IMPORTANT NOTE!

SOUND CARD BASICS
for MARS Stations

THE USE OF SOUND CARD MODES IS EXPANDING RAPIDLY THROUGHOUT NAVMARCORMARS. THESE MODES ARE PROVING TO BE EFFICIENT IN MESSAGE HANDLING AND INEXPENSIVE TO OPERATE, ELIMINATING THE NEED FOR AN EXPENSIVE MULTI-MODE TERMINAL NODE CONTROLLER. SOME REGIONS AND STATES HAVE ESTABLISHED NETS FOR EXPERIMENTATION WITH THESE MODES.

CHNAVMARCORMARS BCST 08-03 - SOUND CARD FREQUENCIES

If you want to get involved in sound card digital radio, you've come to the right place (at least one of them). Trust me; it's not nearly as complicated as it sounds. Here how to get started quickly and easily. If you have a computer with a sound card and an extra ten bucks or so, you're ready to go.

This information should be considered un-official. To review the current official position of NAVMARCORMARS regarding sound card modes refer to the following Chief MARS Broadcasts:

- **03-03**
- **08-03**

Also see: **NAVMARCORMARS WEB PAGE ON SOUND CARDS** for other official sound card info.

IMPORTANT NOTE:

It will likely be some time, if ever, before sound cards will replace TNC's for MARS full digital capability. Bear in mind that PACTOR and AMTOR ARQ are still needed for the NAVMARCORMARS **MDS** System. ARQ is also beneficial for sending traffic under adverse operating conditions.

Used TNC's are often obtainable at reasonable prices, and you can also check with the State **'Twelve'** for the availability of MARS equipment.

So, take advantage of all the functionality of your sound card, but please do not let what we offer here deter you from becoming a fully capable MARS digital station.
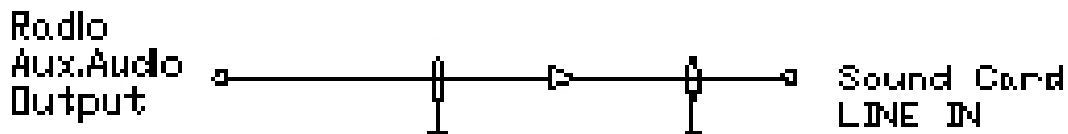
(Back to Sound Cards)

RECEIVING AMTOR FEC

Although, since this was first written, Alabama has changed to **MT63** as the standard method of transmitting general messages, **Amtor** is still a viable mode for Alabama nets, and is used to send traffic on regional nets. The nature of many general messages makes voice transmission very difficult to copy and to understand so you will find digital reception very beneficial.   Actually once the hardware is set up to receive Amtor you can also receive MT63, and vice versa.

Although we transmit EEI messages by voice during ECOM exercises, in an actual event AMTOR is much more efficient and accurate.

Prior to sound card technology, an expensive modem was required to decode received AMTOR. Now your computer's sound card can do the job. If your computer does not have a sound card, you can add one at little cost. Ask around, and someone will likely have an extra one that you can have, and even a new card is very cheap. Virtually any sound card will work. You don't need the latest/greatest super-duper game card. To be safe though, if you're buying one, check to see that it is "Sound Blaster 16 compatible".

Hook-up

NO ELABORATE INTERFACE IS NEEDED to receive AMTOR, or to send it, for that matter. To receive, you'll need a shielded audio cable with the appropriate ends, to take your received audio from your transceiver to the sound card to the computer 'line-in' or 'mic' jack.

```
Radio
Aux.Audio  ⊐────┬────⊏────┬────⊐  Sound Card
Output           │         │       LINE IN
```

 A 1:1 audio transformer (such as Radio Shack #273-1374) is recommended in the line to avoid any ground loops or DC current in the line. I've done it with and without and never had a problem either way.

Just set things up in a manner that suits your particular situation. For example;

- If you use an external speaker, you might just add a "Y" connector (splitter) at your speaker jack and go from one side to your speaker and the other to the sound card 'Line In' (or 'mic' if there is no 'line in' jack).

- Alternately, you can go from your radio's external speaker jack to the sound card 'line in' or 'mic' jack and listen to your radio through your computer speakers.

- You can use, depending on your rig, the accessory connector in the rear of the transceiver as the audio source. Audio from this jack is often a constant level and is unaffected by the gain setting. This works well for sound card work and eliminates the need to constantly adjust your sound card levels.

