Run Scandisk.
- Re-register files and then re-run AVRegister.
- Check for Duplicate files - INI files, device driver, EXE files, DLL's, OCX's.
- Check for naming problems/conflicts/typos
  - System.ini
  - Audiovau.ini
  - Registry
- Check PCR.RAM version for compatibility.
- Check AVINIT.exe for version compatibility.
- Verify correct Foundation Class file versions
  - MFC42.dll
  - MSVCRT.dll
  - MSVCIRT.dll
  - OLEAUT32.dll
  - OLEPRO32.dll
- Install new device driver and server files.

ERROR MESSAGES

Obviously, knowing what the error message **is** is important! Once you know the message or the code, you can research it in the AudioVAULT Help File. It includes a list of each code and the associated error text. By clicking on the link, you'll learn more about the error, and in most cases possible causes and fixes. The list is extensive:

70XX ERROR CODES

7001h/28673d	Invalid Host ID
7002h/28674d	NULL File Handle
7003h/28675d	Unknown File Handle
7004h/28676d	Too Many Open Files
7005h/28677d	Memory Allocate Failed
7006h/28678d	Internal File Table Error
7007h/28679d	UFN Mismatch
7008h/28680d	No Name Hash List
7009h/28681d	Invalid Seek Mode
700Ah/28682d	Read Error
700Bh/28683d	Write Error
700Ch/28684d	Disk Not Mounted
700Dh/28685d	Disk Is Read Only
700Eh/28685d	Disk Is Remote
700Fh/28687d	File Is Open For Read
7010h/28688d	Invalid Argument(s)
7011h/28689d	Device Is Busy
7012h/28690d	Bad Block Magic
7013h/28691d	Bad Indirect Link
7014h/28692d	Bad Indirect Magic
7015h/28693d	No Target Device
7016h/28694d	Unknown RPC
7017h/28695d	RPC Not Implemented
7018h/28696d	Bad RPC Header
7019h/28697d	Communications Timeout
701Ah/28698d	RPC Error
701Bh/28699d	Reset Received
701Ch/28700d	Host PDS Get Error
701Dh/28701d	Host PDS Put Error
701Eh/28702d	Remote PDS Get Error
701Fh/28703d	Remote PDS Put Error
7020h/28704d	Bad Device Number
7021h/28705d	Communications Aborted
7022h/28706d	Access Denied
7023h/28707d	File Is Damaged
7024h/28708d	Attempt to Read Hole
7025h/28709d	Illegal Disk Block
7026h/28710d	Memory Not From Heap
7027h/28711d	No Disk Space
7028h/28712d	File Is Open For Write
7029h/28713d	File Has Not Been Checked
702Ah/28714d	File Not Open For Write
702Bh/28715d	File Is Open Exclusive Access
702Ch/28716d	File Is Open Shared Write
702Dh/28717d	File Is Open Shared Read
702Eh/28718d	Communications Channel Active

702Fh/28719d	File Not Found
7030h/28720d	File Is Deleted
7031h/28721d	Unknown Iterator Handle
7032h/28722d	Bad Stamp Size
7033h/28723d	Bad Stamp CRC
7034h/28724d	Iteration Not Completed
7035h/28725d	SCSI Bus Reset
7036h/28726d	Early End of EOP/M
7037h/28727d	End Of Data
7038h/28728d	End Of Partition
7039h/28729d	Beginning Of Partition
703Ah/28730d	No Medium
703Bh/28731d	Tape Not Ready
703Ch/28732d	Initiator Parity Error
703Dh/28733d	SCSI Command Terminated
703Eh/28734d	SCSI Bus Error
703Fh/28735d	SCSI Bus Timeout
7040h/28736d	Write Protected
7041h/28737d	File Mark Encountered
7042h/28738d	Set Mark Encountered
7043h/28739d	Communications out of sync
7044h/28740d	FFB Not Checked
7046h/28742d	Extended Property not found
7080h/28800d	DSP Timeout
7081h/28801d	Time beyond event list
7082h/28802d	Can't do that while recording
7083h/28803d	Event list empty
7084h/28804d	DSP DMA avoidance timeout
7085h/28805d	DSP Invalid ping value
7086h/28806d	DSP Version text overflow
7087h/28807d	DSP Invalid DSP request
7088h/28808d	DSP Invalid MPU request
7089h/28809d	DSP DMA protocol error
708ah/28810d	DSP Cue/Uncue while running
708bh/28811d	DSP Command sequence error
708ch/28812d	DSP Invalid command argument
708dh/28813d	DSP Error
708eh/28814d	Invalid AudioState value
708fh/28815d	Audio dropout
7090h/28816d	Rate change not supported
7091h/28817d	Error loading DSP ramp list
7092h/28818d	Invalid mixer knob number
7093h/28819d	Invalid deck id
7094h/28820d	Invalid machine id
7095h/28820d	Invalid clock id
7096h/28822d	Event too short
7097h/28823d	Attempt to arm multiple lists
7098h/28824d	Disarming un-armed list
7099h/28825d	Silence played
709ah/28826d	Record data overrun
709bh/28827d	Digital audio input rate mismatch
709ch/28828d	Digital audio input unlocked
709dh/28829d	Digital audio input invalid
709eh/28830d	MPU Late

709fh/28831d Invalid compression specification
70a0h/28832d MPEG Decoder unlocked
70a1h/28833d MPEG Out of time
70a2h/28834d Disk late
70a3h/28835d Too many events
70a4h/28836d DSP late
70a5h/28837d DSP Error loading overlay
70a6h/28838d Unsupported save-as operation
70a7h/28839d Timeout during save-as operation

71XX ERROR CODES

7101h/28929d Invalid function number
7102h/28930d File not found
7103h/28931d Path not found
7107h/28935d Memory blocks destroyed
7109h/28937d Invalid memory block address
710ah/28938d Invalid environment
710bh/28939d Invalid format
710ch/28940d Invalid access code
710dh/28941d Invalid data
710fh/28943d Invalid drive specified
7110h/28944d Attempt to remove CurDir
7111h/28945d Not same device
7112h/28946d No more files
7104h/28932d Too many open files
7105h/28933d Permission denied
7106h/28934d Bad file number
7108h/28936d Not enough memory
710eh/28942d Unknown error
7113h/28947d Invalid argument
7114h/28948d Arg list too long
7115h/28949d Exec format error
7116h/28950d Cross-device link
711ch/28956d No space left on device
7121h/28961d Math argument
7122h/28962d Result too large
7123h/28963d File already exists
7124h/28964d Locking violation

72XX ERROR CODES

7201h/29185d Illegal Buffer Length
7202h/29186d Buffers full, no receive issued
7203h/29187d Illegal command
7205h/29189d Command timed out
7206h/29190d Message incomplete, issue another command
7207h/29191d Illegal buffer address
7208h/29192d Session number out of range
7209h/29193d No resource available
720ah/29194d Session closed
720bh/29195d Command cancelled
720ch/29196d PC DMA failed
720dh/29197d Duplicate name

720eh/29198d	Name table full
720fh/29199d	No deletions, name has active sessions
7210h/29200d	Name not found or no valid name
7211h/29201d	Local session table full
7212h/29202d	Remote session table full
7213h/29203d	Illegal name number
7214h/29204d	No callname
7215h/29205d	Cannot put * in NCB_NAME
7216h/29206d	Name in use on remote adapter
7217h/29207d	Called name cannot == name or name #
7218h/29208d	Session ended abnormally
7219h/29209d	Name conflict detected
7221h/29217d	Interface busy, IRET before retrying
7222h/29218d	Too many commands outstanding, retry late
7223h/29219d	Ncb_bridge field not 00 or 01
7224h/29220d	Command completed while cancel occurring
7225h/29221d	Reserved name specified
7226h/29222d	Command not valid to cancel
7233h/29235d	Multiple requests for same session
7236h/29238d	Max number of applications exceeded
7238h/29240d	Nested resources are not available
7240h/29248d	System error
7241h/29249d	ROM checksum failure
7242h/29250d	RAM test failure
7243h/29251d	Digital loopback failure
7244h/29252d	Analog loopback failure
7245h/29253d	Interface failure
7250h/29264d	Network adapter malfunction
72fbh/29435d	Not installed

7EXX ERROR CODES

7E01h/32257d	Warning
7E02h/32258d	Application Already Running
7E03h/32259d	Invalid Vault code version
7E04h/32260d	Communications Error
7E05h/32261d	File Not Found
7E06h/32262d	File Already Exists
7E07h/32263d	Incorrect File Type
7E08h/32264d	No Type Selected
7E09h/32265d	Invalid Command
7E0Ah/32266d	Invalid Date/Time
7E0Bh/32267d	Invalid File Name
7E0Ch/32268d	The current item can not be modified
7E0Dh/32269d	This file may not be modified by you
7E0Eh/32270d	Item has been removed
7E0Fh/32271d	Item could not be renamed
7E10h/32272d	Unable to Open
7E11h/32273d	Unable to Open Database
7E12h/32274d	Unable to Save
7E13h/32275d	Trying to Reset RPC
7E14h/32276d	Reset RPC Failed
7E15h/32277d	Checking Boot Status
7E16h/32278d	Trying to Boot from Disk

7E17h/32279d	Trying to Download Code
7E18h/32280d	List could not renamed
7E19h/32281d	You have some un-saved lists.
7E1Ah/32282d	Cut out-of-date
7E1Bh/32283d	No Error
7E1Ch/32284d	Audio interrupted by Stop/Skip
7E1Dh/32285d	Cut or Break not played due to error
7E1Eh/32286d	Audio interrupted by Pause/Preview/Scan...
7E1Fh/32287d	File missing or zero length
7E20h/32288d	Cursor not on or in Audio/Secondary/Tertiary cue tone
7E21h/32289d	Too many cue tones. Some tones discarded
7E22h/32290d	Database not open.
7E23h/32291d	Insufficient Space
7E24h/32292d	Workstation Clock Re-synchronized
7E25h/32293d	Memory is low
7E26h/32294d	Device Specific Error
7E27h/32295d	Error while playing
7E28h/32296d	Warning while playing
7E29h/32297d	Reset Received
7E2Ah/32298d	RPC Timeout
7E2Bh/32299d	RPC Communications Error
7E2Ch/32300d	Call of unimplemented function
7E2Dh/32301d	Bad or missing configuration data
7E2Eh/32302d	Invalid Break Data
7E2Fh/32303d	Cut too short
7E30h/32304d	File is empty
7E31h/32305d	Playlist tried to start itself
7E32h/32306d	Macro processing error
7E33h/32307d	Out of near heap space
7E34h/32308d	List tried to load itself
7E36h/32310d	Vault/Port is already in use
7E37h/32311d	Machine/Track is already in use
7E38h/32312d	Invalid new filename
7E39h/32313d	Cannot rename cut
7E3Ah/32314d	Cannot create new edit list
7E3Bh/32315d	Error copying cut properties
7E3Ch/32316d	Error saving EditList properties
7E3Dh/32317d	Listbox is full
7E3Eh/32318d	Too many files selected
7E3Fh/32319d	All cuts must be same format for SaveAs

7FXX ERROR CODES

7F01h/32513d	Invalid Host ID
7F02h/32514d	Invalid Machine ID
7F03h/32515d	Machine is active
7F04h/32516d	Invalid Track ID
7F05h/32517d	Track is active
7F06h/32518d	Invalid Deck ID
7F07h/32519d	Empty name list
7F08h/32520d	Invalid request
7F09h/32521d	Invalid track data
7F0Ah/32522d	Database could not be openned
7F0Bh/32523d	Invalid machine param index

7F0Ch/32524d	FHDR key sort error
7F0Dh/32525d	FHDR filename mismatch
7F0Eh/32526d	Break is too complex
7F0Fh/32527d	Bad cart
7F10h/32528d	Incorrect file type
7F11h/32529d	Missing Channel substituted
7F12h/32530d	CR: Out of time
7F13h/32531d	Copy could not be started
7F14h/32532d	Copy in progress
7F15h/32533d	No copy in progress
7F16h/32534d	Files do not match
7F17h/32535d	File not found
7F18h/32536d	Out of memory
7F19h/32537d	Invalid event length
7F1Ah/32538d	Illegal when clock running
7F1Bh/32539d	Illegal when clock stopped

28000 ERROR CODES

28673	AV100: Invalid Host ID
28674	AV100 Null File Handle
28675	AV100: Unknown File
28676	AV100: Too Many Open Files
28677	AV100: Memory Allocate Failed
28678	AV100: Internal File Table Error
28679	AV100: UNF Mismatch
28680	AV100: No Name Hash List
28681	AV100: Invalid Seek Mode
28682	AV100: Read Error
28683	AV100: Write Error
28684	AV100: Disk Not Mounted
28685	AV100: Disk Is Read Only
28686	AV100: Disk Is Remote
28687	AV100: File Is Open For Read
28688	AV100: Invalid Argument(s)
28689	AV100: Device is Busy
28690	AV100: Bad Block Magic
28691	AV100: Bad Indirect Link
28692	AV100: Bad Indirect Magic
28693	AV100: No Target Device
28694	AV100: Unknown RPC
28695	AV100: RPC Not Implemented
28696	AV100: Bad RPC Header
28697	AV100: Communications Timeout
28698	AV100: RPC Error
28699	AV100: Reset Received
28700	AV100: Host PDS Get Error
28701	AV100: Host PDS Put Error
28702	AV100: Remote PDS Get Error
28703	AV100: Remote PDS Put Error
28704	AV100: Bad Device Number
28705	AV100: Communications Aborted
28706	AV100: Access Denied
28707	AV100: File Is Damaged

