APPENDIX A

DIGITAL RECORDING CONCEPTS

ANALOG RECORDING BASICS

Digital recording works very differently from analog recording. With analog recording, tape containing millions of tiny magnetizable particles move past a record head. The magnetic field around this head fluctuates according to the audio signal present at the tape recorder's input. These fluctuations permanently rearrange the particles on the tape to form a pattern that is analogous to the original audio signal.
On playback, the patterns on tape are read by a separate playback head (or from the record head, set up to read instead of record signals) that converts the magnetic fluctuations back into an audio signal.

The biggest problem with analog recording is that the tape itself alters the sound originally recorded on tape. Tape hiss is one problem; it superimposes a low-level rushing noise onto the audio signal. Although there are ways to minimize noise, such as noise reduction circuitry, this colors the sound in the process of masking the noise. Tape's frequency response is also an issue. Tape has a hard time "absorbing" higher frequencies, which can dullen the sound. Moving tape faster allows the heads to magnetize more particles and extends the high frequency response, but the tradeoff is increased tape costs, and heftier transports to move bigger reels of tape.

DIGITAL RECORDING BASICS

With digital recording, the technology is very similar — tape moves past a record head, and plays back through a playback head. However, the signal recorded on tape is very different.

Audio signals entering each channel of the XT first pass through an analog-to-digital (A/D) converter, a device that takes 48,000 samples or "snapshots" of the signal level every second[1]. Each sample is assigned a specific numeric value that corresponds to its level.
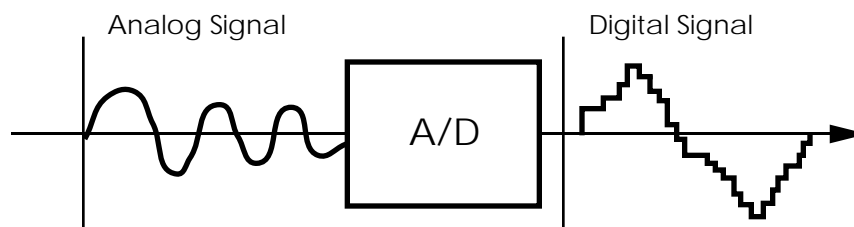
These numbers, which represent coded audio, are then converted into an audio signal that can be recorded on tape. Fortunately, recording a number on tape doesn't degrade the signal.
During playback, a digital-to-analog (D/A) converter reads the numbers from tape and outputs a corresponding level. This creates a "stairstep" reconstruction of the original signal, which is close to (but not exactly) the same as the original signal. To complete the process, this stairstep signal is smoothed by a low pass filter. The result is natural-sounding audio that sounds virtually unchanged from what was originally recorded.

[1]48,000 samples are taken per second at a sampling rate of 48 kHz; 44,100 samples are taken per second at a sampling rate of 44.1 kHz.

Digital audio requires lots of numbers to represent an analog version of the same sound. Analog signals may require at least 20kHz frequency response to reproduce audio faithfully. Digital signals for the same 20 kHz audio requires a frequency response of several million Hertz. Due to the way individual numbers are transmitted, digital audio requires a wide bandwidth recording medium[2].

WHY S-VHS?

S-VHS recording technology offers more than enough bandwidth to record eight tracks of digital audio. S-VHS tapes are built to higher standards than standard VHS tapes, and can take the tape shuttling required by professional audio applications. S-VHS tape cassettes are also inexpensive compared to reel-to-reel tape, readily available, compact, and easy to transport and store.

[2].Bandwidth is a measure of the lowest to highest frequency a signal path can handle.

APPENDIX B

TROUBLESHOOTING

TROUBLE-SHOOTING INDEX

If you are experience problems while operating the XT, please use the following table to locate possible causes and solutions before contacting Alesis customer service for assistance.