I've had QSO's with stations that had no interface at all! They just put their computer microphone in the vicinity of the radio speaker and feed the audio to the sound card acoustically. It is not the best set-up, but I've tried it myself and it really does work!

That is all that's needed to receive. For transmit setup, go to the [interface](#) topic.

Software for AMTOR

You'll need some [software](#). Currently I know of only three Windows based programs that decode AMTOR. Two, TruTTY and MixW, are shareware and one, MultiPSK, is freeware.

MultiPSK	**This is the only freeware AMTOR program I've found. The author is French, and has approached things somewhat different from what you may be used to. CPU usage seems less efficient than some others and requires a Pentium 166 or better computer. If your computer is slower, this program probably will not work for you. But it is free, and it does copy AMTOR quite well. MultiPSK also does CW, CCW, PSK and Baudot RTTY.** **Step by step instructions to get started with MultiPSK are HERE.**
TruTTY www.dxsoft. com/en/ products/ truetty/	**"A program for amateur radio digital communications via a sound card. Supported modes are RTTY (Baudot code), ASCII (7 or 8 bits), PSK31 (BPSK and QPSK), AMTOR-FEC (SITOR-B, NAVTEX), MultiFSK-16. HF-PACKET and UHF-PACKET (AX25) are supported in KISS-TNC emulation mode. SELFEC SITOR and DTMF-code decoding is also possible."** (From the Author's web page)
MixW http://www. mixw.net/	**MixW is a multimode program for HAMs. It will help you in regular and contest QSOs. This program has many features which give you almost automatic processing of a QSO.** (From the Author's web page) **MixW supports:** **CW, BPSK31, QPSK31, FSK31, RTTY, Packet (HF/VHF), Pactor (RX only), AMTOR (FEC), MFSK, Hellschreiber, Throb, Fax (RX only), SSTV, MT63.**

Clicking on the program name above will take you to the download site. From time to time you may not be able to link to these sites as they are sometimes moved, removed or whatever. If you have any trouble just email NNN0GAA-Ten for a copy via email or CD.

That's it! You can now receive AMTOR FEC!
~~ and ~~

- **Pactor FEC**
- **PSK31**
- **MT63**
- **MFSK**
- **RTTY**
- **Packet**
- **Q15X25**
- **SSTV**
- **Throb**
- **Hellscheiber**
- **ALE**
- **Fax**
- **and any other current and future Sound Card**

Mode.

How's that for a bargain?

Transmitting AMTOR FEC is almost as easy. All you need now is a connection from your sound card 'Line Out' to your transmitter. This can be accomplished in several ways with little effort and expense. See the INTERFACE section for details.......just remember KEEP IT SIMPLE!

Don't forget, the MARS preferred AMTOR operating method is with a TNC for full FEC and ARQ capability. See **Important Note**. That's it! You can now receive AMTOR FEC!

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Digital Modes:

Listed here are but a few of the sound card modes, concentrating on the ones of possible interest to the MARS operator.

MODE	DESCRIPTION	ADD'NL INFO LINKS
AMTOR FEC	In NAVMARCORPMARS, AMTOR FEC is used to transmit all general messages, such as Chief MARS Broadcasts and Info Broadcasts, to our Region and State nets. In addition FEC is also used to send traffic between stations equipped to operate in this mode. Currently there is not, to my knowledge, any sound card software supporting AMTOR ARQ and you are encouraged to procure a TNC for Full MARS support of AMTOR FEC and ARQ	AMTOR - BY TONY VK2DHU ARRL Articles NTP-8(c), p 930, 940

| PSK31
(BPSK and QPSK) | **PSK31 is the mode that really sparked a general interest in sound card communication modes.**

PSK31 is based on an idea by SP9VRC and developed by Peter Martinez, G3PLX, who also developed AMTOR. Based on RTTY, PSK is used for live keyboard-to-keyboard QSOs at 50 WPM (31 Baud) and uses "Phase Shift Keying" to signal mark and space values, instead of changing the frequency like RTTY (FSK).

PSK31 operates in a very narrow bandwidth allowing several individual, non interfering, QSOs to simultaneously occupy one 3000 Hz bandwidth allocation. PSK31 is very effective with low power and QPSK improves communication under some adverse band conditions.