28708	AV100: Attempt to Read Hole
28709	AV100: Illegal Disk Block
28710	AV100: Memory Not From Heap
28711	AV100: No Disk Space
28712	AV100: File Is Open For Write
28713	AV100: File Has Not Been Checked
28714	AV100: File Not Open For Write
28715	Av100: File Is Open Exclusive Access
28716	AV100: File Is Open Shared Write
28717	AV100: File Is Open Shared Read
28718	AV100: Communications Channel Active
28719	AV100: File Not Found
28720	AV100: File Is Deleted
28721	AV100: Unknown Iterator Handle
28722	AV100: Bad Stamp Size
28723	AV100: Bad Stamp CRC
28724	AV100: Iteration Not Completed
28725	AV100: SCSI Bus Reset
28726	AV100: Early End of EOP/M
28727	AV100: End of Data
28728	AV100: End of Partition
28729	AV100: Beginning of Partition
28730	AV100: No Medium
28731	AV100: Tape Not Ready
28732	AV100: Initiator Parity Error
28733	AV100: SCSI Command Terminated
28734	AV100: SCSI Bus Error
28735	AV100: SCSI Bus Timeout
28736	AV100: Write Protected
28737	AV100: File Mark Encountered
28738	AV100: Set Mark Encountered
28739	AV100: Communications Out of Sync
28800	AV100: DSP Timeout
28801	AV100: Time Beyond Event list
28802	AV100: Can't do that while recording
28803	AV100: Event List Empty
28804	AV100: DSP DMA Avoidance Timeout
28805	AV100: DSP Invalid Ping Value
28806	AV100: DSP Version Text Overflow
28807	AV100: DSP Invalid DSP
28808	AV100: DSP Invalid MPU Request
28809	AV100: DSP DMA Protocol Error
28810	AV100: DSP Cue/Uncue while running
28811	AV100: DSP Command sequence error
28812	AV100: DSP Invalid command argument
28813	AV100: DSP Error
28814	AV100: Invalid AudioState value
28815	AV100: Audio dropout
28815	AV100: Audio dropout
28816	AV100: Rate change not supported
28817	AV100: Error loading DSP ramp list
28818	AV100: Invalid mixer knob number
28819	AV100: Invalid deck id
28820	AV100: Invalid machine id

28821	AV100: Invalid clock id
28822	AV100: Event too short
28823	AV100: Attempt to arm multiple lists
28824	AV100: Disarming un-armed list
28825	AV100: Silence played
28826	AV100: Record data overrun
28827	AV100: Digital audio input rate mismatch
28828	AV100: Digital audio input unlocked
28829	AV100: Digital audio input invalid
28830	AV100: MPU Late
28831	AV100: Invalid compression specification
28832	AV100: MPEG Decoder Unlocked
28833	AV100: MPEG Out of time
28834	AV100: Disk Late
28835	AV100: Too many events
28836	AV100: DSP late
28837	AV100: DSP Error loading overlay
28929	Invalid function number
28930	File not found
28931	Path not found
28932	Too many open files
28933	Permission denied
28934	Bad file number
28935	Memory blocks destroyed
28936	Not enough memory
28937	Invalid memory block address
28938	Invalid environment
28939	Invalid format
28940	Invalid access code
28941	Invalid data
28942	Unknown error
28943	Invalid drive specified
28944	Attempt to remove CurDir
28945	Not same device
28946	No more files
28947	Invalid argument
28948	Arg list too long
28949	Exec format error
28950	Cross-device link

It's unlikely you'll ever see most of these errors. There's a pretty short list of errors that you might see:

7208:NETBIOS SESSION NUMBER OUT OF RANGE

The server creates/publishes network names for its AV-100 boards, and the workstation is unable to connect to that name. Remembering how the Workstation communicates with the Server can help:

Always check the simple things first, then move ahead in complexity.

- Network cable
- NIC hardware
- AV100 software, both workstation and server
- NIC configuration
- AV-100 board hardware failures
- Inter-Board Sync cable
- SCSI termination or bus errors
- AV-100/PC IRQ conflicts
- Shared memory failures
- EMM386 exclusions

Most likely, either there's a network problem or the server program is not operating. If a Network problem is ruled out, rebooting the server will usually correct the problem.

FILE IS OPEN FOR READ

- The cut is highlighted, or has been loaded, and another machine attempted to record it. Move the highlight bar off the cluster/cut and retry the record.
- In rare cases this can occur if a workstation crashes just after it has opened a file--that file can only be closed by rebooting the server.
- This could also be caused by two (or more) workstations attempting to load the same cart (possibly within an auto-started break) at the same time. Each would try to open the cart file to first get the rotation pointer and then again to write back the new/next rotation pointer.
- Another cause may be NFServer. If a cut is recorded, then NFServer reads the cut when copying the file to another server. If you attempt to record the cut again while NFServer is copying, the error will occur. If a production mistake is made while recording a cut, then use PAUSE and SKIP REVERSE to start over (instead of STOP and TIMED RECORD), thus leaving the cut in the RECORD mode and thus preventing NFServer from opening/reading the cut.

FILE IS OPEN FOR WRITE

The cut is being recorded, and another machine attempted to cue it up. When the recording is complete re-load the cut/cluster by clicking off and then back on the first event. In rare cases this can occur if a workstation crashes just after it has opened a file--that file can only be closed by rebooting the server.

BAD BLOCK MAGIC (AV100 ONLY)

Each block of data on the disk has an associated identifier in its header. This ID is called the "block magic" number. This error indicates there was a file system error. Delete the file in question and reboot the AV-100's server to force the file system checker to run. If it is the FSCK itself that reported the error, then simply allow it to complete. BAD BLOCK MAGIC errors sometimes prevent any new cuts from being successfully recorded. For NFS systems, delete the damaged file LOCALLY so that other copies of the file have the opportunity to get copied back. Use AVFixUp with UseNFS OFF, and DELETE FILES selected, while supplying the file's name in the Name field.

APPLICATION COMMUNICATIONS TIMEOUT (AV100 ONLY)

The AV-100 board or the server is not responding to the workstation's packets. First, ensure both are running. Try to reboot the server and possibly the workstation. For a

server/workstation, ensure the inter-board sync cable is installed and that the IRQ is correctly defined.

AVINIT COMMUNICATIONS TIMEOUT (AV100 ONLY)

When this error is reported by AVINIT during boot up, the problem could be:

- An AV-100 board ID Conflict. This can be caused by incorrect DIP switch settings (duplicate ID), or by non-unique DeviceAddress= settings in the AUDIOVAU.INI file. Also ensure C:\WINDOWS\AUDIOVAU.INI is the only AUDIOVAU.INI file on the PC via DOS' DIR /S \AUDIOVAU.INI command. Likewise, ensure only one SYSTEM.INI exists and its in the Windows directory.
- SCSI bus termination. A common failure is incorrect termination on the two AV-100 board's SCSI busses. If the SCSI cable has been removed, remember to reconnect the cable to the correct SCSI bus connectors--SCSI A is toward the tail of the AV-100 board while SCSI B is toward the center the AV-100 board. Also remember that SCSI SIP termination resistors are not symmetrical--there is a pin 1. Try to terminate both busses of every AV-100 card and remove all SCSI cables; if the timeout condition goes away then the problem is either the cable(s) or the cable termination. If the problem persists then termination is not an issue.
- Possibly a SCSI ID conflict. Remember that AV-100's themselves use a SCSI ID, and that all devices on the bus must have a unique ID. The amber LED may be bright because the can get "flooded" with SCSI bus controller interrupts.
- Failed or not well seated AV-100 board. Try to swap Contents boards around to see if the problem follows a given board ID, or a given physical AV-100 board. Try to reproduce the problem with few AV-100 boards.
- For passive backplane PCs, ensure the CPU card is fully seated into the backplane. Since the entire PC is on a card, the PC may appear to function even if the ISA bus is not well seated. This tends to affect all contents in the PC, and tends to start failing after inserting some cards in the PC (thus pushing the backplane away from the CPU card).
- A shared memory conflict.
- The PCR.RAM or AvInit.Exe DOS files may be corrupt. Try fresh copies from another PC.
- The PC's power supply is weak. Ensure the card's LEDs blink correctly upon power up. Measure the supply voltages for drop. Remove some Contents and/or daughter cards to lessen the load for testing.

MPEG DECODER HAS BECOME UNLOCKED

When playing MPEG-encoded cuts, if the MPEG decoder encounters a non-MPEG data block then "DECODER UNLOCKED" is reported and the decoder starts pitching bytes until a MPEG header is encountered in the data stream. Each MPEG block represents about 35mS of audio, so the dropout may go undetected.

Possible Causes:

- Damaged cut--Look in the as-run logs for the AV-100 card and play channel that reported the MPEG error (in the console log file). Play that cut back to see if the error can be reproduced. If so, delete the cut and re-record it. Also, AVFixUp can detect files with Holes or Bad MPEG.
- Failing AV100 SCSI drive--Inspect the console log file for SCSI sense errors such as "00 00 03". If the drive is reporting read errors then consider replacing the drive.
- AV100 SCSI bus errors--Look for bus errors in the console log file. If present, replace the cable, check termination, shorten the cable, etc.
- Power loss--If the card's write cache has not been committed to disk when power is lost then that file may be damaged. Delete it and re-record.

- Faulty hardware--Try to swap the AV100 (or daughter card) to diagnose the suspect circuit board. Keep in mind that the problem may be heat sensitive, and difficult to isolate. The problem may be caused by a single SCSI drive--collect data to pin point the drive and then correct/replace it.

DISK LATE

The storage disk's bandwidth has been exceeded.AudioVAULT can't read/write fast enough to the disk. This can occur when:

- Too many simultaneous records/plays are occurring. Switch to mono, or compress the cuts (more).
- The disk is not a qualified vendor/model. Purchase a qualified drive.
- The disk is encountering data errors.
- The drive is overheating--ensure the chassis filters are clear, and the fan motor is gum-free.
- The cut was very short (such as 0.1 second), and the read-ahead cache simply could not keep up.
- There were many short-in-duration cuts back-to-back, and the look ahead cache simply could not keep up.
- The read ahead cache algorithm is misbehaving. If true, the error would only be reported with certain file lengths, or sample rates, or compression ratios.

RESET RECEIVED (AV100 ONLY)

The AV-100 board was reset while in use or being booted. Possible causes:

- Two (or more) AV-100 boards have the same ID.
- Two (or more) AV-100 boards have the same DeviceAddress= setting.
- One (or more) SCSI bus is not terminated correctly.
- The AV-100 board is intermittent. Try to swap it with another.
- That board's host PC was reset or lost power. Reboot the host PC as to reload PCR.RAM.
- The AV100 card ran out of on-card RAM.

RESET RECEIVED (VAULT^2 ONLY)

The AV2K.DLL or the sound card drivers have locked up. Reboot and contact Customer Service for follow-up.

MACRO PROCESSING ERROR

A macro has a syntax error. Determine which macro has the error, then correct the macro definition by editing the playlist, or AUDIOVAU.INI. The error sometimes happens when a playlist event is mistakenly made a command instead of a comment or a cut/cart (audio) event. Verify that exact event of the playlist that reported the error.

MACHINE/TRACK ALREADY IN USE

The error is reported when an application tried to connect to a card of channel already in use by another workstation or application. Other possibilities:

- The machine was in use by a workstation which terminated abnormally -- before the machine could be released via Close_Session(). Try to power-cycle that server, or to run AvInit.Exe /NoReset /NoLoad on that server to explicitly clear all on-card sessions.
- This workstation doesn't have a HostID of 1 to 254, and/or isn't unique among all workstation in the system.

UNKNOWN FILE TYPE:SKIPPING (VAULT^2 ONLY)

Indicates the AudioVAULT has encountered a file in the File System directory and it doesn't understand the extension on it (not a .wav, .pls, .crt, etc). It will skip this file and not add it to

its directory. Not really much to worry about, except you will want to find out why these extra files are turning up in our system directory.

NO DIGIGRAM DRIVERS PRESENT (VAULT2 ONLY)

Not an error, just a message, means that you are using all DirectX devices. There are no Digigram NP Drivers installed.

AV10 CHUNK OUT OF DATE (VAULT2 ONLY)

Data has been found in other chunks in the WAV file that is newer than the data in the AV10 chunk. The new data will be read and the chunks synchronized.

COULD NOT FIND DIRECTX DEVICE:<NAME> (VAULT2 ONLY)

A device with <name> is listed in the AV2K.ini file, but could not be found as a DirectX device on the PC.

ERROR MOUNTING DIRECTORY <DIRECTORY> <REASON> (VAULT2 ONLY)

AV2K could not find the file system directory. This is the directory specified in the AV2K.ini file on the Mount= line. The directory could not be mounted for one of several reasons, including Permission Denied, Network Path not found, etc.

FAILURE GETTING LICENSE FOR <FEATURE> (VAULT2 ONLY)

License for AV2K-DirectX or AV2K-Digigram was not granted. This usually points to a problem with the FLEXlm Server or the license file.

READING AV100 CONSOLE LOGS

Console logs are created by the AVConsole program and written to the C:\AUDIOVAU\[Host] folder. Console logs contain information concerning AV100 activity, SCSI activity and general system information. In addition to incident-based logging, a "Daily Dump" is written to each daily log, and can include valuable information on the overall health of the system.

	00:10:02 AAA1: Daily Dump 00:10:00
Free memory available on the AV100	00:10:02 AAA1: [Software]
	00:10:02 AAA1: FreeMemory=11622816
PCR.RAM version	00:10:02 AAA1: Version=7.41.5
DSP version	00:10:03 AAA1: DSP(0).Version=7.41.1
	00:10:03 AAA1: DSP(1).Version=7.41.1
PCR.RAM Code checking information	00:10:03 AAA1: CodeCRC=46c34732
CodeFails should always be zero	00:10:03 AAA1: CodePasses=340137
	00:10:03 AAA1: CodeFails=0
Total memory available on the AV100	00:10:03 AAA1: [Hardware]
Xilinx hardware version	00:10:03 AAA1: TotalMemory=15728640
Base card serial number	00:10:03 AAA1: ASICLevel=3
	00:10:03 AAA1: SerialNumber=1.0.286.45538.126
	00:10:03 AAA1: IOAddr(3)=0000
	00:10:03 AAA1: MfgID=0447
AV100 board ID	00:10:03 AAA1: BoardID=1
I/O address	00:10:03 AAA1: IOAddr=0220
	00:10:03 AAA1: Switches=20
Daughtercard information	00:10:03 AAA1: DaughterType=Record/Play
	00:10:03 AAA1: DaughterSerialNumber=16.0.13.6141.115
	00:10:04 AAA1: DaughterTemperature=40.5
	00:10:04 AAA1: DSP(0).TypeCode=0
	00:10:04 AAA1: DSP(0).TotalMemory=131072
DSP Clock Speed	00:10:04 AAA1: DSP(1).TypeCode=2
	00:10:04 AAA1: DSP(1).TotalMemory=524288
	00:10:04 AAA1: DSP(0).ClockSpeed=60
Specific configuration information	00:10:04 AAA1: DSP(1).ClockSpeed=60
	00:10:04 AAA1: [Configuration]
	00:10:04 AAA1: DSP(1).InputTrim=0.030
	00:10:04 AAA1: DSP(1).OutputTrim=0.688

Console logs also report Read and Write Latency figures. These numbers are informational in nature.the figure is logged when a new maximum SCSI disk read or write latency was encountered for that card. The message was added to track down the cause of DISK LATE errors which early 2-Play daughter board software versions encountered. It has been retained should further research be needed regarding disk buffering, caching, etc. If your system encounters latencies of more than about 500, further research may be prudent. Otherwise there is no need for concern as the AV100 machines always try to read ahead 1 second's worth of audio in on-card cache (regardless of sample rate, compression ratio, etc).