Symptom	Cause	Solution
The display does not light when the [POWER] switch is turned on.	No power.	Check that the power cable is plugged in properly.
FORMAT icon flashes.	Tape is not formatted.	Format the tape, or reinsert.
The record-enabled tracks' meters do not indicate	Cables are not connected properly or are shorted.	Check your audio cables.
input levels.	DIGITAL INPUT is selected.	Press [ANALOG INPUT].
Can't change the sample rate/clock source.	If slave in a multiple ADAT system, EXT clock is selected automatically.	Set the sample rate/clock source on the master XT.
Pressing [AUTO REC] displays "invALid".	Locate Point 3's position is before Locate Point 2.	Set Locate Point 3 past Locate Point 2.
AUTO RETURN icon flashes.	Locate Point 4's position is before Locate Point 1.	Set Locate Point 4 past Locate Point 1.
When used as a slave in a multiple ADAT system, doesn't follow the master.	No ADAT master is detected.	Check sync cables. Power down the Master only, then restart.
TIME counter does not show tape position.	Edit mode is turned on.	Press [EDIT VALUE] to turn Edit mode off.
Interpolation indicator (☼) lights/flashes.	One or more errors have been detected/corrected	Clean the tape heads. Make a backup copy of your tape.
48K or 44.1K icon flashes.	Tape was formatted at different sample rate than currently selected.	If desired, press [CLOCK SELECT] to use original sample rate.
Error Message in display	Several possible	See Appendix C: Error Codes

RE-INITIALIZING

If your unit behaves erratically or "freezes", the first step is to power down the unit. and power it back up again. If this steps do not solve the problem, you must re-initialize the software.

To re-initialize the XT, hold down both [RECORD] and [PLAY] while turning on the [POWER] switch. This will reset all parameters to their default settings

CHECKING SOFTWARE VERSION

The current software version may be determined by holding [SET LOCATE] and pressing [FAST FWD]. The XT will momentarily indicate the current operating software version installed in the TIME counter.

ERROR RATE DISPLAY

The TIME counter has a secondary mode which, when selected, will display only the minutes and seconds of the tape position, and the *error rate* while the transport is engaged in play or record. This error rate is viewed as a count of the number of sync block errors per 14 drum revolutions (every 280ms). Since there are 30 sync blocks per sector, 8 sectors per track, and two tracks per revolution, the maximum number is 6720. If this display mode is selected during any other mode than play or record, the number will always read "0000".

To view the error rate display:

1 Hold [SET LOCATE] and press RECORD ENABLE [3].
The TIME counter will briefly read:

$$\text{ABS} \quad \textbf{d1 SP E rr}$$

When PLAY or RECORD are engaged, the TIME counter will change to show minutes and seconds on the left, and a 4-digit error rate counter on the rate.

2 Repeat step **1** to return the TIME display to its normal state.
The TIME counter will briefly read:

$$\text{ABS} \quad \textbf{d1 SP r E9}$$

…and will then change back to show hours, minutes, seconds and 100ths-of-a-second.

ABOUT ERROR RATE READINGS

A new, perfect tape on a clean machine will normally read "0000" with occasional flashes up to "0005" or "0010". Errors of 3 or below are 100% correctable, and the odds are that significantly higher readings will also be 100% correctable. Many new tapes out of the box from some manufacturers have readings up to 100. Readings above 1000, however, are guaranteed to cause some interpolation to take place.

Therefore, readings up to about 10-15 aren't anything to worry about unless accompanied by the Interpolation indicator; but they do show you that there is something less than ideal about current conditions. If readings rise above 20, you should take action (see page 75). If your brand of tape has a typical error rate above 20, that's acceptable, but you want to look out for increases above the usual.

ADAT HEAD LIFE

The expected head life for each ADAT varies according to a number of factors. Given optimum conditions, tape quality, tape care, and operating environment head life for the average ADAT will always be better than if your ADAT is abused, placed in bad environmental conditions and used with badly maintained tapes. Properly cared for, your heads should last for thousands of hours.

You should not subject your ADAT to environmental extremes, humidity or moisture of any kind, dust, dirt, extreme temperatures, extreme temperature fluctuations or any kind of physical abuse (drops, shocks).

Under no circumstances should you remove the top or bottom cover of the ADAT. You already know that there are NO user serviceable parts inside. However, you

should also be aware that it is extremely easy to damage your heads and other sensitive parts of your ADAT. Do not open up your ADAT to clean the heads.

What it comes to is this: ADAT is a very sophisticated piece of digital technology. It is going to be used for your important projects so take the best care of your ADAT and your ADAT heads possible.