For MARS purposes, these features are offset by PSK31 being relatively slow, and having no real forward error correction (FEC) features.

In addition to BPSK and QPSK there are several variations to PSK31, but are beyond the scope of this article. | [NB6Z](#)

[PSK31 HOMEPAGE](#)

[WM2U - PSK31](#)

[Getting Started with Digipan](#) |
| MFSK | **MFSK is a technique for transmitting digital data using multiple tones, extending the RTTY two tone technique to many tones, usually, but not always, one tone at a time.**

MFSK has several performance advantages:

• **High rejection of pulse and broadband noise due to narrow receiver bandwidth per tone**
• **Low baud rate for sensitivity and multi-path rejection - data bit rate higher than symbol baud rate**
• **Constant transmitter power**
• **Tolerance of ionosphere effects such as doppler, fading and multi-path**

Most important of all, with an MFSK system, the error rate improves as the number of tones is increased, so with as many as 32 tones the performance is unrivaled. With PSK systems the opposite is true. *Murry Greenman ZL1BPU* | [MFSK by ZL1BPU](#)

[MFSK - WM2U](#) |

MT63	**MT63 is a DSP based advanced HF mode for Amateur Radio, intended to provide high performance keyboard - to - keyboard operation on HF bands under poor conditions. MT63 utilizes a number of revolutionary ideas, and is technically very complex. MT63 is no more difficult to operate than RTTY, and is easy to tune. It also provides much better performance on HF than most other modes.** **The specialty of MT63 is its performance when conditions are both weak and unstable. It also copes with incredible QRM.** *Murry Greenman ZL1BPU* **Keep an eye on this one. It appears to have great potential for MARS operation.**	**MT63 Page** [MT63 by ZLBPU](#) [MT63 - WM2U](#) **[NAVMARCORMARS](#)**
Packet	**Packet radio is a digital method of communications adapted from a standard computer protocol (X.25) by which computers communicate with each other. The version adopted for NAVMARCORPMARS use is AX.25. Packet radio was originally developed for VHF use, but has since been modified for HF .** *NTP-8 (c) para. 951*	http://www.packetradio.com/ primer.htm [TAPR](#) [NTP-8(c), p 950](#)
Q15X25	**Q15X25 is a 15 tone packet mode with a Kiss/AX25 interface, and from its performance, should long ago have replaced conventional packet for HF use! Q15X25 is now available for Motorola EVM, LINUX PC and Windows PC sound card operation.** *Murry Greenman ZL1BPU* ***'BEACONS USING Q15X25 ARE ENCOURAGED. THIS MODE MIGHT BE ADAPTABLE FOR THE MDS BUT WE NEED MORE EXPERIMENTATION UNDER DIFFERING PROPAGATION CONDITIONS.'*** *NNN0ASA Chief MARS BCST 08-03*	[Q15X25 by ZL1BPU](#) [Set-up Q15X25 Modem with MixW](#)
PACTOR FEC	**Pactor ARQ is used in the MARS MDS/BBS system. Pactor FEC would be suitable for broadcast mode traffic transmission, but generally on MARS nets AMTOR FEC is used instead.** **Currently I know of no software supporting Pactor ARQ. At one time Brian Beezley, K6STI, offered a DOS based sound card program called 'RITTY' which reportedly would do Pactor ARQ. RITTY required a TRUE Sound Blaster sound card and, I am told, would NOT run on the vast majority of sound card clones. I am not sure that it is still supported, and the last license fee I heard was**	[NB6Z - PACTOR](#) [AIRMAIL 2000](#) also see NTP-8 (c) p.960

	around the cost of a good used TNC. **Again, I encourage you to procure a TNC for full MARS digital capability**	
SSTV	**Slow Scan TV is the transmission of still images via RF**	[SSTV Primer](#) [NTP8(c), Annex G, G340](#)
ALE	**Automatic Link Establishment** **The primary purpose of ALE is to provide a much more reliable means for one station to call another station via HF radio.**	[ALE Area](#)

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Interface Basics:

I don't know, …..maybe it's the ads for some commercial sound card interfaces that lead people to believe that this is a complicated process. It isn't. You need to take audio from the transceiver to the sound card (to receive) and from the sound card to the transceiver's microphone circuits (to transmit), and you'll need some method to key the transceiver.