Console logs can also log Sense Code information returned by the SCSI devices in the system. These Sense Codes can identify problems before they get out of hand.

Sense codes should only occur when an AV100 first communicates with a SCSI device. In this case, the bus is being reset or powered up, so messages would be expected.

Sense codes would appear in the console log like this:

0:0 SENSE: 70 00 06 00 00 00 00 0A 00 00 00 00 29 00 00 00 00 00
0:0 CDB: 25 00 00 00 00 00 00 00 00 00

The Sense code key is the 3rd byte from the left, and will be 00 (no error) or 06 (device has been reset) for power up cases. The Sense Data is the 13th and 14th bytes from the left. It gives more specific information about the sense code key that was returned.

CDB is the Command (Description Block) that the Contents issued to which the sense code was returned -- the last command issued.

SEAGATE SENSE CODES

Sense Code Keys (3rd SENSE byte from left)

Key	Description
00	No Sense (Successful)
01	Recovered Error
02	Not Ready
03	Medium Error -- Replace the disk drive ASAP
04	Hardware or Bus Error
05	Illegal Request
06	Unit Attention (Disk may have been reset--NORMAL upon power up)
07	Data Protect
09	Firmware Error
0B	Aborted Command
0C	Equal (SEARCH DATA)
0D	Volume Overflow (INTERNAL BUFFER NOT EMPTY, DISK FULL)
0E	Miscompare

Sense Data

Byte13	Byte14	Description
00	00	No Additional Sense Information
01	00	No Index/Sector Signal
02	00	No Seek Complete
03	00	Peripheral Device Write Fault
04	00	Logical Unit Not Ready, Cause Not Reportable
04	01	Logical Unit Not Ready, Becoming Ready
04	02	Logical Unit Not Ready, Initializing Command Required
04	03	Logical Unit Not Ready, Manual Intervention Required
04	04	Logical Unit Not Ready, Format In Progress
08	00	Logical Unit Communication Failure
08	01	Logical Unit Communication Time-Out
08	02	Logical Unit Communication Parity Error
09	00	Track Following Error
09	04	Head Select Fault
0A	00	Error Log overflow
0C	00	Write Error
0C	01	Write Error Recovered With Auto-Reallocation
0C	02	Write Error--Auto Reallocation failed
10	00	ID CRC or ECC Error
11	00	Unrecovered Read Error
11	01	Read Retires Exhausted
11	02	Error Too Long To Correct
11	04	Unrecovered Read Error--Auto Reallocation failed
12	00	Address Mark Not Found or ID Field

12	01	Recovered Data without ECC using Previous Sector ID
12	02	Recovered Data with ECC using Previous Sector ID
14	00	Sector Not Found
14	01	Record Not Found
15	00	Random Positioning Error
15	01	Mechanical Positioning Error
15	02	Positioning Error Detected By Read Of Medium
16	00	Data Synchronization Mark Error
17	00	Recovered Data With No Error Correction Applied
17	01	Recovered Data Using Retries
17	02	Recovered Data Using Positive Offset
17	03	Recovered Data Using Negative Offset
17	05	Recovered Data Using Previous Sector ID
17	06	Recovered Data Without ECC--Data Auto Reallocated
18	00	Recovered Data With ECC
18	01	Recovered Data With ECC And Retries Applied
18	02	Recovered Data With ECC And/Or Retries, Data AutoReallocated
19	00	Defect List Error
19	01	Defect List Not Available
19	02	Defect List Error In Primary List
19	03	Defect List Error In Growth List
1A	00	Parameter List Length Error
1B	00	Synchronous Data Transfer Error
1C	00	Defect List Not Found
1C	01	Primary Defect List Not Found
1C	02	Growth Defect List Not Found
1C	83	Seagate Unique diagnostic code
1D	00	Miscompare During Verify Operation
20	00	Invalid Command Operation Code
21	00	Logical Block Address Out Of Range
24	00	Invalid Field In CDB
25	00	Logical Unit Not Supported
26	00	Invalid Field In Parameter List
26	01	Parameter Not Supported
26	02	Parameter Value Invalid
26	03	Invalid Field Parameter--Threshold Parameter
26	98	Invalid Field Parameter--Check Sum
26	99	Invalid Field Parameter--Firmware Tag
27	00	Write Protected
28	00	Not-Ready to Ready Transition; medium may have changed
29	00	Power On, Reset, or Bus Device Reset Occurred
29	01	Power On Reset occurred
2A	00	Parameters Changed
2A	01	Mode Parameters Changed
2A	02	Log Parameters Changed
2F	00	Tagged Commands Cleared By Another Initiator
31	00	Medium Format corrupted
31	01	Format Failed
32	00	No Defect Spare Location Available
37	00	Parameter Rounded
3D	00	Invalid Bits in Identify Message
3E	00	Logical Unit has Not Self Configured yet
3F	00	Target Operating Conditions have changed
3F	01	Microcode Changed

3F	02	Changed Operating Definition
40	01	DRAM Parity Error
42	00	Power-On or Self-Test Failure
43	00	Message Error
44	00	Internal Target Failure
45	00	Select/Reselection Failure
47	00	SCSI Parity Error. See PE.
48	00	Initiator Detected Error Message Received
49	00	Invalid Message Error
4C	00	Logical Unit Failed Self-Configuration
4E	00	Overlapped Commands Attempted
5B	00	Log Exception
5B	01	Threshold Condition Met
5B	02	Log Counter At Maximum
5B	03	Log List Codes Exhausted
5C	00	RPL Status Change
5C	01	Spindles Synchronized
5C	02	Spindles Not Synchronized
65	00	Voltage Fault
80	00	General Firmware Error Qualifier

READING NFS LOGS

NFServer writes information about file transfers in varying degrees of detail. The amount of logging is set with the **DebugLevel=** statement in the AUDIOVAU.INI. Possible values are 1,2 and 3, with 3 offering the most detail.

NFServer: DebugLevel=1

Sample File copy:

```
10:45:02# Copy file MCR1:9222 to PCR1: AM 56 49 (Overwrite)
```

MCR1	The vault where the file is copied from (source)
9222	The name of the file being copied
PCR1	The vault where the file is being to (destination)
AM	Class of the file being copied
56 49	The size of the body (56) and the header (49), in bytes
(Overwrite)	The file already exists on the destination server and is being overwritten

NFServer: DebugLevel=3

Sample File Copy:

```
07:05:08# Copy file SVD1:EN0701A to SVG1: CME 600,120 3,102,574 (Overwrite)
07:05:08# Fm:        SVD1:EN0701A        H 05/20/98:07:03:02 B 05/20/98:07:03:02
07:05:08# To:        SVG1:EN0701A        H 05/19/98:07:03:03 B 05/19/98:07:03:03
07:05:18# Copy deleting original file SVG1:EN0701A
```

First Line:

```
07:05:08# Copy file SVD1:EN0701A to SVG1: CME 600,120 3,102,574 (Overwrite)
```

SVD1	The vault where the file is copied from (source)
EN0701A	The name of the file being copied
SVG1	The vault where the file is being to (destination)
CME	Class of the file being copied
600,120	The size of the body in bytes
3,102,574	The size of the header in bytes
(Overwrite)	The file already exists on the destination server and is being overwritten

The file EN0701A is being copied from the SVD server to the SCG server, class is CME, and the file already exists on the SCG Server, so it is being overwritten.

The file size for the body and the header, in bytes, is also reported. Note that each header will have a 3MB "hole" in it, and the actual header size is closer to

<DISPLAYED SIZE> - 3MB

In this example, the ACTUAL header size is about

3102574-3072000=~ 32K

The hole is there because the wave/energy data starts out at 3MB, skipping over up to (but usually much less than) 3MB of text String Properties, etc.

Second Line:

```
07:05:08# Fm:        SVD1:EN0701A        H 05/20/98:07:03:02 B 05/20/98:07:03:02
```

SVD1	The vault where the file is copied from (source)
EN0701A	The name of the file being copied
H 05/20/98:07:03:02	Time Last Modified: Header
B 05/20/98:07:03:02	Time Last Modified: Body

Third Line:

```
07:05:08# To:        SVG1:EN0701A        H 05/19/98:07:03:03 B 05/19/98:07:03:03
```

SVG1	The vault where the file is copied to (destination)
EN0701A	The name of the file being copied
H 05/20/98:07:03:02	Time Last Modified: Header
B 05/20/98:07:03:02	Time Last Modified: Body

Fourth Line:

```
07:05:18# Copy deleting original file SVG1:EN0701A
```

After the new file is copied, then NFServer deletes the old copy of the file.

Sample File Delete:

```
13:57:55# Delete PCR1:0585 (MCR1:)
13:57:55# Del: PCR1:0585 LOCAL 2,458,800 310
13:57:55#          H 03/16/98:11:24:39 B 03/16/98:11:24:39
13:57:55#          NN = ""     ON = ""     CU = ""
13:57:55# By:   MCR1:0585 ALL 0 1 (HIDDEN)
13:57:55#          H 03/18/98:13:35:33 B 03/18/98:13:35:32
13:57:55#          NN = ""     ON = ""     CU = "MC"
13:57:56# Copy delete rec. MCR1:0957 to PCR1: FM 0 32
```

First Line:

```
13:57:55# Delete PCR1:0585 (MCR1:)
```

The PCR server read a delete record for File 0585 from MCR server

Second Line:

```
13:57:55# Del: PCR1:0585 LOCAL 2,458,800 310
```

Shows the class of the cut named 0585: LOCAL
Shows the length in bytes of the Body of the cut: 2,458,800
Shows the length in bytes of the header of the cut: 310

Third Line:

```
13:57:55#          H 03/16/98:11:24:39 B 03/16/98:11:24:39
```

Shows the Time Last Modified of the File Header (H) and File Body(B)

Fourth Line:

```
13:57:55#          NN = ""     ON = ""     CU = ""
```

NN = NewName
ON=OldName

CU=Current User (HostID of machine that did the delete)

Fifth Line:

13:57:55# By: MCR1:0585 ALL 0 1 (HIDDEN)

The vault that (MCR) that the delete was performed on will transfer the delete record to the other vault (PCR).

READING AUDIOVAU TRACE LOGS

AUDIOVAU.EXE has a Trace Log function, which creates a daily log file of input contact closures, input NUL ports, and input serial port remote control-activated functions. Trace Logs are commonly used to help diagnose input remote control problems. Output functions are not logged.

It is often useful to also enable debug logging, showing greater detail of what executed in the 8-possible decks; enable DebugFlags=* and LogEnable1=On through LogEnable8=On.

ENABLING TRACE LOGGING

The AUDIOVAU.INI file requires:

```
[AudioVAULT]
TraceFlags=*
TraceLogFile=C:\AUDIOVAU\Log\%y%m%dT.Log
```

Be sure that the LOG subdirectory exists.

TRACE LOG STRUCTURE

Each remote control input which fires a AudioVAULT function is logged, one line per event. The line is time-stamped to an accuracy of 100th of a second.

```
          +-MachineID.  Useful if running split/flip AUDIOVAU.EXE screens.
          I  +-PIO identifies a Parallel I/O event (push button or NUL)
          I  I   +-Port addr.  NUL port uses 0001 - 0007
          I  I   I    +-Current hex value
          I  I   I    I    +-Msg ID (SYMTAB.C, less last digit; XBTN("Start1" here))
          I  I   I    I    I   +-1=Input Click, 2=Input Unclick
          I  I   I    I    I   I
16:02:15.75 1 PIO 037A 0001 2221 1



          +-MachineID.Deck #
          I      +-Mapped AV Function (start, stop, pause, etc)
          I      I
          I      I         +-Cut name, or playlist event executed
          I      I         I
          I      I         I
16:02:15.92 1.1 LB_LogStart(0101-A)
16:02:16.85 1.1 LB_LogStop(0101-A)

          +-MachineID.  Useful if running split/flip AUDIOVAU.EXE screens.
          I  +-Serial COM port I/O
          I  I   +-Msg ID (SYMTAB.C, less last digit; METHOD("LoadList",0x3E00,8,))
          I  I   I
          I  I   I
          I  I   I   +-1=Click, 2=Unclick
          I  I   I   I   +-String argument for the "Msg ID" function, if any
          I  I   I   I   I
16:02:25.47 2 SIO 3E01 1 0141
```

```
          +-MachineID.  Useful if running split/flip AUDIOVAU.EXE screens.
         I  +-Keyboard key
         I  I   +-Scan code for the key
         I  I   I    +-Press (1) or release (0)
        I  I   I   I   +-Msg ID (SYMTAB.C, less last digit; XBTN("Start1 here))
         I  I   I    I   I   +-1=Input Click, 2=Input Unclick
         I  I   I    I   I   I
06:53:13.75 1 KEY 0071 0001 2221 1
```

Because AUDIOVAU.EXE logs every remote control input, it can run slower. Try to shut off trace logging as soon as possible.