ADAT HEAD MAINTENANCE

The heads of each ADAT are pre-aligned at Alesis. No user adjustment is necessary. Over the course of time, depending on the quality of the tapes used and the environmental conditions where the ADAT and its tapes are stored, head cleaning may become necessary. Unlike analog or even video tape recorders, the actual sound quality of an ADAT recording will not be affected until there is quite a bit of dirt on the drum and heads. When the Interpolation Indicator (the sunburst at the end of the location display) starts appearing frequently, even on brand new tapes, we recommend that you bring your ADAT to an authorized Alesis Service Center for cleaning. If the indicator is not appearing and the unit is performing normally, there is no reason to clean the heads. Periodic or preventative maintenance should not be over done to prevent premature wear on the headstack.

If head cleaning is necessary and you are unable to bring your ADAT to a service center, you may try using a DRY VHS head cleaning cassette. We recommend 3M VHSHC Black Watch Head Cleaner Video Cassette or 3M ASD HC Digital Audio Head Cleaning Cassette.

- Do NOT use any other type of head cleaning cassette. They are abrasive and will damage or wear out your heads.

- Do NOT use head cleaning cassettes that require any kind of liquid.

- Do not use the Black Watch cassette any more often than necessary. Over-cleaning the heads wears them down, reducing their life span.

- Do NOT attempt to clean the heads yourself unless you are a skilled technician experienced in the maintenance of video cassette recorders. Information for such technicians is available from Alesis Product Support. ADAT head cleaning requires different materials and procedures from analog head cleaning, similar to VCR maintenance. **Cleaning the heads with a cotton swab, or rubbing in the wrong direction, will destroy them. Opening the case of your ADAT will void the warranty.**

Maintenance of the ADAT should be based on the Interpolation Indicator (or Error Count Display, see p. 74) or if the unit begins to behave erratically. To determine if these symptoms are caused by dirty heads, (not a defective or worn tape), keep a "benchmark" tape from the first weeks of operation set aside in a safe place (see page 40). If the Interpolation Indicator lights frequently when playing back this tape, it is likely that head cleaning is needed, particularly if several hundred drum-on hours have elapsed since the last cleaning (see page 74).

Call Alesis Product Support for more information about head cleaning and authorized Alesis Service Centers.

DRUM TIME DISPLAY

The XT keeps track of how long the head has been actively spinning against tape (i.e., threaded in stop, or play, or cue/review). This can help determine how long it has been since the last time it was serviced or cleaned.

To display the head time counter:

1 Hold [SET LOCATE] and press [STOP]:
The number of drum hours will briefly appear in the TIME counter.

TAPE MAINTENANCE: SAFE TAPE

ADAT tapes are no different than any standard tape: they must be treated with care. Never expose ADAT tapes to temperature extremes, strong magnetic fields (such as speakers), high humidity, dust and so on.

You should always practice SAFE TAPE:

• At the end of every session you should rewind the tape all the way to the leader, stop, eject the tape, remove it from the ADAT and place it in its protective case. This cuts down on the amount of dust that can enter the transport and keeps wear on the tape at a minimum.

• Don't leave your tapes near speakers, power amps or other potential magnetic fields such as televisions or electrical devices.

• Don't subject your tapes to extreme temperatures or wild temperature fluctuations.

• Don't expose your tapes to high humidity, moisture or high dust levels.

• Don't leave your tapes on the dashboard of your car. (In fact, never leave ADAT tapes in a car EVER. Keep them with you at all times!)

• Certainly, no matter how tempted you are to open the shutter to see what is inside, NEVER TOUCH THE TAPE. The magnetic particles on your ADAT tape need to be preserved in the condition in which they were recorded. The oils from your fingers WILL damage your tapes as well as get on the heads and damage them.

• Never turn off the ADAT power while the tape is threaded. This leaves the tape bent around the rollers and head. Press [STOP] until the tape is unthreaded before turning off power.

Practice "safe tape" at all times because you can never retrieve lost data.

If you are archiving your tapes, make sure they are stored in environmentally stable conditions, i.e. a cool dry place. If you do archive your tapes, you need to check them once a year. Run each tape through your ADAT from end to end. This will prevent buildup that can occur when a tape is left simply "sitting".

