TIMEWAVE
TECHNOLOGY INC.

DSP-232
Multi-Mode
Operating Manual

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Welcome

Thank you for purchasing a Timewave product! Before you go any further, please fill out and return the enclosed Warranty Registration Card. Only a portion of all warranty cards are return, which makes it hard to keep Timewave customers up to date. From time to time, Timewave offers updates to its products--we can only tell you about these updates if we have your warranty card on file, so send it in if you haven't already done so. Returning your warranty card also places you on Timewave's catalog mailing list.

FCC Regulations

This device complies with Part 15 of the FCC rules. These rules are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, these is no guarantee that interference will not occur in particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device on and off, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the device and receiver.
• Connect the device into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the manufacturer will void the user's authority to operate the device.

You must use shielded cables for all device connections, then tie all grounding wires/shields to a single point, normally the radio. You need an effective station ground or you'll have problems when RFI infiltrates your equipment and causes all kinds of unexpected problems.

Disclaimer

As part of its continuing program of product improvement, AEA reserves the right to make changes in this product's specifications or documentation. AEA also reserves the right to incorporate and issue any information thus supplied in whatever manner it deems suitable, without incurring any obligation whatsoever.

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Chapter 1

The DSP-232

Overview

The DSP-232 was designed by Timewave Technology Inc. to be the ultimate digital operating platform when coupled to your computer or "dumb" terminal. The DSP couples your HF, VHF, UHF transceiver(s) or short-wave receiver to your computer so you can "talk" to other Amateurs or listen in to their—or a utility station's—digital and Morse communications. This unit is state-of-the-art and has been designed with an eye toward the future. The architecture and parts used in the DSP-232 allow room for future technological enhancements. Timewaves's PK-232MBX left a decade long legacy of dependability and high-performance digital communication, the DSP-232 will carry you through the next decade, and well into the next century.

Capabilities

With the DSP you can transmit and receive all the popular amateur digital modes. You can receive other modes such as NAVTEX and bit-inverted Baudot RTTY. These capabilities, along with SIAM (Signal Identification and Acquisition Mode), make the DSP ideal for the digital signal short-wave listeners (SWL) as well as the active digital communication users. New modes will become popular and you can be assured this unit will be able to handle them.

The DSP will transceive in the following modes:
- AX.25 packet on HF (300 bps), VHF and UHF (9600 bps and 1200 bps)
- Baudot and ASCII RTTY
- AMTOR/SITOR CCIR Rec. 476 and 625
- Morse Code
- PACTOR

In addition, the DSP receives the following modes:
- NAVTEX marine broadcasts and AMTEX amateur bulletins
- Bit-inverted Baudot RTTY

The DSP also has the following special features:
- Gateway firmware which allows the DSP-232 to operate as a node and identify TCP/IP, TheNet, and NET/ROM stations. There are two heard lists with Gateway, one for nodes heard and one for stations heard.
- Memory ARQ for better HF throughput in marginal conditions.

DSP-232 features continued. . .

♦ Numerous external adjustments, ports, and connectors.
♦ The ultimate in digital filtering with the high-power, high-speed Digital Signal Processor.
♦ The unique LED display which keeps you informed of system activity. This display allows for future modes and features as no other display can. After all, we designed this unit for growth.
♦ Packet/AMTOR/PACTOR MailDrop message handling.
♦ A Mailbox that can expanded to 242K (256K RAM).
♦ KISS mode for TCP/IP packet applications.
♦ Host mode for popular Host application programs.

What Did—and Didn't—Come In the Box

Besides this manual, the following items are enclosed:
♦ two 5-pin DIN radio cable
♦ one 8-pin DIN connector
♦ two RX audio cables
♦ one 2.1mm power cable
♦ one wire loop-back jumper
♦ an RS-232 serial cable with DB-9 connectors (pins 1-3 and 5-8 connected)

Here's what *isn't* enclosed:
♦ DOS, MacIntosh, or other computer platform software to operate your DSP
♦ microphone connectors for your radio(s)
♦ a power supply
♦ a computer and a radio!

The DSP will work with practically any telephone modem or terminal emulation program that your computer can run as long as it uses the full ASCII character set. However, *PK-Term for Windows is* powerful
programs offered by CSS that istailor-made for its controller products. These programs offer many operating and utility features—and conveniences—that simply aren't found in typical modem and 3rd party controller programs. But, if you do run Windows, PK-Term for Windows is the best amateur radio
has to offer in Windows control software. Visit http;//www.cssincorp.com
for more details about PK-Term programs.