I have used this circuit with various rigs with all the programs and all modes mentioned here with good results. Using VOX, a foot switch or the "Send/Receive" switch on the rig it is all I've ever needed. For added convenience I made a manual switch box to select either microphone or sound card for transmit. A 1:1 audio transformer (such as Radio Shack #273-1374) in each line is recommended to avoid ground loops and any DC current in the lines.

Here are a couple of excellent sites that cover the interface subject if you want to build your own interface.

http://www.qsl.net/wm2u/interface.html

> http://www.packetradio.com/bbbb.htm
>
> **If you'd prefer, kits with full PTT circuitry are available for around $25 and assembled units are available for around $50 from this and other sources.**
>
> http://www.packetradio.com/
>
> **Many find the convenience offered by commercial interface units beneficial. Currently there many units available and can be located in Amateur radio publications or on the internet. Remember to keep it simple, and you do not need to spend lots to obtain excellent results. My particular set up cost just a few dollars and has worked flawlessly for several years on all digital modes.**

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Software and Where to Find it:

Clicking on the program name will take you to the download site. From time to time you may not be able to link to these sites as they are sometimes moved, removed or whatever. If you have any trouble just email **NNN0GAATen for** a copy via email or CD.

Click on Program Name to download:

Mode >	F/S/C	Amtor FEC	Pactor FEC	PSK31	MFSK	MT-63	Hell-schriber	Packet	RTTY	Q15x25	SSTV	Throb	CW	Fax	ALE	Other Modes/Features
MixW (a)	S	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
MultiPSK	F	Y		Y			Y		Y		Y	Y	Y	Y		Y
TrueTTY (b)	S	Y			Y			Y	Y							Y
Hamscope	F			Y	Y				Y				Y			
Stream	F			Y	Y											Y
MT63	F					Y										
Hellschriber	F						Y						Y			
MMTTY	F								Y							

MMSSTV	F								Y					
Digipan	F													
PC-ALE	F												Y	
WinWarbler	F		Y				Y							
Logger32	F		Y				Y							

F=Freeware, S=Shareware, C=Commercial

(a) http://www.mixw.net/
(b) http://www.dxsoft.com/

Other Sound Card Software Sources

(Check these sites often as new programs and updates occur frequently)

- **Amateur Radio Sound Blaster Software Collection**
- **Digisoft**
- **http://members.fortunecity.com/xe1bef/soundcard.htm**

Here is a little utility program that is a 'must have'. QuickMix is a freeware and can be downloaded clicking **here.**

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Tuning your sound Card

Setting Audio Levels:

Adjust the sound card audio INPUT level such that a nominal signal tuned in on the transceiver will be seen prominently in the program signal display window without overdriving the sound card input. (See PSK31 Screen Shot for an example of how this might look on the several ham programs.)

Use the MASTER control to adjust the sound to the PC speakers (if you use them) and then re-adjust the other levels as needed. Note that other windows applications you run on your PC that provide sound card adjustment controls may change your PSK31 settings! You may have to re-adjust these levels. Generally, once these levels have been set, you will not need to change them.

Adjust the sound card audio OUTPUT level to the transceiver such that a small amount of ALC voltage is detected at the transceiver while transmitting into a proper antenna load (50 ohms) with the MIC Gain control at a nominal setting. After this adjustment, you can reduce the MIC gain control slightly to achieve full output power with no ALC deflection. Note that full output on a 100 watt transceiver would be about 100 watts if using a single tone (CW) from the sound card, but would be about 50 watts if using the double tones of a PSK31 carrier.

<p align="center">**Turn your speech processor OFF.**</p>

When you get your first PSK31 contact, ask the other station for an "IMD report" on your signal. (You must allow several seconds of "no text" for the reading to be made.) A properly adjusted audio input level to your transceiver will have an IMD at least -20 dB below the carrier and a very clean signal will be around -28 dB. It should be noted that a strongly received PSK31 signal (S9 or greater) can appear to have a high IMD level when viewed on the digi program display. This is often the fault of the receiver's front-end being over driven by the strong signal. Before issuing a bad IMD report to another station, you should add attenuation to the receiver and observe the reading under a nominal signal strength.
by *Richard B. Griffin, N6BZ*

Several of the software packages help files have good detailed instructions on sound card tuning. There are many approaches to this, as you will see, but just remember that once you have found settings that work for you they should work with any of the programs.