SOME POSSIBLE SYMTAB.C/XBTN VALUES

```
/* Generic Dialog Box Buttons */
   XBTN(  "OK",                    0x0001
   XBTN(  "Cancel",          0x0002
   XBTN(  "Abort",           0x0003

/* Vault/Workstation Buttons */
   XBTN( "SetClock",               0x1010
   XBTN(  "SaveCategory",  0x1020
   XBTN(   "EditCategory",   0x1030
   XBTN(    "SaveConfig",    0x1040
   XBTN(     "EditConfig",    0x1050
   XBTN(  "SelectMachine",  0x1060
   XBTN(  "About",           0x1070
   XBTN(  "Quit",            0x1080
   XBTN(    "SystemInfo",    0x1090
   XBTN(  "Help",            0x10A0
   XBTN(  "Minimize",              0x10F0
   XBTN(  "Restore",               0x1100

/* Machine/Menu Buttons (Non-deck Related) */
   XBTN(  "Power",           0x2010,
   XBTN( "Monitor",          0x2040
   XBTN(   "MonitorTape",   0x2041
   XBTN(  "MonitorRecord",  0x2042
   XBTN(   "MonitorAuto",   0x2043
   XBTN(  "MonitorSource",  0x2044
   XBTN(   "MonitorPlay",   0x2045
   XBTN(   "MonitorNone",   0x2046
   XBTN(   "InputSource",   0x2050
   XBTN(  "Macro",           0x2080
   XBTN(  "Indicator",             0x2090


/* Machine/Menu Buttons (Deck Related) */
   XBTN(  "Stop",            0x2200
   XBTN(  "Start",           0x2220
   XBTN(  "StartImmediate" 0x2230
   XBTN(  "StartASAP",             0x2240
   XBTN(  "TimedRecord",    0x22F0
   XBTN(  "StartQueued",    0x2310


/* Deck/List Buttons (Deck Id will change edit focus) */
```

```
XBTN(  "SelectDeck",      0x3010
XBTN(  "Load",            0x3100
XBTN(  "Reload",          0x3120
XBTN(  "NextLine",                0x3200
XBTN(  "PreviousLine",    0x3210
XBTN(  "NextPage",                0x3220
XBTN(  "PreviousPage",    0x3230
XBTN(  "RecordSet",               0x3300
```

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HARDWARE MAINTENANCE

Cleaning

It is recommended that all computers and components be cleaned of dust and debris periodically. Get a can of compressed air and use it to periodically blow the dust out of your keyboard, off the top and sides of your monitor, and off the back of your CPU. If you need to remove the cover for some reason, blow the dust off the motherboard. The Drive Chassis are the most important candidates for cleaning, as they contain the SCSI drives. The more dust and debris on these drives, the hotter they get, reducing their efficiency.

Clean Your Mouse

Dust and oil can accumulate on your mouse pad and on the mouse's rolling mechanism. If you notice a sluggish mouse or have difficulty selecting a range or a block of text, you may need to perform some routine maintenance on the mouse.

Surge Protectors

Get one. Plug all your components into it. They don't provide perfect protection, but the investment in surge protection could save a lot of money in lost data or productivity.

Power Supplies

A UPS, or uninterruptible power supply, can also save wear and tear on your computers. If the normal power supply fails, the battery-powered UPS takes over. The UPS may not keep your machine running long enough for you to restore normal power, but it will allow you time to shut things down nicely. The cost for a UPS can vary, depending on how much power you need to keep available and the length of time you want the backup power source to last.

SOFTWARE MAINTENANCE

Backups

In addition to backing up your AudioVAULT files, there are configuration files on each computer that should be backed up periodically. At a minimum, you should have each machine's AUDIOVAU.INI backed up somewhere, either on a network drive or a floppy disk. Other files that should be backed up regularly include each station's AVScheduler Data Directory, AVAir Databases, and the Broadcast Electronics registry key.

NFS Reset

NFS often runs more efficiently if it is shut down once every 4 weeks. Shut down the NFS application ("Q" on the keyboard, then exit the application), and re-start through the StartUp menu.

Anti-Virus Software

Anti-virus software certainly can be used with the AudioVAULT system. It is even recommended on systems that interface with the outside world and especially the Internet.

FILE MAINTENANCE: DELETION AND HOUSEKEEPING

Several kinds of files reside on the local workstation's hard drive, and need to be deleted as part of a regular maintenance schedule.

Log Files
- Example: MAY221.LOG
- Located in: C:\AUDIOVAU\LOG
- Specific to: All computers running an AudioVAULT screen.

AVAir AsRun LTX Files
- Example: 052199.LTX
- Located in: C:\AUDIOVAU\AVAIR\LOG
- Specific to: All computers running AVAir.

AVAir AsRun MDB Files
- Example: 052199.MDB
- Located in: C:\AUDIOVAU\AVAIR
- Specific to: All computers running AVAir.

AVScheduler CSAW Files
- Example: 19990521.CSAW
- Located in: C:\AVSCHEDULER\[DATA DIRECTORY]
- Specific to: All computers hosting AVScheduler Data Directories.

Trace Logs
- Example: 990521T.LOG
- Located in: C:\AUDIOVAU\LOG
- Specific to: All computers with Trace Logging enabled.

Several kinds of files reside on the server's non-SCSI hard drive, and need to be deleted as part of a regular maintenance schedule.

Console Log Files
- Example: 052299C.LOG
- Located in: C:\AUDIOVAU\[Server Name]
- Specific to: All servers

NFS Log Files
- Example: 052299N.LOG
- Located in: C:\AUDIOVAU\LOG
- Specific to: All servers running NFS

AudioVAULT File Maintenance Checklist

Workstation: Date:

Completed	Operation	Additional Notes
	Hardware Maintenance	Check for dust in fans, verify cables are connected properly, etc.
	NFS Reset	
	Defragmentation	C:\WINDOWS\DEFRAG.EXE
	File Housecleaning	
	Log Files	Example: MAY221.LOG Located in: C:\AUDIOVAU\LOG Specific to: All computers running an AudioVAULT screen.
	Trace Logs	Example: 990521T.LOG Located in: C:\AUDIOVAU\LOG Specific to: All computers with Trace Logging enabled.
	AVAir LTX Files	Example: 052199.LTX Located in: C:\AUDIOVAU\AVAIR\LOG Specific to: All computers running AVAir.
	AVAir AsRun MDB Files	Example: 052199.MDB Located in: C:\AUDIOVAU\AVAIR Specific to: All computers running AVAir.
	AVScheduler CSAW Files	Example: 19990521.CSAW Located in: C:\AVSCHEDULER\[DATA DIRECTORY] Specific to: All computers hosting AVScheduler Data Directories.
	Console Log Files	Example: 101897C.LOG Located in: C:\AUDIOVAU\[Server Name] Specific to: All servers
	NFS Log Files	Example: 101897N.LOG Located in: C:\AUDIOVAU\LOG Specific to: All servers running NFS

FILE MAINTENANCE OF AUDIOVAULT FILES

AudioVAULT files (on the SCSI drives) are deleted through the AudioVAULT production workstations. This needs to be done periodically, with the goal of maintaining keep at least 30 minutes free on each drive at all times. You can see the free time of the SCSI drives by clicking on SYSTEM and INFO on a production workstation.

To Delete a single cut which **is not** used in a list

- Click Load
- Enter the cut number and "Load"
- Click Cut
- Click Modify
- Click Delete
- Click Yes

To Delete a single cut which **is** used in a list

- Click Load
- Enter the List/Cart number and "Expand"
- Click List
- Click Contents
- Highlight the cut
- Click Cut Line
- Click Save
- Load and highlight the cut
- Click Cut
- Click Modify
- Click Delete
- Click Yes

To Delete Multiple Cuts

- Click System
- Click Files
- Click File Maint
- Search for the cuts to delete
- Highlight them using:
  - Control Key and Left Mouse Click
  - Shift Key and Arrow up/down key.
- Click Delete and then Yes
- Click Done

To Delete A Single List/Cart

- Click Load
- Enter the List/Cart number and "Expand"
- Click List
- Click Label
- Click Delete
- Click Yes

To Delete Multiple Lists/Carts

- Click System
- Click Files
- Click File Maint
- Search for the lists/carts to delete
- Highlight them using:
  - Control Key and Left Mouse Click

- Shift Key and Arrow up/down key.
- Click Delete and then Yes
- Click Done

DEFRAGMENTING

You should also run a program called Defrag.Exe located in the C:\WINDOWS directory. This should be run on all computers monthly after deleting all the files that are to be deleted. Follow the recommendations of the program. As the AudioVAULT system does very little with the local IDE drive, Fragmentation is rarely an issue.

AV100 SCSI drives never have to be defragmented due to the HPFS.

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Appendix I: Collected Troubleshooting Articles

The following articles are offered as background material only. They are not intended to suggest specific courses of action.only to provide insight to the issues surrounding the Windows Operating System.

Both the Smart Computing web site and the Microsoft Knowledge Base are exceptional sources of information and it's recommended that users, Administrators in particular, turn to these sites regularly for knowledge and insight.

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Smart Computing IN PLAIN ENGLISH

WINDOWS ERROR MESSAGES

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Windows error messages are a simple fact of life. Thankfully, with each passing version, Windows becomes a little more stable and the error messages appear with less frequency. But, as any Windows user knows, regardless of the version of Windows you are using, they do appear (and it's not a matter of if, so much as when). Perhaps most frustrating is not the fact that these errors appear, but that the messages are usually so cryptic that it's difficult to know how to handle the reported problem without undertaking some serious research. Until recently, these messages rarely provided any meaningful instructions on how to resolve the problem reported in the error.

These messages have such a bad reputation in fact, that there are numerous Web sites devoted to making fun of Windows error messages. But for those of you who have to interpret these messages and figure out what's happening with your computer, it's no laughing matter.

Microsoft, apparently recognizing that Windows error messages are less than helpful, has attempted to provide more information with Windows Me errors (and these more useful error messages are also showing up in Windows Media Player 7.0).

The idea is to be able to link the user to the information required to resolve the problem. Clicking a Details button in some error messages opens the Error Center, which may provide additional details about the error (but not always). From here, if you can't find enough information, there is a link to the Web where eventually you may come up with some useful information, such as a related article in the Microsoft Knowledge Base, and this approach is probably easier than searching for the same article yourself.

To be fair, some operating system errors are quite easy to figure out. For example, the error message generated by Windows 98 when your printer is out paper clearly states this fact. It even tells you to add more paper (just in case you didn't quite understand the likely solution to this problem).

When you encounter an "i//ega/ operation" message, c/icking the Detai/s button revea/s additiona/ information, but for most users, this resource is not that he/pfu/.

Other errors, however, are not that clear. A good example is the familiar message that states: "This program has performed an illegal operation and will be shut down." This cryptic message provides little information as to why this happened, and even clicking the Details button provides little help. Rather than displaying meaningful information (at least for most users), the details tend to be intimidating and make the user wonder if there is something terribly wrong with the computer. In most cases, it's just another error and you will live to compute another day. This article will provide an overview of some common errors you are likely to encounter in Windows, regardless of your version, and some that are more specific to a particular version of Windows.

Windows Error Message Primer

Regardless of your version of Windows, you are likely to encounter one of several types of operating system errors. This section discusses each of these error message types and what you can do (if anything) when you encounter them. Later on, you can review some more specific messages you may encounter during your daily interaction with Windows.

Illegal operation error messages. As mentioned earlier, these messages appear frequently and any regular Windows user will surely recognize them, although fewer understand why they appear and what they actually mean.

Error: The error itself states that Explorer has performed an "illegal operation," but exactly what happened to trigger this message is anyone's guess. Clicking the Details button reveals some additional information indicating that "Explorer caused an invalid page fault in a certain module at a certain memory address."

Interpretation: Essentially the program did something the operating system didn't like. Just what this was, you may never know, but at this point, the program will close and your computer may become unstable. (We discuss the cause of "invalid page faults" later in this section.)

Solution: Begin by clicking the Close button to shut down the program. You may find that you still have control of the machine and can continue working, or you might find that the system has become unstable in spite of the fact that the offending program has closed. Regardless, your best bet is to reboot by clicking the Start button, Shut Down, and Restart. If the problem persists, shut down the computer by choosing Shut Down rather than Restart from the Shut Down Windows dialog box, wait 10 seconds, and then turn on your computer. If you continue to have problems, try uninstalling and then reinstalling the program that is triggering the illegal operation message (or contact a computer repair professional).

Fatal exception errors. These are another famous type of Windows error messages. They have a cryptic message containing mostly code that's understandable only to high-level PC support personnel.

Error: A typical error reads: "A fatal exception <XX> has occurred in XXXX : XXXXXXXX." <XX> is a hexadecimal number representing the type of exception. The other number represents the memory address where the error occurred. These errors often appear as a blue screen with white type that takes over the entire screen and has come to be known in the Windows community as the "Blue Screen of Death" While this sounds horrible, it is not usually fatal with some Windows versions, in spite of the name (just be sure to save your work often).

Interpretation: Windows didn't actually cause the error, but processes the error message because the offending program didn't handle it. For example, let's assume your program needs video resources to display the next screen, but your machine is low on these resources. The program should warn you about this problem by displaying a dialog box, but if the program fails to have a contingency to deal with the low video resources problem, it's left to Windows to report the problem in the form of a Fatal Exception Error.

Solution: At this point, you are probably going to be forced to reboot. If you still have control of your machine, try to shut down normally. If you can't, and you have control of your keyboard, press CTRL-ALT-DELETE to reboot. Oftentimes, however, the machine is completely locked up and you have no control at all. If this is the case, then click the computer's reset or power button to restart the computer. Windows will run ScanDisk because of the illegal

shutdown and then open again. After this, you may want to shut down again by clicking the Start button, Shut Down, and selecting Shut Down from the dialog box.

If you continue to experience these errors, you should try and track down the cause, although this is not always easy. For more information, see the Microsoft Knowledge Base article "What Are Fatal Exception Errors" (http://support.microsoft.com/support/kb/articles/q150/3/14.asp). If you are experiencing frequent fatal exception errors, you should seek help from an experienced computer professional or technical support personnel to help you track the cause.

Invalid page faults. These errors consist of an invalid page fault message, and you might see it in conjunction with the other two messages described above.

Error: Generally, this message is similar to "Explorer caused an invalid page fault in module WININET.DLL at 0177 : 7021798b."