We also didn't enclose any mike connectors because we don't know which brand or model of radio you plan to use with your DSP.

Finally, we didn't include a power supply since many owners simply connect their DSP to the same 12 VDC supply that powers their radio and station accessories. If you want to operate your DSP from a "power cube" that plugs into your wall outlet, you can purchase one locally or you can purchase the AC-5 power supply from Timewave
 or through your favorite electronic equipment dealer.

Your Radio...

We presume that you have an operating radio transceiver or short-wave receiver that you'll use with your DSP. In the Amateur bands, most of the VHF packet activity occurs on the 2-meter FM band while most of the HF digital activity occurs on the 20-meter band. By convention, an HF receiver or transceiver must be capable of SSB operation in order to communicate digitally to other stations. While no specific brand of transceiver is required, we recommend that a modern transceiver (built in the last 20 years) be used. Specific transceiver connections are described in Appendix A of this manual.

Most modern radio transceivers are capable of excellent performance in Morse, Baudot and ASCII RTTY, AMTOR, PACTOR, and packet radio. Although AMTOR Mode A (ARQ) and PACTOR operation imposes more demanding switching speed requirements than the other operating modes, most radios will operate in both AMTOR and PACTOR modes without any modifications. (See the AMTOR operating section for further details on timing requirements.) The DSP has software-controlled timing variations that permits operation with nearly all the HF, VHF and UHF radios in general use today.

...and Computer

You'll need a computer or "dumb" terminal that has an RS-232 serial communications port in order to have it communicate with your DSP. The most popular computers are IBM™-PC compatibles, PC laptops, and Apple Macintosh™ (and Powerbooks™).

For the sake of brevity in this manual, instead of using both the phrases "dumb terminal" and "computer" interchangeably we'll just use the word, computer.

A Tour of the DSP-232

Before you leap ahead into the next chapter to see how to hook up your DSP, you should read this section to find out what all those LEDs, adjustment levels and connectors are on the unit and what they do. If their functions or terms sound cryptic to you now, don't worry about it—they'll be explained fully in later chapters.

Carefully remove the DSP from its box and plastic bag and inspect the it for signs of damage that may have occurred during shipment. If there's visible damage, please contact the dealer or shipper. *Don't install or use a damaged controller.*

The Front
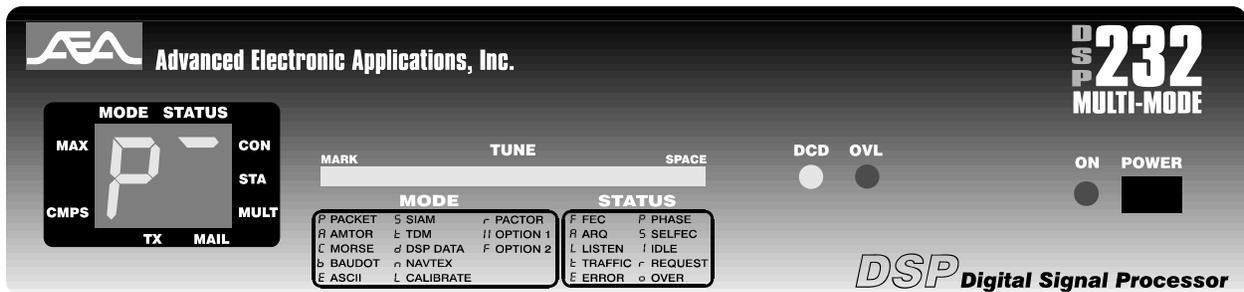
Front view of the DSP-232

Now, set it on the table or hold it in your hands and take a few minutes here to take a guided tour of your controller, starting with the blacked-out display on the left-hand side of the front of the DSP labeled Mode and Status. Under this black display are two, seven-segment LED indicators. These lights tell you which mode you're using and what's going on while you're in that mode. Let's start with the ones in the MODE box.

Mode Indicators

In the Mode area, there are twelve possible symbols that can appear. Below is a rundown of these symbols. You will find a legend on the front of the DSP-232 which tells you what symbols stand for what mode.
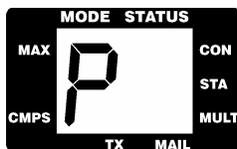
'P' will light when you're using VHF/UHF or HF Packet at 9600, 1200, or 300 bps.
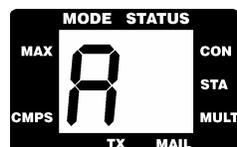
'A' will light when you're in the AMTOR mode.
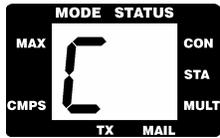
'C' will light when you're using the DSP to decode Morse code signals.