Also see *The Ins and Outs of a Sound Card* by K1UHF - October 2003 QST

> **Here's a little utility program that's a "MUST HAVE"! It allows you to store and retrieve your sound card settings, avoiding the process of readjusting each time another program changes them. QuickMix is freeware and can be downloaded from here.**

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Digital Net Procedures

by NNN0GAA for Alabama (experimental) Digital Net use.

DIGITAL NET PROCEDURES

1. NECOS

<XMTR ON>
30 sec (min) idle/synch signal (Ref: NPP 8(C), 810)
<2 CR>
Send call-up (Ref: NTP 8(C), 661)
Nnn0als nnn0als nnn0als DE NNN0(*NECOS*) NNN0(*NECOS*) NNN0(*NECOS*) ZKA
2A2B 2A2B 2A2B ZKB AR
<2 CR>
Repeat call-up
<2 CR>
DE NNN0(NECOS) INT ZKE K
<2 CR>
<XMTR OFF>

2. MEMBERS CHECK IN
<XMTR ON>
<2 CR>
NNN0xxx NNN0xxx QRU K
---or if holding traffic---
NNN0xxx NNN0xxx ZBO 2R – 1 ALL 1 GAA K
<2 CR>
<XMTR OFF>

2a ACKNOWLEDGE STATIONS CHECKED IN
<XMTR ON>

<2 CR>

NNN0--- NNN0--- NNN0---- …..ETC…. DE NNN0(NECOS) R AR

<2 CR>

<XMTR OFF>

3. PASS TRAFFIC

<XMTR ON>

<2 CR>

NNN0--- DE NNN0(NECOS) ZOG 1R NNN0GAA TO NNN0xxx AR

<2 CR>

<XMTR OFF>

<XMTR ON>

<2 CR>

NNN0xxx DE NNN0--- 1R INT QRV K

<2 CR>

<XMTR OFF>

<XMTR ON>

<2 CR>

DE NNN0xxx QRV K

<2 CR>

<XMTR OFF>

<XMTR ON>

<2 CR>

DE NNN0xxx R AR

<2 CR>

<XMTR OFF>

4. FREE NET

<XMTR ON>

<2 CR>

NNN0ALS DE NNN0xxx FREE NET ZKJ1 AR

<2 CR>

<XMTR OFF>

5. SECURE NET

<XMTR ON>

<2 CR>

NNN0ALS DE NNN0xxx ZKJ2 AR

<2 CR>

<XMTR OFF>

Q/Z Signals of Interest

(see NTP 8(C), Annex C)

(Prefix 'INT' makes signal a question)

QRU - I HAVE NO TRAFFIC

QRV - I AM READY TO COPY TRAFFIC

QSP - RELAY

ZBO - I HAVE TRAFFIC FOR . . .

ZKE - I REPORT INTO NET

ZKA - I AM NET CONTROL STATION

ZKB - IT IS NECESSARY TO OBTAIN NECOS PERMISSION TO TRANSMIT (DIRECTED NET)

ZOG - TRANSMIT THIS MESSAGE TO ...

ZKJ - CLOSE DOWN (1 - YOU CLOSE; 2- I AM CLOSING)

Frequency Offsets:

Amtor (Using TNC);

For operations using Amtor, RTTY and Pactor in the AFSK mode set the transmitter dial frequency 700 Hz below the SSB dial frequency.

For example; For a net Frequency of 4040.0 USB, the dial frequency for SSB is 4038.5 and for the AFSK modes the dial frequency is 4037.8. (See NTP 8(C),803,e,2)

PSK-31 (and other soundcard modes)

PSK-31 does not require a transceiver frequency change (offset) from the SSB frequency.

MODE SPECIFIC PROCEDURES

AMTOR (Using TNC and AFSK)

Net will be called using 100 Baud AMTOR FEC. Dial frequency is set to designated net frequency less 2200 Hz. (Example: Dial frequency for a net on 4040.0 would be 4037.8)

AMTOR (Using Soundcard programs)

No transceiver frequency change (offset) is required. Set audio center frequency to 1500 Hz

PSK-31

Nets will be called in BPSK mode with center audio frequency of 1,500 Hz. No transceiver frequency change (offset) is required.