Interpretation: These errors happen as a result of the way Windows manages memory. Windows uses virtual memory on your computer's hard drive in the form of the Windows swap file as a temporary place to store data. Each block of data is known as a page. When your computer's physical RAM needs some data, Windows sends the code from the swap file to your physical RAM. Sometimes, however, the process goes awry and Windows display an invalid page fault.

Solution: If you get an invalid page fault, chances are your program will shut down, and there's not much else you can do. If you wish, you can reboot by clicking the Start button, selecting Shut Down, and clicking the Restart option.

If the problem persists, shut down the computer by choosing Shut Down rather than Restart from the Shut Down Windows dialog box, wait 10 seconds, and then turn on your computer. However, if your computer is stable, you can continue to work. Still, it's a good idea after generating these types of messages to flush the virtual memory by rebooting because it gives Windows a clean slate and you are likely to experience more stable computing.

General protection faults. Known as GPFs, these little beauties have plagued Windows users since the beginning, although they appear less frequently now that Windows operating systems and software have matured. According to Microsoft, the GPF is actually a type of fatal exception error, but it can also appear when you click Details for an illegal operation message.

Error: You'll usually see a message similar to "Program X caused a general protection fault in module XX," where X is the name of the program and XX is the location of the problem.

Interpretation: These errors typically happen when two Windows applications try to use the same memory address at the same time (although there could be other reasons for this, such as low Windows resources or bad device drivers).

Solution: The program reporting the GPF will shut down, and you may end up rebooting the computer. If you're seeing repeated GPFs, it may be difficult to track down the exact cause and you should consult a computer professional or technical support.

More Specific Messages

Now that you are familiar with the general types of error messages you are likely to encounter while using Windows (no doubt you were aware of them before reading this), the remainder of this article will explore more specific error messages that apply to particular versions of Windows. We'll indicate which error messages apply to which versions of Windows as we review each one.

Whatever the reason, errors will happen. The key is to begin to understand why Windows generates messages and what you can do about them when they appear. Microsoft provides a Knowledge Base (http://search.support.microsoft.com/kb) that's full of solutions for known errors. So, the next time you see an error on-screen, be prepared to do a little research. Chances are, you're not the first user to find the same problem.

by Ron Miller

Smart Computing IN PLAIN ENGLISH

TROUBLESHOOTING WINDOWS 98

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Every OS (operating system) has problems from time to time, but if you know how to troubleshoot common problems, you can cut down on your phone calls to tech support. Read on to learn Windows 98 maintenance tips, performance tweaks, and tune-ups.

Emergency Startup Disk. Create an emergency boot diskette to safeguard startup in the event your system won't start up from your hard drive. Click Start, choose Settings, and select Control Panel. Then double-click Add/Remove Programs and click the Startup Disk tab. Click the Create Disk button. Insert a blank diskette into the A: drive. Click OK. When the job completes, use the diskette to start up the computer. If it works, store it in a safe place.

Starting Up in Safe Mode. Troubleshoot computer problems in Safe Mode if Win98 doesn't launch normally after your system completes its POST (*Power On Self Test; the test performed at each startup when the BIOS [Basic Input Output System] looks for and verifies memory, ports, video adapter, keyboard, disk drives, and other basic devices*). You'll also want to boot in Safe Mode if your computer stalls repeatedly or if operation slows to a snail's pace for inexplicable reasons. Frequently, booting in Safe Mode and then clicking Start, Shut Down, and restarting the computer resets a video display that has an unusual or unreadable appearance.

A computer that starts up in Safe Mode doesn't run Config.sys and Autoexec.bat startup files and doesn't process the Registry. Instead, it loads only the drivers that are absolutely necessary (for instance, the mouse and keyboard) and sets the display to 680 x 480 resolution with 16 colors. Running just this bare configuration makes it easier to find problematic network or hardware settings. In addition, you can use the Windows 98 Troubleshooting located in the Win 98 Start menu under the Help option. You'll know if your computer has started up in Safe Mode because the words "Safe Mode" display in four places on the screen.

To boot Win98 in Safe Mode, press F5 at Startup. To boot to the DOS prompt in Safe Mode, press SHIFT-F5 at Startup. Alternatively, press and hold the CTRL key to access the Win98 startup menu, then select Safe Mode. You can also access the Win98 startup menu by inserting a nonbootable diskette in the diskette drive and restarting the computer. When the error message indicating a "nonsystem disk or disk error. . ." appears on-screen, remove the diskette from the disk drive, then press F8 twice. Choose Safe Mode. Alternatively, press Start, click Run, type **msconfig** in the Open field, click the Advanced button (General tab), place a check mark in Enable Startup menu, click OK twice, reboot, then choose Safe Mode.

Once in Safe Mode, remove all applications and data files from the Startup folder. Also, click Start, click run, type **Sysedit** in the Open field, then check your WIN.INI file to ensure that Load= and Run= lines are blank. Be sure to click the horizontal scroll button to scroll the WIN.INI window all the way to the right. We once encountered a Load= command followed by several spaces that effectively hid an instruction to load a virus-infected application. It was only by scrolling the window all the way to the right that the full contents of the Load= line could be seen then deleted.

After starting Win 98 in Safe Mode, the operating system saves a text file called BOOTLOG.TXT

in the root directory of the startup drive (typically C:\BOOTLOG.TXT). It can be read with any text editor. Boot to the DOS prompt using your emergency startup diskette or restart the computer with the CTRL key pressed, then choose Command Prompt Only. At the DOS prompt (:\>), type **edit bootlog.txt**, then press ENTER to open the file in the MS-DOS editor.

Scroll through BOOTLOG.TXT in search of lines indicating a load failure, for instance LoadFail = mouse.drv or LoadFail = keyboard.drv. If you find any LoadFail items, you may have to reinstall the driver for the offending device. However, not all LoadFail lines are problematic. Some appear because the necessary hardware hasn't been installed. For instance you might see a LoadFail for network drivers, ndis2sup.vxd, or for the APM (Advanced Power Management) driver, VPOWERD if your system doesn't support APM.

Selecting Step-by-Step Confirmation from the Win98 Startup menu is an invaluable troubleshooting option because it enables you to confirm each command in the Config.sys, Autoexec.bat, and IO.sys files. After executing a command, watch your screen display for error messages that might indicate a problematic device or command line.

Troubleshooting hardware configurations. To find out which installed device is causing Win98 problems, right-click My Computer, click Properties, and then click the Device Manager tab. An exclamation point in a yellow circle next to any entry could indicate a hardware conflict. To fix the problem, select the offending device, then click Properties. The General tab of the System Properties dialog box provides information about devices configured to use the same resources. You may be able to click the dialog box's Resources tab and modify settings to eliminate this conflict. No two devices should have identical IRQ (interrupt request line) or DMA (direct memory access) settings. Click OK. Restart the computer. If Windows places an exclamation point next to a device that was not enabled in the computer BIOS, restart the computer, then press the appropriate key to enter the Setup menu. Enable the device. Restart the computer. Alternatively, contact your computer manufacturer for an updated BIOS.

System Configuration Utility (SCU). SCU (msconfig.exe) is a convenient Win98 troubleshooting tool that lets you modify your system configuration by turning options on or off. You can also use SCU to create a backup copy of system files before making any changes. Launch SCU by clicking Start, Programs, Accessories, System Tools, System Information. Select System Configuration Utility from the Tools menu. Alternatively, click Start, Run and type **msconfig** in the Open field.

To back up important System files, click the General tab, click Create Backup, then click OK. Follow on-screen prompts. To disable items that Win98 loads at startup, click the Startup tab, then clear the checkbox of any item that you don't want to start up. Click OK. Restart your PC. Win98 places a Disabled Startup Items in the Programs list, indicating which items it didn't run at startup.

System File Checker (SFC). Use this applet to scan and verify the integrity of your computer's system files. You can configure it to replace damaged or corrupt files with a file version that works. Launch SFC by clicking Start, Programs, Accessories, System Tools, System Information. Select System File Checker from the Tools menu. Alternatively, click Start, Run, then type **SFC** in the Open field. Select Scan for altered files, then click Start. If SFC detects a damaged file, it will present you with additional options. Otherwise, it pops up a Finished dialog box. Click Details to view System File Checker Results, which will give you information about the number of files and folders examined and the files added to the verification data file saved in C:\WINDOWS\Default.sfc.

SFC comes with a file extraction utility, making it easy for you to extract a working version of the damaged file from Win98 CAB files (Cabinet files). Click the radio button to the left of "Extract one file from installation disk," then enter the name of the file you wish to extract. In the Restore From box, verify the replacement file's source and destination locations. When Win98 inquires if you want to back up the current file. Select Yes, just in case the new file doesn't work as expected. SFC stores the backup in C:\WINDOWS\Helpdesk\SFC unless you click the Settings button, then click Change and specify another location. Follow on-screen directions to back up the file, then continue with extraction. A successful replacement message should display if all activities complete without mishap.

Add RAM. Your Win98 system may have a fast CPU (central processing unit), but performance suffers if it lacks sufficient RAM (random-access memory). RAM stores actively running applications and their data. The more installed RAM (up to the maximum permitted), the faster the CPU can process instructions. Don't confuse RAM, which is typically measured in kilobytes (KB) or megabytes (MB), with hard drive capacity, measured in thousands of MB or gigabytes (GB). Your hard drive stores inactive applications and data.

Installed RAM not only affects operating system performance, but it also determines how many applications a system can run at one time. It also determines the size of the largest data file.

According to Microsoft, it takes 16MB of RAM to run Win98 and 24MB of RAM to run Win98 SE. However, operation is sluggish with this bare minimum because the CPU must constantly move inactive contents in and out of RAM to make room for requested applications, instructions, and data. Whatever Win98 can't find in RAM, it retrieves from the hard drive. To optimize performance, run Win98 with at least 32MB of RAM; 64 or 128MB are recommended.

Prevent Win98 Logon Prompt at Startup. If you compute in an environment that doesn't require password protection, speed up startup by preventing Win98 from asking for a password at Logon. Right-click Network Neighborhood, then click Properties. Click the Configuration tab, select Windows Logon from the Primary Network Logon tab, and click OK. Do not restart the computer. Click Start, Settings, Control Panel, and double-click Passwords. Click the Change Passwords tab, click the Change Windows Password button, and click OK. The Change Windows Password dialog box appears. Enter your current password in the Old Password field. Leave New password and Confirm New password fields blank. Click OK. Click the User Profiles tab under Password properties. Select "All users of this computer use the same preferences and desktop settings." Click OK. Shut down the computer, then restart it. Now the Logon prompt won't appear.

Clean Out the Temp File. Occasionally, when you install new software or you work with an installed application, Windows (or the target application) stores temporary files in the Windows TEMP folder (typically located at C:\WINDOWS\TEMP). Files in the TEMP folder consume valuable hard drive space and can sometimes prevent Windows from loading. To improve performance, delete temporary files your computer no longer uses. Right-click Start, click Explore, scroll to C:\WINDOWS\TEMP, double-click the folder, and select Details from the View menu. Click the Modified column to sort by date. If a file hasn't been modified for 7-14 days, it's probably safe to delete. Select files to delete, then right-click a selected file. Click Delete. If one of the selected files is an application, Windows will ask you to Confirm your file delete request. Click Yes.

Remove Fonts from the FONTS Folder. Installed fonts consume memory whether you use them or not. The more fonts installed in the WINDOWS \FONTS folder, the longer it takes Win98 to start up. Delete typefaces you don't use or move them to a location other than the FONTS folder until you need them. To delete or move fonts, click Start, Settings, Control Panel, then double-click Fonts. The FONTS folder will open. It's best not to have more than 500

installed typefaces. To delete a font, right-click to select it, then click Delete on the context menu. To delete several fonts simultaneously, press and hold CTRL and click each font you want to remove, then right-click one of the selected fonts. Click Delete.

To move selected fonts instead of deleting them, right-click a blank area of the desktop, point at New, and click Folder. Name this folder MY FONTS. Click Start, Settings, Control Panel, and then double-click Fonts. Press and hold the CTRL key as you select Fonts you want to move. Shrink the Fonts Window until you see both the MY FONTS and FONTS folders. Right-click a selected font in the FONTS folder to drag them all to MY FONTS. Select Move Here from the Context menu.

Quick Launch Toolbar. Remove clutter from the Windows Desktop. Store shortcuts to frequently used programs in the Quick Launch area of the Win98 Taskbar. To view this area, right-click an empty spot on the Taskbar, point at Toolbars, and click Quick Launch to select it. Drag an item (e.g., an application shortcut or a data file created by an application) from the Desktop into this area. A shortcut appears. You can also right-click Start, click Explore, click a Folder icon (left window), then click and drag an item from the right Explorer window into the Taskbar's Quick Launch area. To delete an item from the Quick Launch area, right-click the item, then click Delete on the Context menu.

Customizing the Taskbar. Users can customize the Windows 98 Taskbar by adding toolbars consisting of programs, files, folders, and frequently accessed Web addresses. Win98 has four default toolbars: Quick Launch, Address, Links, and Desktop. To view Taskbar toolbars, right-click a blank area on the Taskbar, point at Toolbars, and then click a toolbar option. To create a new toolbar and add it to the Taskbar, right-click a blank toolbar area, point at Toolbars, then click New toolbar. For a toolbar with shortcuts to your favorite programs or files, create a folder on your hard drive containing all the desired shortcuts, then turn this folder into a toolbar by dragging it to the Taskbar. To delete a user-created toolbar, right-click the toolbar name, choose Close from the pop-up menu, and click OK.

by Carol S. Holzberg, Ph.D.

Smart Computing IN PLAIN ENGLISH

TROUBLESHOOTING WINDOWS 95

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For all its improvements over Windows 3.1, Windows 95 is far from being a perfect operating system. Of course, you could say the same thing about every other operating system, but that is little comfort when trouble strikes. From time to time, you'll run into errors, glitches, conflicts, headaches, and the occasional outright disaster. Not all of them will be Windows 95's fault, and you won't be able to fix all of them. However, there is a great deal you can do to make working with Windows 95 more convenient and trouble-free.