'b' will light when you're in the Baudot mode.

'E' will light when you're in the ASCII mode.

'S' will light when you're using Signal Identification and Acquisition mode (SIAM™)   to identify signals.

'd' doesn't stand for an actual mode, but will light during special telemetry and data conversion applications.
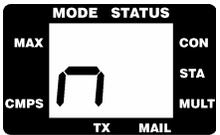
'n' will light when you're copying NAVTEX data.
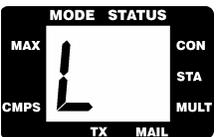
'L' will light when calibrating the DSP.

'r' will light when you're working PACTOR.

'II' is an optional symbol which will be used for future applications.

'F' is an optional symbol which will be used for future applications.

Status Indicators

Now, let's move on to the Status Indicators. There are ten symbols which may appear in the Status area. Below is an explanation of these symbols. The legend on the front of the DSP-232 tells you what the symbols mean as well.
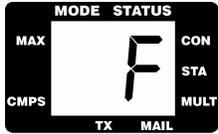
'F' lights when you're in FEC mode in AMTOR or PACTOR.
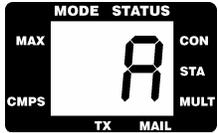
'A' comes on when you're in ARQ mode in AMTOR.
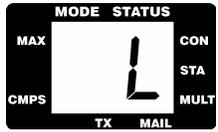
'L' comes on when you're in Listen mode in AMTOR or PACTOR
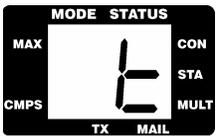
't' comes on when sending "traffic" in AMTOR.
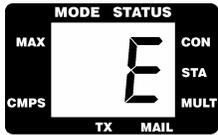
'E' This stands for ERROR. When not in packet, it'll glow when it has trouble   receiving—or when it has received—a bad "block" of data while in PACTOR or AMTOR .
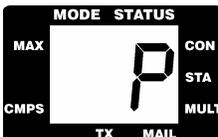
'P' Stands for PHASE and indicates that while in AMTOR or PACTOR, your transmitter is trying to lock onto and synchronize with another station's signal.
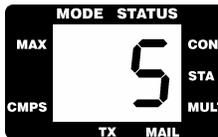
'S' Stands for SELFEC and will glow when you're operating SELFEC AMTOR.
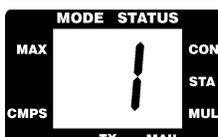
'I' IDLE is next. When on—while in AMTOR or PACTOR—it indicates that although you're connected to another station, no traffic is being transmitted or received.
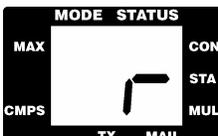
'r' comes on when an error has occurred and the DSP 'Requests' a re-transmission.
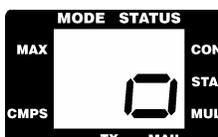
'o' Stands for OVER and lights up when the DSP goes from transmit to receive while in AMTOR or PACTOR.

Other Indicators
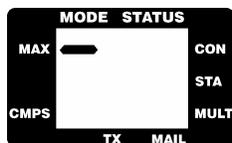
To the left of the Mode LCD display is 'MAX'. This is the abbreviation for Maximum Throughput. This will light when PACTOR data is being throughput as fast as the mode allows. When in PACTOR, with the 'P' showing in the Mode area, you will be able to distinguish the top line of the 'P' from this slash because the 'MAX' slash will blink.
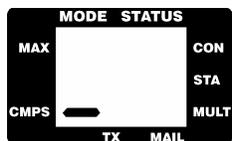
Also on the left is 'CMPS.' This is the abbreviation for Compression. This will light when data is compressed in PACTOR.

There are three abbreviations to the left of the STATUS portion of the window: CON, STA, and MULT.
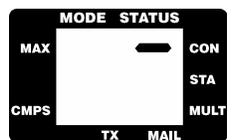
CON is the abbreviation for CONnected, and glows while you're connected to another station while in packet.
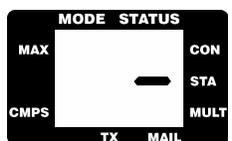
STA is the abbreviation for STAtus, and glows while in packet when you've sent a packet that hasn't been acknowledged (*ack*ed) by another station, yet.
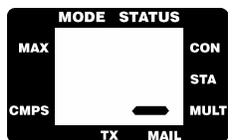
MULT is the abbreviation for MULTiple. It glows constantly while you're chatting (connected) with more than one station at a given time while in packet. When the MULT light blinks, it means that the DSP's memory (32K standard, expandable to 256K) buffer is full.