Under difficult band conditions, NECOS may instruct stations to switch to QPSK mode.

NECOS should make the following software settings:

- audio frequency set to 1500 Hz.
- "NET" set to OFF. If using DigiPan, set "LOCK ON"

("NET" is a commonly used term by many PSK-31 programs to instruct the program to transmit at the receive frequency. Some software use a different term for the same function. For example, in Digipan, "LOCK OFF" is the same as "NET ON")

- AFC set to "ON".

This will allow slight frequency adjustments to stations transmitting slightly off frequency.

Check-in Stations should make the following software settings:

- "NET" set to "ON" (or "LOCK OFF")
- "AFC" set to "ON"
- Use the computer mouse to click on NECOS' signal seen on the program's waterfall or spectrum display.

Note: The above procedures are for single channel PSK-31 operation. Other schemes, not addressed here, divide the bandwidth into several channels, so simultaneous traffic can be handled on the same transmitter/receiver dial frequency.

MFSK-16

Nets will be called in MFSK-16 mode with center audio frequency of 1,500 Hz. No transceiver frequency change (offset) is required.

MT-63

Nets will be called in using 2000Hz Bandwidth and Long Interleave. No transceiver frequency change (offset) is required. Leave software at the default audio frequencies which is the lower edge of the signal at 500Hz. All transmissions should be proceeded by a 15- 30 sec. idle.

Basic Setup and Adjustment for Transmitting via soundcard modes;

❍ Make sure that your sound card to microphone connection has a voltage attenuator (100:1). Isolation transformers (1:1 audio trans-formers) are recommended in both lines between the radio and computer.

❍ Set your microphone gain so that you do not see any ALC activity. Turn off your radio's speech processor.

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MultiPSK Step by step AMTOR receive.

This software approaches things differently than you're probably used to.....it just doesn't 'feel' like most Windows programs. So here are the steps to get things up and running. You can play with it to learn its other features later, but this will get the AMTOR thing working right away.

Steps to receive AMTOR using MultiPSK

1. **Open program.**
2. **In the box above the light blue bar "Short cuts" verify that "XIT as an offset (Hz) is checked.**
3. **In the same box, set XIT: to 0, RX Fr.: to 1600 and TX Fr.: to 1600.**
4. **Under "SHORTCUTS" click on "RX/TX window"**
5. **Click on "MODE". (a drop down box will appear)**
6. **Click on "Reception Mode RX". (Another drop down box will appear)**
7. **Click "AMTOR REC"**
8. **Click "RETURN" bar.**
9. **Under "Reception", click "reverse".**
10. **Select "Spectrum" or "Waterfall" It's a matter of personal preference, but I'd recommend starting with "Spectrum" for AMTOR**

> **Note: steps 2 - 10 need only to be done once. The program will open next time in the mode it was in when last shut down.**

11. **You will see the received signal in the spectrogram as twin peaks. With the above settings, the right peak should already be at the light blue vertical bar at 1600 Hz. If not, click on the right peak and the traffic will print out in the box below.**

Have MultiPsk open and operating on the desktop or in the background at

the beginning of the net. There is no need to offset your receiver frequency (that's just needed for TNC's). When another station starts sending you are all set up to receive.

TO REVIEW AND PRINT:

- At each new session, a new 'QSO' (Capture file) file is created.

- To get to the capture file:
  - From the RX/TX window click on 'QSO' (on the tool bar at the top of the page in version 2.2 or at the bottom of the screen in earlier versions) or,
  - From the initial ('Configuration') window, click on 'Reading of a QSO'.

The text from the current session is displayed. To view a previous sessions click on 'Load a previous QSO'. This will display a list of saved sessions. Select the one desired and it will be displayed for review or printing.

Editing cannot be done in this window, so use your text editor for any editing that you want to perform.

You might want to delete unwanted capture files from time to time to clean up your hard drive.

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General Info Links

For more information, check out these links:

http://home.teleport.com/~nb6z/frame.htm
http://winlink.org/News/0101050.pdf

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Other Sound Card Uses:

In addition to the digital modes, as if that weren't enough, with this same set up you can use spectrograms, VOX recorders, audio filters, etc. A good place to find what's available is: [SoundBlaster Software Collection](#) **.**

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