Preventative Maintenance. The best way to deal with any computer foul-up is to avoid it in the first place. Some simple preparations will mean the difference between a pain in the neck and a catastrophe. The most important preparation is to make a backup.

Ideally, you should back up everything. You should make a fresh copy of your entire system at least once a month and back up every file you change or create in between. With today's multigigabyte hard drives, however, that is becoming harder to do. Many systems just don't work well with tape drives, and other backup options either require a large number of disks, cartridges, or CD-Rs (recordable CD-ROMs) or are expensive. But if you have the option of periodically backing up your complete system, use it.

If making complete system backups is impractical, then back up all your data files frequently and keep your original system software safe. That still isn't enough; there are two components of system backup you absolutely must have.

First, make a boot disk and file it safely away. A boot disk is a diskette that contains the files needed to get your computer running if your hard drive completely fails. It's the ultimate computer lifesaver, and making one is very easy. Put a fresh, formatted diskette in your diskette drive, click Start, select Settings, and click Control Panel. Next, double -click Add/Remove Programs, select the Startup Disk tab, and click the Create Disk button.

Second, you need to back up your **Registry**, which is a vast database of everything Win95 needs to know about your computer to make it work the way you want it to. Win95 automatically makes a backup each time you open the Registry, but it's wise to make your own backup in case of emergency.

Win95 comes with a program called Registry Editor, which you can use to edit and work with the Registry. Before we go any further, we should give you a word of caution: Unless you really know what you're doing, do not mess around in the Registry. A simple mistake there can result in untold hours of malfunctions and a floor full of torn hair. However, it is easy to make up a Registry backup using the Registry Editor

Click the Start button and select Run. In the Open field, type **regedit** and click OK. When the Registry Editor window appears, open the Registry menu and select Export Registry File. In the Export Registry File window, make sure the Save As Type field reads Registration Files (*.REG). Select the location you want to save the file to, type in a file name you'll recognize (such as RegBackup1), and click Save.

Keep in mind that your Registry is probably too big to fit on a diskette. If you have an Imation SuperDisk drive, an Iomega Zip drive, or some other storage medium capable of holding files too large for a diskette, use that because it never hurts to have a backup of your Registry stored away from your hard drive.

Here are some other tips that will help you avoid problems before they strike:

Get a good antivirus program and keep it up to date. The two leading manufacturers are McAfee (www.mcafee.com) and Symantec (www.symantec.com). Both companies have products that let you download upgrades from their Web sites once you purchase their software.

Use a utility program. One of our favorites is Symantec's Norton Utilities, which you can use to back up files and run diagnostic checks on your system, but there are other utilities available. One of those is ScanDisk, a program included in Win95 that finds and corrects corrupted files. You'll find ScanDisk by clicking the Start button, selecting Programs, choosing Accessories, and then clicking System Tools.

Look for updated drivers. Drivers are programs that let your computer communicate with the hardware peripherals you have connected to your system. Your video card, printer, and sound card all have their own drivers, and many of Win95's troubles can be traced back to a driver, especially video card drivers. Keep in mind, though, that new drivers can contain new bugs, so always back up your Registry before installing a new driver.

The Initial Shock. No matter how many preventive measures you take, chances are good that sooner or later you'll fire up your computer and find error messages. Don't panic yet. These problems are often easy to solve, depending upon what Windows is telling you.

***Win95 can't find a fi/e*.** This means the operating system is looking for some file or program that is supposed to load when you start up Windows, but it's not there. The program or file could be missing or corrupted. Try reinstalling the program Win95 is looking for.

***Win95 is unab/e to /oad a driver*.** This problem could also be caused by a corrupted file. Try reinstalling the driver. If the driver is for a device that you recently added to your system, you also may be suffering from a hardware conflict. (This means your new device and an old device are both trying to use a system resource that is not meant to be shared.) Unless you're technically knowledgeable enough to play around in the Windows Device Manager, your best bet is to get in touch with your new device's technical support line.

***Fata/ exception, i//ega/ operation, or page-fau/t errors*.** There are a number of problems that can cause these errors. One of the most common is a software conflict, which is a situation where two different pieces of software both try to use the same chunk of computer memory. You also may have an error on your hard drive or a RAM (random-access memory) chip that is going bad. Run ScanDisk or another utility program to find out if the errors are caused by a drive. If the problem still remains, pay close attention to when and how the trouble pops up and try to determine which software is causing it. Once you do, get in touch with that company's technical support.

Midwork Frustrations. Nothing is more frustrating to a computer user than getting so close to completing a project only to have the PC freeze up. Although there are a wide variety of problems that could be at fault, we've collected some of the most common ones so you can

get back to business.

***Bad memory*.** Faults in memory chips show up in many ways. You may see your system freeze up often, get frequent error messages, or Win95 may even refuse to start. To make matters more frustrating, these problems often seem to occur at random. If you feel competent to work under the hood of your computer, crack open the case and see if the memory cards are firmly seated in their slots and that there's no dust or debris interfering with the connection. Beyond that, you can run troubleshooting software, such as CheckIt (www.megacode.com/checkit.htm) to see if it finds a problem.

***Changes to diskettes*.** When you put an old diskette into a Win95 machine, Win95 changes the diskette's file system to allow it to accept long file names. Unfortunately, that can destroy data on some types of older diskettes, including MS-DOS startup disks and various software master diskettes. Before putting a diskette created on a pre-Win95 system in your Win95 machine, copy protect the diskette. Flip the little tab in the upper-left corner on the back of the diskette to the up position (so the hole is not blocked).

***Disappearing fi*/*es*.** There is nothing more frustrating than having a file you need seem to vanish from your hard drive. Although this is often the result of a user error, files can also disappear because they become corrupted or because they are deleted or renamed by another program. About the only thing you can do is run ScanDisk or other utilities to search for, and possibly fix, corrupted files. Beyond that, this is another reason why it's important to keep backups of everything you need. At least with a backup file you have only the annoyance of copying it back to your hard drive, but little or nothing is lost.

***Documents menu works proper*/*y*.** You wouldn't think that having a feature actually work properly would be a problem, but in this case it can be. The Documents option in your Start menu brings up a short list of the past several documents you've opened. Although intended to be a convenient way to quickly return to a file, there is no way to turn this option off. That makes it a massive security hole if you work with confidential documents. However, there is a workaround that lets you rig your system so that shortcuts to files get diverted from the Documents menu and sent directly to the Recycle Bin where they are instantly deleted (the shortcuts, not the files). The cost is that you have to configure your Recycle Bin to delete files immediately instead of hanging on to them until you manually empty the Recycle Bin.

***Exp/orer opens with inconvenient fo*/*der*.** Explorer's default is to opens to an expanded C: (hard drive) drive menu. If it would be more convenient to have it open to a different folder or to none at all, you can easily change this. Right-click a shortcut to Explorer and select Properties. Select the Shortcut tab. In the Target field, it will probably read C:\WINDOWS\EXPLORER.EXE /n,/e,C:/. If you want Explorer to open to a different file, change C:/ to whichever folder you want. For example, if you want it to open to a folder called "Work" on your D: drive, change what's in the Target window to read C:\WINDOWS\EXPLORER.EXE /n,/e,D:\work/.

***Freeze-ups*.** Like disappearing files, frequent freeze-ups are a common Win95 annoyance. Keep in mind that the longer you use Win95, the more system resources you draw upon. And sometimes, when you close a program, the resources you were using do not all become available again. As a result, over time you try to do more and more work with fewer and fewer resources until you slow to a crawl or freeze. You can avoid a lot of this by simply rebooting Win95 periodically. Once a day is enough for some users, but if you work your system harder, you may need to do it every few hours.

Freezes can also be caused by a variety of hardware and software conflicts. If you find them happening repeatedly, keep a close eye on the problem and try to spot a pattern. Does it

usually occur in the same software? Does it tend to happen during certain operations? If so, make note of exactly what you're doing when the freezes occur and which software or hardware you're using. Then, take the matter up with that company's technical support.

Excessive hard drive activity. If Win95 slows down or lags for several seconds to a minute for no apparent reason as it accesses your hard drive, it's probably being inefficient in handling the disk **cache**. Cache is temporary memory that Win95 stores on your hard drive when space in RAM is too scarce. Your cache is probably fragmented, which means it is stored in bits and pieces throughout the hard drive. An easy way around this is to add more memory, but you can make your drive cache run more efficiently. Major technical skills aren't required, but it's not a task for a raw beginner.

***Moving and copying fi/es is confusing*.** In Win95, dragging and dropping files from one part of Windows Explorer doesn't produce consistent results. Under some conditions the file is moved, under others it's copied, and under still others you create a shortcut. You can take control, though. Holding the CTRL key while dragging always creates a copy. Holding the SHIFT key while dragging always moves the file. If you do your drag and drop while holding the right mouse button instead of the left one, you'll get a menu that asks you whether you want this to be a copy or a move.

***P/ease Wait forever*.** When shutting down your computer, does it come to a screeching halt at the "Please Wait" screen? If so, you probably have a driver that's resisting being unloaded. If this happens intermittently, try pressing the ENTER key to jolt the computer out of its freeze. If it happens regularly, hold down the SHIFT key when clicking OK when you tell your computer to shut down. This sometimes bypasses whatever is causing the problem. This hang-up can also be due to the sound file that's used at shutdown becoming corrupted. You can test that by clicking Start, selecting Settings, clicking Control Panel, and double-clicking Sounds and either turning off the sound event for Windows Close Program or selecting a different sound to play instead.

***Programs crash*.** When a program repeatedly crashes on you, it could be an indication of a conflict or a corrupted file. If this is a program that was running fine before, and you haven't made any changes to it or your system, try reinstalling it. If that fails, try reinstalling Win95. If the program has never worked properly or reinstallations don't help, it's time to call the program's technical support.

***Unnecessary searches of diskettes*.** Sometimes, Win95 will start searching the diskette for no apparent reason every time you open a program. Clearing the Documents menu can help this problem. Click on Start, select Settings, click Taskbar & Start Menu, select the Start Menu Programs tab, and click Clear.

by Steve A. Glaser and Elizabeth Lewis

TROUBLESHOOTING WINDOWS 2000

Receiving an error message is one of the easiest ways to start troubleshooting your Windows 2000 system, but any behavior that is unusual (drive slowdowns, system slowdowns, etc.) can indicate a problem. Record all error messages and watch for patterns: if X always happens when you do Y, for example, that may indicate a problem.

If, despite the problems, your PC starts, and the operating system runs, use the Troubleshooter Wizards built in to the Win2000 help system.

Help Inside Your Computer
The Win2000 help system includes more troubleshooting wizards than ever before. To locate them quickly, click the Start button, choose Help, select the Contents tab, and click Troubleshooting And Maintenance. In addition to listing Win2000 Troubleshooters, you'll also find tips on how to diagnose problems and handle typical drive and system maintenance tasks. The list of Troubleshooters below is arranged by category, rather than alphabetically, as in the actual Help system.

Network And Internet-related
- Client Services For NetWare
- Internet Connections (connecting to an ISP [Internet service provider])
- Modems
- Networking (TCP/IP [Transmission Control Protocol/Internet Protocol], including Internet and networking)
- Remote Access (via modem and dial-up connections)
- Print (printers and configuration)

Software-related
- MS-DOS Programs
- Multimedia And Games (DirectX)
- Windows 3.x Programs

Hardware-related
- Display (monitor and video card)
- Modems
- Print (printers and configurations)
- Sound (cards and speakers)
- Hardware (other types)
- System Setup

After you select a Troubleshooter, you'll be asked a series of questions to help you find the answer. Some Troubleshooters contain links to the tools we'll discuss later in this article.

Help Online
If you can use the Internet, go to http://www.microsoft.com/windows 2000/support to check the list of top issues and FAQs for your problem or search the online Knowledge Base if you

have a specific error message. To learn more about the tools below, see the Win2000 Technical Library, available online at http://www.microsoft.com /windows 2000 /library. Technical articles and excerpts from the Win2000 Resource Kit will provide you with additional help for your Win2000 problems.

In the following sections, we'll look at some common problems and at the tools and techniques you should use to solve them.

Windows, Heal Thyself?
If you accidentally delete or alter important files in the Win2000 folder, usually C:\WINNT, check the Recycle Bin and restore them if possible. Then, try restarting the system. Win2000 has a new feature called Windows File Protection that can automatically restore some altered or missing system files. If this method doesn't work, see the section below on repairing your Win2000 installation.

If hardware, such as a storage device, stops working correctly, use the Device Manager (right-click My Computer, select Manage, and click Device Manager) to delete the device. Restart your system, and Win2000 will re-install the device if it's Plug and Play and is on the Win2000 Hardware Compatibility Listing.

Whenever you access the Internet, the Win2000 update program runs, checking Microsoft's Web site for updates that download and install automatically.

Solving Drive Problems
If your system is taking longer and longer to retrieve files or print documents, your hard drive is making a lot of noise, or you see disk error messages, your hard drive needs help!

Win2000 offers three tools that can be used to solve and prevent hard-drive problems: **Error-checking**, **Backup**, and **Defragment**. To access these tools, right-click the drive's icon in Windows Explorer (Start, Programs), select Properties, and select Tools.

If your drive is taking a long time to retrieve a file (and may display a blue-screen error asking you to retry), use Error-Checking. This runs a drive-testing program called Check Disk, which is similar to Win9x's ScanDisk, that checks for problems with files and folders. You can also have Check Disk automatically fix system errors and scan for and try to repair bad sectors, which can cause drive-read errors.

Using Check Disk options
Use the following list to determine the best options to select when using Check Disk

If . . . you are testing the drive every week and haven't had any errors
Then . . . run Check Disk with the Automatically Fix File System Errors option selected.

If . . . you are trying to fix reported drive errors but can't manage the process (you're running it while you're away from your drive)
Then . . . run Check Disk with the Automatically Fix File System Errors and Scan For And Attempt Recovery Of Bad Sectors options selected; scanning for bad sectors will require additional time.

If . . . you are trying to fix reported drive errors and want full control of the process
Then . . . run Check Disk with the Scan For And Attempt Recovery Of Bad Sectors option selected; you will be prompted for input when errors are detected.