✎ **Note**: the buffer can be filled with or without the computer connected to the controller since the DSP's buffer stores whatever it hears from the radio—not just the computer.

At the bottom of seven-segment LCD displays are two dots labeled: TX and MAIL.
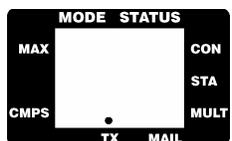
TX stands for Transmit. This LCD dot will glow when you are transmitting data in any mode.
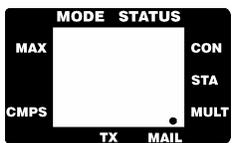
Mail stands for Mailbox. This LCD dot will blink when you have mail waiting for you in your mailbox.

Moving to the right is the tuning indicator. When you tune a signal, the LEDs behind the tune window will light a certain way to tell you whether you're tuned above or below the frequency of the signal you're trying to receive. The 'Mark' and 'Space' above the TUNE window denotes which way the Mark and Space tones are. With the LEDs glowing, you'll refer to the Mark and Space to see if the tones are above or below frequency.

Next is DCD, which means Data Carrier Detect. In HF, whenever your DSP hears anything—be it noise or someone else's signal—the LED will glow providing that the threshold is adjusted correctly. If it doesn't glow, then it means that the DSP can't 'hear' any signals. In 1200 and 9600bps VHF packet, the light only glows if a valid packet signal is heard.

Just to the right is OVL, which means Overload. When the DSP's threshold is too high, the Overload LED will glow. Too much volume will allow an excessive amount of noise into the DSP. If this occurs, turn the volume on the receiver down.

The last LED on the right is the ON indicator. When this LED is glowing, your DSP is being supplied with power.

To the right is the ON/OFF power switch. With it in, the DSP powers up; out, it's off.

The Back
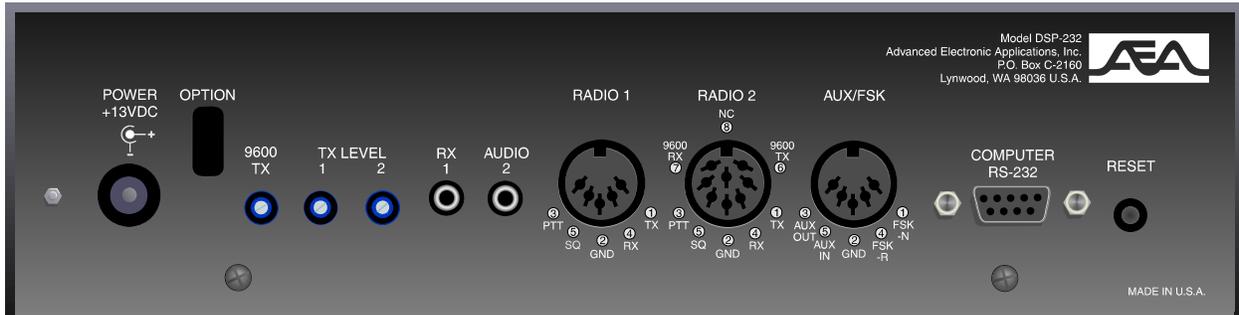
Rear view of the DSP-232

Turn the DSP around so you can see the back. AEA feels that the back of the unit is just as important as the front. The attention to the back of the unit makes the DSP compatible with the equipment you have now, the equipment you will buy in the future, offers convenient adjusting, and provides upgradability for future applications.

Starting from the left again and moving to the right is the station ground stud. This convenient stud provides a ground for the equipment in your station.

Next is the 12 VDC POWER receptacle. The center pin is (+) and the ring, or outside, is (−).

Moving to the right are three transmit level adjustments. One for 9600 bps on radio port two, one for radio port one, and one for radio port two.

RX AUDIO 1 is where the audio output from your receiver or transceiver will go if you don't (or can't) use Pin 1 of the RADIO 1 connector. Use this jack if you have a short-wave receiver or just want to listen with your transceiver.

RX AUDIO 2 has the same function as RX AUDIO 1, but for RADIO 2 port.