Of course, for your super sensitive or important material, nothing beats making multiple digital backups. Every year or so, simply do another digital backup onto a brand new tape.

MAINTENANCE/SERVICE

CLEANING

Disconnect the AC cord, then use a damp cloth to clean the keyboard's metal and plastic surfaces. For heavy dirt, use a non-abrasive household cleaner such as

Formula 409 or Fantastik. DO NOT SPRAY THE CLEANER DIRECTLY ONTO THE FRONT OF THE UNIT AS IT MAY DESTROY THE LUBRICANTS USED IN THE SWITCHES AND CONTROLS! Spray onto a cloth, then use the cloth to clean the unit.

MAINTENANCE

Here are some tips for preventive maintenance.

- Periodically check the AC cord for signs of fraying or damage.

- Unplug the XT when not in use for extended periods of time.

- Do not leave tapes inserted halfway into the XT when not in use, as this allows dust to enter the transport chamber. Always leave tapes either fully inserted, or remove them completely.

REFER ALL SERVICING TO ALESIS

We believe that the XT is one of the most reliable digital recorders that can be made using current technology, and should provide years of trouble-free use. However, should problems occur, DO NOT attempt to service the unit yourself. The full AC line voltage, as well as high voltage/high current DC voltages, are present at several points within the chassis. Service on this product should be performed only by qualified technicians. THERE ARE NO USER-SERVICEABLE PARTS INSIDE.

OBTAINING REPAIR SERVICE

Before contacting Alesis, check over all your connections, and make sure you've read the manual.

Customers in the USA:
If the problem persists, call Alesis USA at 1-310-841-2272 and request the Product Support department. Talk the problem over with one of our technicians; if necessary, you will be given a repair order (RO) number and instructions on how to return the unit. All units must be shipped prepaid and COD shipments will not be accepted.

For prompt service, indicate the RO number on the shipping label. If you do not have the original packing, ship the XT in a sturdy carton, with shock-absorbing materials such as styrofoam pellets (the kind without CFCs, please) or "bubble-pack" surrounding the unit. Shipping damage caused by inadequate packing is not covered by the Alesis warranty.

Tape a note to the top of the unit describing the problem, include your name and a phone number where Alesis can contact you if necessary, as well as instructions on where you want the product returned. Alesis will pay for standard one-way shipping back to you on any repair covered under the terms of this warranty. Next day service is available for a surcharge.
Field repairs are not normally authorized during the warranty period, and repair attempts by unqualified personnel may invalidate the warranty.

Service address for customers in the USA:

Alesis Product Support
3630 Holdrege Avenue
Los Angeles, CA 90016

Customers outside the USA:

Contact your local Alesis dealer for warranty assistance. The Alesis Limited Warranty applies only to products sold to users in the USA and Canada. Customers outside the USA and Canada are not convered by this Limited Warranty and may or may not be covered by independent distributor warranty in the county of sale. Do not return products to the factory unless you have been given specific instructions to do so.

APPENDIX C
ERROR CODES

The following errors codes may appear from time to time in the TIME counter display. Use this reference to learn the possible cause of the error code before attempting to contact Alesis Product Support.

dv

Dew Sensor: The unit has been subjected to overly high humidity. Do not operate the unit. Turn on the power without installing a tape. This will allow the unit to warm up and disperse the moisture. If the "dv" message does not go out after 2 hours contact Alesis for service.

noFo

No Format: The tape is located at a point that has not been formatted. Rewind the tape to the beginning. Press play. If the tape is formatted the message will change to "LEAd" for 15 seconds then "dAtA" for 2 minutes prior to the beginning of the audio section. If these messages do not appear, the tape should be formatted.

FULL

Serial Buffer Full: Not seen very often. "FULL" occurs when a slave XT is slow to sync to the master XT. The serial buffer within the micro controller has become full of data. This could be the result of unlike versions of software within each unit. Sometimes the problem is related to the sync cable itself. It is recommended that only shielded and grounded cables be used as sync cables.

Finally, this error may occur in slave machines that are playing damaged tapes. The edges of the tape have become damaged. If only one tape is found to cause this problem, don't use it. If the problem is seen with several tapes, the machine should be taken in for service. Contact Alesis for service.