If you boot up in Safe Mode with Command Prompt, you can use the command-line CHKDSK command to perform similar tests.

Us**ing Defragmentation to improve system performance**
Every time you start a program, log on to the Internet, or print a file with Win2000, temporary files are created that are eventually deleted by the system. As time passes, Windows must store files in pieces because there is no longer enough contiguous space for files. This causes system performance to decline because multiple movements of a drive's read-write head are required to locate all portions of a file. This file fragmentation, in extreme cases, can appear to the user like a failing drive because the elapsed time required to load a file is so much longer than before.

Use Error-Checking first, then use Defragmentation to place every file into a single group of clusters. The Win2000 version provides a detailed graphic and optional text report analysis to help you determine when the drive needs to be defragmented.

Backup
The Win2000 Backup program is the third tool you can use to prevent and solve problems. Make backups of your system before you install new software or of data files only to help you recover from a drive problem. Another important function of the Win2000 Backup program is to let you create the ERD (Emergency Repair Disk), which can be used to repair a damaged Win2000 installation or restart Win2000 in the event of problems.

As with Defragmentation, use Error-Checking first to make sure your drive is in good condition before starting the Backup process. You can back up to both drive-based and tape-based removable storage drives.

The Emergency Repair Diskette
The ERD (Emergency Repair Diskette) is an important part of the process that is used to correct a damaged Win2000 installation. You create it with the Emergency Repair Disk Wizard in the Backup program. When you make the ERD, you should select the option to Also Backup The Registry To The Repair Directory, which creates a folder called RegBack in the C:\WINNT\REPAIR folder and copies your system Registry to the folder. In the event of a serious system failure, having a copy of the Registry makes recovery easier.

Because ERD makes a copy of the Registry, create a new ERD after each major change you make to a system, such as adding new hardware or installing new programs. Because using the ERD to repair your system reverts it to the status at the ERD's creation date, using an out-of-date ERD will lose any configuration changes.

If Win2000 becomes damaged, and your system can't start normally, restart the system with the Win2000 CD-ROM or with the Setup diskettes that you created when you first installed Windows 2000. After the Setup program starts, you'll be prompted to press **R** to repair the installation. You have two options on the next screen: press **R** to start the emergency repair process or press **C** to start the Recovery Console. (See below.)

On the next screen, you can choose to press **M** (manual) or **F** (fast) repair. In most cases, you should choose Fast repair as your first option. Press ENTER on the next screen to use the ERD and insert it as prompted. Press ENTER to start the recovery process. After analysis and repairs, you'll be prompted to remove the ERD as the system restarts. If a Fast repair fails, you can try Manual repairs with the ERD.

Manual repair lets you choose from the these options: Inspect Startup Environment, Verify Win2000 System Files, or Inspect Boot Sector. By default, all three are selected; you can

select only the tests you like. A Manual repair is more thorough than a Fast repair and lets you see which file needs to be repaired and lets you repair or skip each file or repair all files automatically.

In our testing, in which we deleted files in several system folders, Fast repair didn't work, but Manual repair worked flawlessly, even when we let it make all fixes itself. If the Manual repair process fails, you'll need to perform a full reinstall of Win2000 from the original media.
Special Startup Options
You can solve some Win2000 problems by starting the system in one of several special modes. Press the F8 key at Startup when the system displays Starting Windows to see the Advanced Options menu for Startup options.

Unlike Win9x, which used confusing numbers as well as text labels, the Win2000 Advanced Options are identified strictly by text labels. They include: Safe Mode, Safe Mode With Networking, Safe Mode With Command Prompt, Enable Boot Logging, Enable VGA Mode, Last Known Good Configuration, Directory Services Restore Mode (domain controllers only), Debugging Mode, and Boot Normally.

Use the cursor keys to select an option and press ENTER to continue.

Safe Mode options
Safe Mode doesn't load 32-bit drivers, but it runs in standard VGA mode and disables user customization, such as Startup programs, to bypass potential trouble spots. Because BIOS (Basic Input/Output System) services are used to run hard drives, system startup is very slow. You'll see Safe Mode in all four corners of the screen.

Use Safe Mode to view settings in the Device Manager for devices and to add, change, and remove the devices, software, and drivers. Unlike Win9x, Device Manager in Safe Mode will display the hardware resources (IRQ, DMA, etc.) used by devices. Restart the system after you use Safe Mode. To maintain a network connection with Safe Mode, choose Safe Mode With Networking.

Use Safe Mode with Command Prompt if you need to use Recovery Console options to repair your system. (See below.)

One oddity of Safe Mode is that some serial mouse devices won't work.

If you suspect that a defective video driver is the cause of system problems, use Enable VGA Mode instead; this uses a standard 640 x 480 resolution, 16-color VGA driver in place of your normal video driver but retains all other normal 32-bit drivers.

Using Boot Log
To determine whether all drivers and services used by Win2000 are loading properly, select Enable Boot Logging from the Advanced Options startup menu. The Boot Log is a text file that records all activity during the Win2000 startup process. This file is stored in the default Win2000 folder (normally C:\WINNT) and is called Ntbtlog.txt. So you can compare the differences between a system working normally and a system with problems, make a Boot Log and change its name to Normal_bootlog.txt as soon as your system is fully configured and after every major hardware change. Then, you can use the Boot Log feature when your system has a problem to help you see the differences.

If you start the system in Safe Mode, a Boot Log is automatically generated; this Boot Log file will list both the drivers that are loaded and those that are skipped in Safe Mode.

Using Last Known Good Configuration
If you install new hardware or software, and Win2000 stops working, restart the system and choose the Last Known Good Configuration from the Advanced Options startup menu. If the system works properly, this indicates the changes made didn't work. Restart the system in Safe Mode and uninstall the hardware or software that caused the problem.

Using the Recovery Console
If you're an old DOS hand, you'll appreciate the Recovery Console, which lets you run Win2000-specific versions of classic MS-DOS commands (and some new ones) to repair a seriously damaged system. Start it from the Win2000 Setup Repair option. (See above.) The Recovery Console resembles the familiar command prompt but will work only with the current Win2000 installation and not with folders used for programs or documents.

In addition to familiar commands, such as DIR (directory), CLS (clear screen), MD (make directory/folder), CD (change directory/folder), RD (remove directory/folder), DEL, and COPY, you can also run the following drive-repair tools from the Recovery Console:

fixboot: This command copies boot sector files to a drive; use it if the drive's boot sector files are missing or damaged.
fixmbr: This command restores the MBR (master boot record) to a drive; use it if the MBR has been damaged by a virus or by other problems.
map: This command lists the current drive letters, types, and other drive information; use it to determine what drives are on your system.
diskpart: Similar to MS-DOS/Win9x's Fdisk, this command lets you delete and create drive partitions; data on existing partitions will be lost when partitions are deleted.

Other useful commands include:

expand: Use this command to manually retrieve a file from a compressed .CAB file on the Win2000 CD-ROM and copy it to the hard drive.
enable /disable: Starts or stops specified services.
attrib: Changes file attributes; incorrect file attributes can prevent system files and folders from working.
/?: type **/?** after each command to get the details for using each command.
EXIT: Type **EXIT** to stop the Recovery Console and restart the system.

Use System Information

If you need hardware and software details for troubleshooting, the single best source of information about your system is Microsoft's System Information, which you can run from Start, Programs, Accessories, System Tools. The opening screen identifies major system facts, including Win2000 release, physical and virtual (swapfile) memory, CPU type and speed, Windows folder, and time zone. Click the left-side menu to get incredibly detailed information about hardware resources, hardware components, software, and the integrated Internet Explorer 5.0. As you click some parts of the listing, there is a short delay while the system is checked for updated information.

If you check on Components, Multimedia, CD-ROM, for example, you'll learn the CD-ROM drive's letter, the model number and manufacturer of the drive, the status, its transfer rate (if media is on-board), and even its Plug-and-Play ID. Use System Information, and you can avoid removing the cover to learn about drive details in many cases. System Information is also the

launch pad for advanced troubleshooting tools, including Disk Cleanup, which finds temporary files you can delete to free up drive space; Dr Watson, which captures the system condition when a system crashes; DirectX Diagnostics, which helps you test and repair DirectX drivers for gaming and multimedia; and others.

by Mark E. Soper

Smart Computing IN PLAIN ENGLISH

NT & 2000 TROUBLESHOOTING

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Those who are eternally pessimistic like to avoid purchasing gadgets with multiple features because they think the extra features just mean something else could break down.

This type of pessimist might avoid purchasing a multifunction device because its four-functions-in-one hardware design means four times as many things could go wrong. They prefer basic cars with as many manual devices as possible; automatic windows and dual-exhaust systems just increase the chances of a trip to the repair shop. When you focus on the negative, the additional benefits these features provide don't enter into the equation.

Such pessimists probably are leery about installing Windows NT 4.x or Windows 2000 on their computers because of the networking capabilities built into these OSes (operating systems) versus other Windows OSes. They think the networking features might be handy, but they'll probably lead to additional troubleshooting down the road.

WinNT and Win2000 aren't necessarily more susceptible to malfunctions and error messages than OSes such as Windows 98 just because of their networking capabilities, though. They might require some different troubleshooting techniques because of their unique architectures, but they're still OSes at heart.

We'll try to take the worry out of running WinNT or Win2000 by discussing some troubleshooting tips you can use to fix problems in these OSes when they occur. We'll focus on some of the tougher problems you might encounter in an effort to appeal to even the biggest pessimists out there.

Insta//ation & Booting

While the installation and booting of Win2000 and WinNT is fairly straightforward, you might run into a complex problem at some point. These problems can be especially difficult to decipher because you typically have very few clues, so pay special attention to any messages you see.

Create a new Emergency Repair Disk periodically. During the installation of WinNT or Win2000, you might have created an Emergency Repair Disk, which can be key if you ever have problems with booting the system later.

However, diskettes have been known to fail, and it never hurts to have a few repair diskettes on hand. You also need to periodically create new Emergency Repair Disks as you add components to your system because information about the components actually is stored on the diskette. You can also create an Emergency Repair Disk from within the Windows OS.

Click the Start button and then select Run. In the Run text box, type **ntbackup** when running Win2000 and click OK. (When running WinNT, type **rdisk** in the Run text box.) In the Backup window, click Emergency Repair Disk and insert a blank diskette to create the Emergency Repair Disk.

Eliminating delays while booting NT. For some WinNT systems, a delay of a few to 10 or more seconds is possible near the end of the boot-up process. You can shorten this delay by right-clicking the My Computer icon and clicking Properties.

In the System Properties window, click the Startup/Shutdown tab. In the Show List For area of the window, type a lower number for the number of seconds WinNT waits before starting.

You can improve the boot speed if you're using WinNT on a computer not connected to any network, too. By telling WinNT that the computer is a standalone PC, unnecessary drivers for networking won't be loaded, allowing WinNT to load more quickly.

From the System Properties window, click the Hardware Profiles tab. Click Original Configuration and Properties. Then click the Network tab and add a check mark to the Network-Disabled Hardware Profile checkbox. (If you don't have a network card installed, this option probably won't be available.)

Hanging during installation. If Win2000 just doesn't seem to install properly and crashes during the file-copying process, you may have some device driver conflicts. Make sure your hard drive and optical drive drivers aren't malfunctioning and aren't corrupted.

You also may need to disable (at least temporarily) your system cache memory. Refer to your computer's users guide to perform this step properly.

Replace your malfunctioning setup diskette. If you're having problems while trying to install Win2000 from a diskette, the diskette may be defective. If possible, test the diskette by trying to view its contents using the DIR command under DOS or through Windows Explorer.

If one of the diskettes appears to be defective, you can create new installation diskettes using the Win2000 CD-ROM. Find a computer running Win2000, WinNT, or Win95/98 and insert the Win2000 CD-ROM. Close the installation program if it tries to open automatically. Click the Start button, Run, and in the Open text box, type ***d*:\bootdisk\makeboot.exe *a*:** (where ***d*:** is the letter of your CD-ROM or other optical drive, and ***a*:** is the letter of your diskette drive). Four new installation diskettes will be created.

If the diskette isn't defective, you need to check your computer's CMOS (complementary metal-oxide semiconductor) to make sure it checks the diskette drive first when running through its boot order. It's possible the diskette drive itself is malfunctioning, too.

Replacing the Ntoskrnl.exe file. If your Ntoskrnl.exe file becomes corrupted or inadvertently deleted in WinNT, you'll see an error message during the boot process. You also could see an error message regarding the Ntoskrnl.exe file if you've added a hard drive or partitioned your hard drive, causing the Ntoskrnl.exe file to be moved to a new drive letter path.

To fix this problem, use Windows Notepad to open your Boot.ini file. (It should be in your C: folder.) Find the "[boot loader]" section of the file and make sure the paths for each file are listed correctly. If not, change the path here and save the changes. (Be extremely careful when making changes to system files such as Boot.ini.)

If the Boot.ini file looks OK, then the Ntoskrnl.exe file may be corrupted. In this case, you'll have to replace it from your WinNT boot diskette, or you'll have to rerun the WinNT installation program and select the Repair option.

Revealing hard drive problems. Some WinNT and Win2000 error messages that occur during the boot process don't necessarily reflect problems with the OS.

Error messages similar to "I/O Error Accessing Boot Sector File, multi(*XX*)disk (*XX*)rdisk(*XX*)partition(*XX*):\bootsect.dos" (where *XX* can represent one digit or letter or a string of them) could signal a major problem with your hard drive. Probably the best way to handle this serious problem is to run the Windows installation program and select the Repair option, which should repair the boot sector to the point where WinNT or Win2000 can be booted.

Next, run the Windows ScanDisk program to determine whether your hard drive has any physical errors that need repairing. To run ScanDisk, double-click My Computer. Highlight the drive you want to scan, click File, Properties, and the Tools tab. In the Error-Checking area of the window, click Check Now. If the problem occurs frequently, your hard drive might need to be replaced.

Genera/ Usage Issues

While you're using WinNT and Win2000, you might begin to encounter a whole new set of problems. These tips deal with a wide range of day-to-day operational tasks.

All-numeric names aren't allowed in 2000. For those who upgraded from WinNT to Win2000, using all-numeric computer names can cause several headaches.