The RADIO 1 connector is where you'll plug in the radio transceiver you plan to designate as Radio 1. (Pins 1 and 5's locations in that jack are marked under the connector.)

The RADIO 2 connector is where you'll plug in the radio transceiver you plan to designate as Radio 2. (This is an eight Pin DIN, equipped to accommodate 9600 bps applications.)

AUX/FSK is used when you want to hook up auxiliary equipment to the controller or want to use FSK (Frequency Shift Keying) with your HF radio's accessory port—if it has one.

The RS-232 I/O receptacle is where you'll plug in the cable that connects to your computer.

Finally, the there is the RESET button which allows you to perform a hard reset on the DSP-232.

This ends your tour of the DSP. Let's move on to the next chapter to hook up your computer and radio.

Chapter 2

Power Supply and Computer Installation

Overview

In this chapter, you'll power up the DSP and connect it to the RS-232 serial port of your computer. After the connection has been made, you'll perform a quick check of the DSP's internal firmware. You'll also check the DSP's internal modem by performing the all-important "loop-back" test. When you've completed this chapter, you'll be ready to connect the DSP to your receiver or transceiver and begin using it on the air.

Connecting Power

Before you hook up to your computer, you need to connect power to your DSP. To prevent any potential accidents, make sure your power supply is off and unplugged before connecting the DSP to a live power source.

(If you have a ready-made power supply, like AEA's AC-4, insert the coaxial connector into the DSP's POWER receptacle, plug the "power cube" into the wall, skip this rest of the section and go to the *Turning it On* section below. DO NOT CONNECT YOUR COMPUTER YET.)

Locate the power cable in the accessory bag—the one that's black but has a white strip running down the length of one of its conductors—and strip off just enough insulation from the ends of both conductors to connect it to your 12-14 VDC *regulated* power supply.

! **VERY IMPORTANT**: your power supply must provide at least 12 VDC @ 1A *under load* to the DSP for it to operate correctly.

Fasten the positive (+) lead—the one which has the white stripe running down its length—to the (+) terminal of your power supply. Connect the other conductor to the negative (−) terminal of your power supply. Insert the coaxial power plug into the POWER receptacle on the left rear of the DSP. DO NOT CONNECT YOUR COMPUTER YET.

Turning it On

With the power connections made, turn on your power supply (or plug in the power cube into the wall outlet) then depress the POWER switch on the front of the DSP. WATCH CLOSELY FOR THE FOLLOWING: the power LED to glow, the 'AU' (AU stands for Autobaud) to light in the 7-segment Mode and Status windows, and the tune bar LEDs to become active. If this occurs, then switch off the DSP and move on to the section, *Connecting Your Computer to the DSP*. If the above doesn't happen, then go to *Chapter 13 - Troubleshooting*.

✎   **Note**: If something other than 'AU' glows, the controller probably has been previously initialized and should be reinitialized as described below.

Re-Initialization

If the DSP has been previously initialized, it's ready to communicate with a computer or terminal at a specific baud rate (probably 300, 1200, 2400, 4800, 9600 or 19,200bits/sec) or was shut off in the last mode it was operating in, like packet or Morse. **Reinitializing the controller will make it "forget" all of its user-defined parameters and will return it to its factory default settings**. However, by reinitializing it now you'll have an easier time getting it up and running later.

To re-initialize the DSP:
1. Turn power off (power button out.)

2. Press and hold the RESET button on the back panel of the DSP.

3. Continue holding the RESET button and turn the DSP on (power button in.)

4. Continue holding the reset button in for five seconds to insure that the controller's memory has forgotten all of its previously set parameters.

5. Release the reset button and the unit has been re-initialized.

If the above procedure didn't restore the proper start-up operation of the DSP's front panel LEDs, then refer to *Chapter 13 - Troubleshooting*.

Connecting Your Computer to the DSP
Make sure that the DSP and computer are turned off before proceeding.

The Cable
For communication to take place between your computer and the DSP, you need a properly wired, shielded cable that'll connect the computer's serial port to the RS-232 I/O port on the back of the DSP. (The cable that accompanies your DSP is pinned correctly and is ready to use.)

The style of connector you have on your computer is probably a DB-25F (25-pin), a DB-9 (9-pin), or a mini Din-8 for Apple computers (8-pin).