Er 0

Tape Load Error: This may be a problem with the TAPE LOAD or (insert) switch. This can be caused by labels that have been applied to the cassette outside of the designated area. If this error message is displayed with only one tape, the cassette may be at fault. If the message is displayed with several tapes, with and without labels, you should contact Alesis for service.

Er 1 – Er 4

Tape Threading: These error codes are usually related to tape threading. Eject the tape and load it again.   If this error message is displayed with only one tape, the cassette may be at fault. If the message is displayed with several tapes, with and without labels, you should contact Alesis for service.

Er 5

Drum/Capstan: This error points to the head drum and capstan servos. The problem is caused by anything creating extra resistance in the tape path, an unevenly wound cassette or a misalligned cassette shell. You should fast forward and rewind the cassette from end to end to flex the tape then try the tape again.   If this error message is displayed with only one tape the cassette may be at fault. If the message is displayed with several tapes, with and without labels, you should contact Alesis for service.

Er 7   **Clean Heads:** If this error message is seen, it may indicate that the heads are in need of cleaning. See page 75 for information about cleaning your heads.

Er 8   **Sync Lost:** Error message 8 normally occurs when the tape reaches the end while formatting or recording. It is caused by the fact that the XT cannot read timing data from the leader. The error is caused by the unit losing sync. If the unit is being run in the slave mode check the sync cable connection.   It is recommended that only shielded and grounded cables be used as sync cables.

Er 9   **Take-up Reel.** This error indicates that the take-up reel didn't move after PLAY or RECORD was engaged. This can spool tape out of the cassette, so the XT stops the tape immediately. It's possible that the take up reel of the tape is jammed; try a blank or unimportant tape to see if the error recurs. The idler wheel that turns the take-up reel may need cleaning or replacement.

no 9ood tc   **No Time Code.** The XT is reading control track pulses, but no helical scan time code. Usually, a video tape has been inserted into the XT. Format the tape in the ADAT format.

(Error 10 through 13 and 16 are not used)

Error 14-15   **Crossfade buffer, state or channel error.** This indicates a problem with the RAM buffer used for crossfading. Reinitialize the XT using the procedure on p. 75. If the problem recurs, the unit must be serviced.

Error 17   **End sensor error.** One of the optical sensors used to detect the clear leader at the head and tail of the tape cartridge is not working or is blocked temporarily. If the error recurs on other tapes, the unit needs to be serviced.

CAL PG   This error message may appear when you turn on power to the XT. If the display also reads "CAL brAC", there may be something wrong with the battery backup of RAM, or the RAM was accidentally scrambled. If no other error messages occur during operation, and the Interpolation Indicator (see p. 34) is not flashing, playback and recording are still possible. However, do not format any blank tapes on the XT until the PG is reset .

CAL brAc   If this message appears during the turn-on cycle, the brake settings have been set to the default settings due to a problem with RAM memory or the backup battery. Perform the automatic brake calibration (see below). If this message appears in the midst of normal operation more than once in every ten hours of operation, perform the automatic brake calibration (see "Automatic Brake Calibration Procedure", below).

Automatic Brake Calibration Procedure

If the "CAL brAc" error message appears, the internal braking system of the XT may need to be adjusted. The intelligent transport software is capable of calibrating the XT's brakes automatically in a self-test procedure. This procedure may be performed as a regular maintenance procedure every 250 hours of head drum operation (to see the hours on your unit, hold SET LOCATE and press FAST FORWARD).

1. Obtain a standard ST-126 length tape (preferably an Ampex 489 such as that was shipped with your unit) that has already been completely formatted from beginning to end. Use a non-essential tape (i.e., don't insert your only copy of a master tape). Do not use other lengths of tape such as ST-180 or ST-60.

2. Turn off the POWER switch. Hold REWIND and FAST FORWARD while turning the power back on again. The display will read "CALIbrAt".

3. Insert the tape into the transport.

4. At this time the unit will adjust the brake tension automatically. The transport will shuttle back and forth for about 5 minutes. During the operation, the tape will half-eject twice. This is normal.

5. The display should briefly read "PaSS" before ejecting the tape fully and returning to the "ADAT-XT" start-up screen. The brakes have now been recalibrated.