WinNT allowed all-numeric computer names to be used, but Win2000 does not allow them because of potential confusion with numerical IP addresses. Even so, you might still see some all-numeric names in Win2000 simply because Win2000 preserves any WinNT all-numeric names during the upgrading process.

However, if you're running Win2000 and you try to change one of your WinNT all-numeric names to another all-numeric name, Win2000 will display an error message. Any computer names created under Win2000, even if they're adjustments to already existing names, cannot be all-numeric names.

Enough error messages, already! If you're experiencing a lot of error messages, the last thing you want to see is one more message, but that's just what could happen. Each time WinNT or Win2000 encounters a system error or a system event, it's recorded in one of several log files stored on your hard drive. And when one of these log files reaches its limit on entries, you'll receive an error message telling you the log file is full.

To clear a particular log file, open the Event Viewer window by clicking the Start button, Settings, and Control Panel. Double-click Administrative Tools and Event Viewer. Highlight the log file for which you received the error message. Then click the Action menu and Clear All Events. Click Yes to give the file a name and destination path. Once you save the file, the log file is cleared.

You also can avoid this problem by changing the way log files are stored. In the Event Viewer window, highlight the log file for which you want to change the settings. Click the Action menu and Properties. In the Properties window, increase the maximum size for the log file and click the Overwrite Events As Needed button.

(*NOTE: Of course, if error messages are causing a log file to fill, you'll want to also take steps to correct the errors.*)

Inability to install certain programs. When you're logged in as a user or guest on a Win2000 system, you may be unable to install certain programs. Because of its security features, Win2000 can deny certain low-level users the ability to install software that attempts to change the Registry.

To work around this problem, either log in as an administrator or high-level user. These accounts should have access to the Registry. In addition, some software manufacturers have patches available that allow low-level users to install the software.

Older wallpaper appears on the Desktop. When you enact Win2000's Lock Computer feature (by pressing the CTRL-ALT-DELETE key combination and clicking Lock Computer), you might notice an older version of your wallpaper is viewable on the Desktop rather than your present wallpaper design selection.

If this occurs, you need to clear out your wallpaper choice and start from scratch. Win2000 sometimes will revert to older wallpaper when it is locked and when a .BMP (bitmap) file was used previously.

Right-click the Desktop and click Properties. Select None from the Wallpaper area of the Display Properties window and click OK. Then, reopen the Display Properties window and select the wallpaper you want to use.

Tricking your older software. If you're attempting to run older software on Win2000, you may experience some error messages because those older programs weren't designed to be used with Win2000 and may experience some incompatibilities.

You can try to trick the older software by using Win2000's Application Compatibility Tool (Apcompat.exe). This tool is in the SUPPORT folder, the TOOLS subfolder, and the SUPPORT subfolder on the Win2000 installation CD-ROM. (Yes, there are two SUPPORT folders.) Double-click the Apcompat.exe file to copy it to your hard drive.

Start the Application Compatibility Tool from wherever you saved it on your hard drive. Then click Browse and search for the program file of the software you want to run under Win2000. Specify the operating system under which the software will run.

If the software still won't run, you may need to enable some additional aspects of the Application Compatibility Tool. Older programs may need you to place check marks in some or all of the checkboxes for the additional settings in the lower half of the Application Compatibility Tool window. You'll have to experiment with the settings; different settings will work with different individual software programs.

Using virtual memory properly can improve system performance. If your WinNT computer seems to be running at less than optimum performance levels, you may want to change how it handles its virtual memory settings. By using virtual memory, WinNT can run more programs than it could using the physical RAM alone.

However, virtual memory runs slower than physical memory. You can improve the performance of virtual memory by running it on a hard drive that's faster and has more free space than the disk where your WinNT system files are stored.

To make changes to virtual memory, right-click My Computer and click Properties. Click the Performance tab, and in the Virtual Memory area, click the Change button. Highlight the drive where you want to make changes to virtual memory and enter initial and maximum sizes for

virtual memory in the appropriate text boxes. Then click the Set button followed by the OK button.

It's best to set large values for both the initial and maximum sizes if you have the hard drive space available. WinNT starts the virtual memory size at the initial size and then expands it to the maximum size as necessary. However, this expansion could lead to disk fragmentation.

Periphera/ Woes

Dealing with peripheral components-whether it's a printer through a network or a modem connected to your PC-can be a hassle with any OS, and WinNT and Win2000 are no different. Here are some tips you can use to make hardware hang-ups occur less frequently.

Avoiding printer problems in NT. Sometimes when printing through a WinNT network, your print job to a local printer might return a message that indicates the printer is busy. When you click Retry, the print job typically goes through properly the second time.

To avoid this annoyance, give the printer a longer period of time to hold waiting print jobs. Click the Start button, Settings, and Printers. Highlight the local network printer you're using; then click File and Properties. Click the Ports tab. Highlight the correct port and click the Configure Port button. Now type a larger number in the Transmission Retry text box and click OK. (A number of 90 or more usually will do the trick.)

To further improve the performance of the network printer, enable spooling. In the Properties window for your default printer, click the Scheduling tab. Select the Spool Print Documents So Program Finishes Printing Faster and Start Printing Immediately options to enable faster spooling. Don't select Start Printing After Last Page Is Spooled.

Another trick to making print jobs move more quickly through the network printer is by using file types that don't require font processing. When using this type of file printing, called RAW, the document to be printed is treated as a single graphic, meaning font information isn't required for printing, which speeds the process. From the printer's Properties window, click the General tab and the Print Processor button. Then add a check mark in the Always Spool RAW Datatype checkbox.

Battling hardware conflicts in 2000. Win2000 has simplified the process required for finding conflicts among hardware devices. First, click the Start button, Settings, and Control Panel. Then double-click Administrative Tools and Computer Management.

Next, double-click System Tools, System Information, Hardware Resources, and Conflicts/Sharing. Win2000 will generate a report in the right half of the Computer Management window showing all devices that are sharing IRQs, as well as any conflicts those devices might be having. If you find conflicts, you must open the Win2000 Device Manager to try and fix them. In the Control Panel window, double-click the System icon. Click the Hardware tab and the Device Manager button. One of the best ways to fix conflicts is to make sure each of the devices involved in the conflict have the latest drivers installed.

Modems can require special care. If you install a new modem on your Win2000 computer and you can't seem to make it work properly, you can try various troubleshooting techniques.

If your modem is a Plug and Play modem, you'll want to simply restart Win2000 to see whether the OS can detect the modem and set it up for you. If not, make sure the COM ports aren't causing the conflict. Click the Start button, Settings, and Control Panel. Double-click the

System icon. Then click the Hardware tab and the Device Manager button. Double-click Ports. If any ports are disabled, right-click the port's icon and click Enable.

The disappearing external modem. If you use an external modem with your Win2000 system, the OS occasionally may be unable to find the modem after a system reboot. This problem typically occurs if the modem is turned off during the booting process; turning it on before booting should allow Win2000 to access it properly.

You also can make the operating system find the modem after it boots. Open the Control Panel by clicking the Start button, Settings, and Control Panel. Double-click the System icon. Click the Hardware tab and Device Manager. Double-click the Modems icon, right-click your modem's icon, and then click Scan For Hardware Changes. Win2000 now should be able to find the modem (as long as you remembered to turn it on this time).

Troub/eshooting Too/s

Microsoft offers several easy-to-use troubleshooting tools for WinNT and Win2000. These tools walk you step by step through potential problems you may have encountered and give you potential solutions. They probably won't solve the most complex problems you'll encounter with these OSes, but they might give you a few additional ideas to try while solving a particular problem. Plus, don't forget to use the resources that the Internet provides.

For NT users. To access the WinNT troubleshooting tools, click Start, Help, choose the Contents tab, and then double-click the Troubleshooting book icon. Find the topic that most closely matches your situation and click it to start the tool.

For 2000 users. The Win2000 troubleshooting tools are also available by clicking the Start button, Help, and choosing the Contents tab. Then, click the Troubleshooting And Maintenance icon, click Windows 2000 Troubleshooters in the left half of the Help window, and select the topic that's best suited for your situation in the right half of the window.

On the Web. At the Microsoft Web site, similar troubleshooting tools are available that cover a few additional topics. Visit the Microsoft Product Support Services Troubleshooters Web page (http://support.microsoft.com/support/tshoot/default.asp?TSL=1) to find the troubleshooting tool for WinNT or Win2000 that might help with your particular problem. ■

by Kyle Schurman

HOW TO PROTECT AGAINST COMPUTER VIRUSES

By Shawn Connally and Bruce Stewart

Some are as benign as the common cold, and others can be as deadly to your hard drive as something from the movie *Outbreak*. We're talking computer viruses, and with more than 17,000 known strains, the chances that your computer will contract one at some point are pretty good.

Take into account that only about 40 percent of PC owners use antivirus software, and that viruses can spread to your system easily from the Internet, bulletin boards, or e-mail attachments, and we're talking epidemic. Luckily, though, there are some powerful preventative measures and some equally effective antidotes once you've contracted a bug.

What Is A Virus?

A computer virus is a piece of software that has been written to surreptitiously enter your computer system and "infect" your files. Some viruses are benign and won't harm your system, while others are destructive and can damage or destroy your data.

Typically a computer virus will replicate itself and try to infect as many files and systems as possible. If your system is infected, when you save a file to a disk you will probably infect the disk, and in turn whoever uses that disk will infect their system. As you can see, it's a vicious cycle, not unlike the viruses that plague us humans.

New computer viruses are being written all the time, and it's important to understand how your system can be exposed to them, and what you can do to protect your computer.

Types Of Viruses

Computer viruses are categorized into four main types: boot sector, file or program, macro, and multipartite viruses.

Boot sector viruses are usually transmitted when an infected floppy disk is left in the drive and the system is rebooted. The virus is read from the infected boot sector of the floppy disk and written to the master boot record of the system's hard drive. The master boot sector is the first place your system reads from when booting up from the hard drive. Then, whenever the computer is booted up, the virus will be loaded into the system's memory.

Program or file viruses are pieces of viral code that attach themselves to executable programs. Once the infected program is run, the virus is transferred to your system's memory and may replicate itself further.

Macro viruses are currently the most commonly found viruses. They infect files run by applications that use macro languages, like Microsoft Word or Excel. The virus looks like a macro in the file, and when the file is opened, the virus can execute commands understood by the application's macro language.

Multipartite viruses have characteristics of both boot sector viruses and file viruses. They may start out in the boot sector and spread to applications, or vice versa.

How Your Data Gets Infected
Viruses can be written into almost any type of file, so it's important to be aware of this when you add software to your system. There are known instances of viruses being accidentally included in licensed, shrink-wrapped software, but generally you are safe when installing legally purchased software that you've obtained through normal channels.

The two main ways viruses enter your system are through files added to your system from floppy disks (or other removable media like Zip disks) and from downloading from the Internet or private bulletin boards. You can also get a virus through an e-mail attachment, but not from a plain text email message alone.

A common myth regarding viruses is that they can only be passed into your system through executable program files, or files that are actually programs, not just data. You'd also think, then, that infection couldn't take place unless the program holding the virus is launched. With the advent of "macro" viruses, though, this distinction is getting blurred. Macro viruses can exist inside any document whose application uses a macro language, such as the "Concept" virus passed in Microsoft Word documents. In this case, a user can have a clean version of Microsoft Word and simply open an infected Word document, which will then infect the application.

How To Check For Viruses
Some common symptoms that could indicate your system's been infected are:

- Unusual messages or displays on your monitor
- Unusual sounds or music played at random times
- Your system has less available memory than it should
- A disk or volume name has been changed
- Programs or files are suddenly missing
- Unknown programs or files have been created
- Some of your files become corrupted or suddenly don't work properly

There are several programs (called virus protection software, anti-virus software, or virus checks) that will check your system for known viruses, scan incoming files, and warn you before any infected files are let in. An important fact about these programs is that they are only as good as their database of known viruses. Since new and different viruses are being introduced all the time, anti-virus databases need to be updated often.

ICSA certifies virus protection software and maintains a list of approved software. This is a good site to check regularly, as the organization monitors the progress of computer viruses and offers a wealth of virus information.

If you have a system that is not currently running virus protection software, the first thing you should do is install one of these programs and have it scan your hard drive. It will identify any files that have been infected by any virus it recognizes and offer you the option to repair the file if it can. In some cases infected files can be "cleaned" by your virus protection software; in others, the files will have to be discarded.

Once you have determined that all the files in your system are virus-free, this would be a good time to do a complete backup of your system. If you get infected in the future, you will really appreciate having clean copies of your files.

Another method you can use to detect viruses is to monitor the byte size of the programs installed on your hard drive, particularly .exe and .com files. If you notice any unexplained change in file sizes, this is a good indication that your system has become infected. This can be

a difficult and tedious method of checking your system, however, and installing antivirus software is a better alternative.

How To Protect Your System From Viruses
Once you've scanned your system for viruses and determined it to be clean, it's a good idea to put in place procedures to protect your system. The number one thing to do -- be careful whenever you're installing software or downloading files.

Most anti-virus software can be set to scan all floppy disks inserted in your system and to scan files that are downloaded to your system, including email attachments. We highly recommended that you set up your software to do this. This is the most important thing you can do to protect your system. It's also extremely important to keep your antivirus software current, and you should check regularly with your chosen vendor for updates to their product. This can often be done at the vendor's Web site.

What To Do If You Have A Virus
If you have installed virus protection software and it has detected a virus in your system, first try to get the software to "clean" or "disinfect" the files. If this doesn't work, you'll most likely have to delete these files from your system.

In extreme cases, it may be necessary to reformat your hard drive, destroying all of the data on it. Then you'll have to reinstall your software and data, assuming you have the original software disks and clean backups of your files. In this case, it's a good idea to install your virus protection software first on the empty hard drive, so that the integrity of your backup files and original software can be verified.

You might also want to contact all the people that you've recently (or at any time) exchanged information with -- via floppy disks, e-mail attachments, Zip disks -- and let them know your system's been infected and theirs may be infected as well. You'd want to advise them to check their system for the appropriate virus or symptoms. Funny how these computer viruses mimic human life, huh? Be safe.