Here's a table of pin assignments to wire the DSP's RS-232 I/O port to a typical computer's serial port see diagram on next page:

from DSP-232 RS-232 I/O	to... DB-25F	DB-9	Apple mini-DIN-8P	Function
1	8	1	2	(DCD)
2	3	2	5	(RxD)
3	2	3	3	(TxD)
5	7	5	4+8	(GROUND)
6	6	6		(DSR)
7	4	7		(RTS)
8	5	8		(CTS)

COMPUTER
RS-232
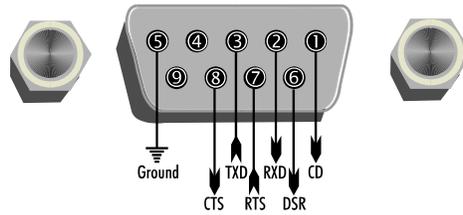
Don't use a "null modem" cable. This type of cable flips pins 2 & 3 so that pin 2 on one end of the cable is connected to pin 3 on the other end (and vice versa.) Use a cable that has "straight through" connections like the ones used to connect computers to a telephone modem since as far as your computer's concerned, the DSP *is* a modem.

Once you've tested the cable to make sure it's pinned correctly, plug one end into your computer's serial port and the other end to the RS-232 I/O port on the back of the DSP, then proceed to the *System Start-up and Loopback Test* later in this chapter.

✎   **Note**: The enclosed computer cable was designed to connect directly to a 9-pin, IBM-PC/XT/AT compatible computer's RS-232 port. Some less-common machines are listed below.

Apple Computers
If you own an Apple Macintosh or Powerbook-type computer, simply purchase a standard mini-DIN8 to DB-9 modem cable.

Dumb Terminals
If you have an RS-232 "dumb" computer terminal, you may need to change the gender of the cable provided with your DSP. This can be done with an inexpensive double-male RS-232 gender changing adapter available from Radio Shack (part number 26-1388, Radio Shack Port Adapter) as well as other computer dealers.

The Computer
If the type of computer you plan to use with the DSP wasn't mentioned earlier in this chapter, you may find specific connection information below. You'll also need a communications program to use with your computer. See *The Control Program* section below for information regarding communication programs for many of the above machines.

Many computers require a serial port adapter card that incorporates the necessary RS-232-C interface circuitry; The IBM-PC is a good example of this. Computers that don't have a serial port or permit use of a suitable adapter or level converter can't be used with the DSP.

Other Computers with RS-232 Ports
If your computer has an RS-232 port, consult your computer manuals to see which pins are used for TxD, RxD and signal ground. Read the manufacturer's recommendations for connecting the serial port to a telephone-type modem and connect your DSP the same way.

The DSP-232 is configured as Data Communications Equipment (DCE)—it transmits data on pin-2. Most computers and terminals are configured as Data Terminal Equipment (DTE) transmitting data on pin-3.

If your computer is configured as Data Terminal Equipment (DTE), use the supplied RS-232 cable with a gender changing adapter, if necessary. These are available from Radio Shack (part number 26-1388) and other computer stores.

Other Computers with Non-Standard Serial Ports
Computers with non-standard serial ports must meet the following conditions:
- ♦ The signal levels must be compatible with RS-232-C. The DSP requires the voltage levels from the computer be greater than +3 volts in the "asserted" state and 0 volts or less in the "non-asserted" state.
- ♦ The signal polarity must conform to the RS-232-C standard. The 0 or negative-voltage state must correspond to logical "1" and the positive-voltage state to logical "0."
- ♦ The computer must be able to correctly receive a signal that meets asynchronous RS-232-C specifications. The DSP supplies signals that meet this specification.

Make or buy a cable that provides the following connections:
- ♦ The computer's serial port signal ground or common pin must be connected to the DSP's serial port connector, pin 5.
- ♦ The pin on which the computer SENDS data (TxD) must be connected to the DSP's RS-232 connector, pin 3.
- ♦ The pin on which the computer RECEIVES data (RxD) must be connected to the DSP's RS-232 connector, pin 2.

If your computer requires any other signals, you must arrange to provide them. The DSP has the standard hardware handshake lines available. As a default, the DSP provides XON/XOFF software flow control to the computer or terminal. The command, XFLOW, can be turned off, disabling software flow control and enabling hardware handshake if your computer requires it. Hardware flow control is achieved with RTS/CTS (pins 7 and 8) of the DB-9 RS-232 I/O connector. The documentation provided with your computer or serial card should clarify any special requirements.