If the "CAL brAc" message appears again shortly after a brake calibration has been performed, there may be something wrong with the tape being used. Check operation with another tape. If the message persists, the unit must be professionally serviced.

Note: If these errors occur only with a certain tape, or display once in a while, it's probably not cause for concern. Errors 1 through 3 and 9 can indicate conditions that may damage a tape; the other errors won't damage the tape or the machine. Backup the data from that tape to another machine, if possible, and continue working from the backup copy.

STEPS TO TAKE BEFORE CALLING FOR HELP

If an error message is displayed or if an ADAT starts behaving strangely, then please follow the suggested steps below:

1 Stop the tape playing (or recording). Does the error go away?

2 Rewind the tape a minute or two. Press [PLAY]. Does the error recur?

3 Eject the tape. Place it back in the XT and press [PLAY]. Does the error recur?

4 Turn down the volume of any mixer or amplifier you have connected to the outputs of the XT. Turn the power of the XT off, wait a minute and then re-power the XT. Repeat steps **1** to **3**. Does the error come back?

5 If it does, then try a different tape. Repeat steps **1** to **3**. Does the problem recur?

6 Try the tape in a different XT or ADAT. (If you are using a single ADAT system, see if you can visit your dealer.) It does not make sense to send your XT in for service when there may be only a problem with, for example, some tapes that you are using. If the same problems occur in another XT or ADAT, then either the tape is faulty or it was formatted on an out of alignment XT or ADAT. At this point, you should call Alesis Product Support. If the problem does not occur, and the tape works fine, then we need to look at your XT. You need to call Alesis Product Support.

Whatever happens, the answers to all these questions are useful information for our Product Support representatives. The more we know, the faster we can discover the cause of your problems. You will help us isolate whether the problem lies in the XT, the tape or somewhere else.

APPENDIX D

SPECIFICATIONS

Transport

Recording Format:	ADAT Rotary head digital recording
Tape Format:	S-VHS cartridge

Heads:	4 (2 Read, 2 Write); Read before Write
Approximate Recording Times:	
ST-60:	22 minutes
ST-120/SE-180:	40 minutes
ST-160/SE-240:	54 minutes
ST-180/SE-260:	62 minutes
Fast Wind Rate:	40 x play speed (Threaded)

Audio

Number of Audio Channels:	Eight
Audio Conversion:	
Record (A/D):	18 bit linear audio, 128 times oversampling, single converter per chan.
Playback (D/A):	20 bit linear, 8 times oversampling, single converter per chan.
Sample Rate:	44.1 /48kHz, Selectable
Vari Speed Range:	+100/-300 cents (48kHz), ±200 cents (44.1kHz)
Frequency Response:	20Hz– 20 kHz, ± 0.5dB
Dynamic Range:	92 dB, A weighted
Distortion:	.009% THD
Channel Crosstalk:	Better than -90 dB @ 1kHz
Wow and Flutter:	Unmeasurable
Reference Level:	-15dB

Analog Inputs/Outputs

Connectors:	
Balanced:	One ELCO® connector (in/out)
Unbalanced:	Sixteen RCA jacks (8 input, 8 output)
Input Impedance:	
Balanced:	10kW
Unbalanced:	10kW
Output Impedance:	
Balanced:	150W into 600W Nominal
Unbalanced:	150W into 10k W Nominal
Nominal Input levels:	
Balanced:	+4 dBu (1.23V)
Unbalanced:	-10 dBV (3.17V)
Maximum Input levels:	
Balanced:	+19 dBu (6.90V)
Unbalanced:	+5 dBV (1.78V)

Digital Inputs/Outputs

Connectors:	Two EIAJ fiber optical jacks (1 in, 1 out)
Communications Protocol:	8-Channel Serial Communication

General

Power Requirements:	90V–250V AC, 50/60 Hz
Power Consumption:	80W
Operating Temperature:	10–40 C for specified performance
Operating Humidity:	80% maximum with no dew condensation for specified performance
Dimensions (H x W x D):	5.25" x 19" x 11" (133.3 x 482 x 279.5mm)
Weight:	20 lbs. (9 kg)

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

AVERTISSEMENT: Risque d'explosion si cette pile est mal utilisée tel que introduite faussement dans l'appareil ou remplacé par une pile non-equivalent.