Peripherals and IRQ Conflicts in IBM-PC Compatibles
On a different note, you need to survey your computer system to see what peripherals are connected to it, both internally and externally. This is important since you can't connect the DSP to a COM port that's shared or occupied by another device like a modem, fax, or mouse card. For example, you may not be able to connect your DSP to COM 1 if COM 3 is occupied by another device; the same holds true with COM 2 and COM 4. COM ports are usually paired, meaning COM 1 "sees" what's connected to COM 3, and COM 2 sees what's connected to COM 4.

The reason why you have to be careful with COM port pairs is due to something called an Interrupt ReQuest (IRQ) conflict—devices and peripherals send a distinct set of signals back to the CPU to interrupt its operation when the device needs "attention." When two devices have the same IRQ codes, their signals fight for the CPU's attention and cause all kinds of trouble. Therefore, if COM 1 or COM 3 are occupied, connect the DSP-232 to COM 2 or COM 4 if you can. If you can't, you'll have to change the hardware (and software) to another IRQ so the shared devices can "live together" on the paired port. Changing the device's IRQ from 3 to 5 usually works. (Refer to the device's manual for changing its IRQ setting.)

Along the same lines as conflicts, sometimes a TSR (Terminate and Stay Resident) program can cause a communication problem between the DSP and your computer. Therefore, when setting up your controller for the first time, disable all of your TSRs to eliminate any potential start-up problems. An easy way to do this is to create a system disk on "floppy" (in DOS, type FORMAT A: /S to create a system disk), start-up your computer from that, then access the communications program you plan to use with your controller.

To prevent programs from automatically booting in your Macintosh or Powerbook, simply hold down the (SHIFT) key on power-up until you see the `Welcome to Macintosh, Extensions Off` message.

The Control Program
If you are going to use the PC PakRatt for Windows program supplied with your DSP-232, you will follow the instructions in the PC PakRatt for Windows manual to install the software on your computer. If you'll be using your DSP with a dumb terminal, you won't need any software and can skip to the next section, *System Start-up and Loop-back Test*.

The DSP operates in much the same manner as a telephone modem so most telephone modem terminal programs will work with your DSP. Some of these programs are in "Public Domain" which means they're free. Other terminal programs are "shareware" which means you may get them from a friend and try them before you buy them.

Follow the installation directions that come with the terminal program you plan to use. Once installed on your computer, you should start the program and set its parameters to:
- Data Rate = 1200 bits per second (Baud)
- Data bits/word length = 7
- Parity = EVEN
- Stop bits = 1
- Duplex = FULL
- Handshake = XON/OFF

✎ **Note**: Early version of PC PakRatt for Windows 2.0 do not list the DSP-232 in the TNC menu. To operate your DSP-232, you will select the DSP-1232 from the TNC menu. To PC PakRatt for Windows, your DSP-232 'looks' just like a DSP-1232. Later versions of PC PakRatt for Windows have the DSP-232 listed in the TNC menu. THIS IS THE ONLY DIFFERENCE BETWEEN EARLY AND LATE RELEASES OF PC PAKRATT FOR WINDOWS version 2.0.

✎ **Note**: as a default, the DSP provides XON/XOFF software flow-control to the computer or terminal. The DSP command, XFLOW, can be turned OFF to disable software flow control and enable hardware handshake if your computer requires it. Hardware flow control is achieved with RTS/CTS (pins 7 and 8) of the DB-9 RS-232 I/O connector.

IBM PCs and Compatibles
Although you can use almost any terminal program with your IBM-PC or compatible computer, AEA currently sells *PC-Pakratt-II for DOS* and *PC-Pakratt for Windows*; programs which provide many features not available in telephone modem programs. (Call AEA's 24-hour Literature Request line at 800-432-8873 and leave a message.) Of course, you already own PC PakRatt for Windows.

If you already have one of AEA's PakRatt programs, follow the instructions in the program's manual to install the software on your computer. For initial checkout of the DSP, use the programs' Dumb Terminal mode.

A partial list of PC programs tested with the DSP includes: PROCOMM Plus, LANLINK, PC PakRatt for Windows 2.0 and 1.0, PC PakRatt II for DOS, YAPP, and the terminal program included with Microsoft Windows 3.1.

Apple Macintosh and Powerbooks
Although you can use almost any Macintosh-based terminal program with your Macintosh or Powerbook, AEA presently sells the *MacRATT* program which provides many features not available in telephone modem-type programs. Again, call or write AEA for more information.

If you already have *MacRATT*, follow the program's manual to install the software on your computer. For initial checkout of the DSP, use *MacRATT*'s Dumb Terminal mode.

As we mentioned above, an AEA program is not required to use the DSP with your Macintosh or Powerbook. A partial list of Macintosh programs tested with the DSP includes: MAC TERMINAL, RED RYDER, MICROPHONE II, SMARTCOMM II and MOCK TERMINAL.

System Start-up and Loop-back Tests
Make sure that you've connected your DSP to an adequate power supply and to the RS-232 port of your computer or terminal.
Radio Port 1 Test

1. *Don't* connect any cables to your radio yet!
2. If a loop-back jumper is included with your shipment of the DSP-232, plug one end into the 1 hole (TX) and the other end into the 4 hole (RX) of Radio 1 port on the back of the DSP-232, and go to step 7. If you did not receive a loop-back jumper, continue following the steps.

RADIO 1

Insert Loop-back jumper in holes 1 and 4

3. Remove one of the 5-wire, shielded radio cables from the DSP accessory bag. If you have a single 10-Ft. cable with 5-pin connectors on each end, cut the cable to the length you need to reach your primary radio.
4. With your pocket knife or wire strippers, remove about an inch (2.5 cm) of cable jacket exposing the five colored wires and the shield-wire, being careful not to accidentally nick the wires' insulation.
5. Strip about 1/4 inch (7 mm) of insulation from the green and white wires and short them together by twisting gently twisting their ends together.
6. Plug the cable into the 5-pin RADIO-1 socket on the DSP's rear panel. Make sure that the cable at the connector end faces downward as it leads away from the controller.
7. Set the RADIO 1 AFSK LEVEL pot on the rear of the DSP to 50% rotation (straight up and down) using a small screwdriver.
8. Turn on your computer. Load and run your communications program. (Choose the TTY option, if available.)

If you're using an AEA program, follow its manual's instructions to enter the packet mode, then skip to Step 11.

✎ **Note**: Early version of PC PakRatt for Windows 2.0 do not list the DSP-232 in the TNC menu. To operate your DSP-232, you will select the DSP-1232 from the TNC menu. To PC PakRatt for Windows, your DSP-232 'looks' just like a DSP-1232. Later versions of PC PakRatt for Windows have the DSP-232 listed in the TNC menu. THIS IS THE ONLY DIFFERENCE BETWEEN EARLY AND LATE RELEASES OF PC PAKRATT FOR WINDOWS version 2.0.

✎ **Note**: You may use a wide range of terminal baud rates with the DSP, but we recommend 1200 baud now to keep this procedure easy and consistent.

9. Press the DSP's power switch to the ON position.
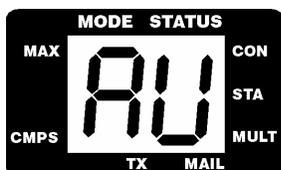
The seven segment LCD symbols 'AU' (AU stands for Auto Buad) will light. (If the above doesn't happen, then refer to *Chapter 13 - Troubleshooting*.

If your serial port is operating at 1200 baud (this is the terminal baud rate), 7-bit even parity as recommended, you'll see the following message:

```
Please type a star (*) for autobaud routine.
```

If your serial port is operating at 2400, 4800, 9600, or 19,200 baud (this is terminal baud), you may see some "garbage" characters. This is normal and you should proceed with Step 10.

10. Type an asterisk (*). When the DSP has recognized your computer's data rate, its 'AU' lights will glow as in the picture above. Your screen will then display the following sign-on message:

```
AEA DSP-232 Data Controller
Copyright (C) 1995 by
Advanced Electronic Applications, Inc.
Release DD.MMM.YY

cmd:
```

"cmd:" is the DSP's system prompt. When you enter (or have entered) a command, you'll see this prompt.
Important: *When you enter a parameter or command, type it after the prompt, press the* (SPACE) *bar once, enter the command's "argument"* (*the variable or text you're changing*) *if appropriate, then press* (RETURN).

At this point the DSP-232 is in its default mode: 1200 bps VHF Packet.

11. Set the DSP to RADIO PORT 1 by typing RADIO 1 (or RAD 1) at the cmd: like this:
RAD 1

11. Enter the following text after the cmd: prompt to set your test callsign to *AAA*:
MYCALL *AAA*

After you've entered this, the DSP will print the following on the screen:
```
MYcall was DSP232
MYcall now AAA
```

12. Enter the following command to "connect" to AAA: (the DSP-232 recognizes the letter C to mean "connect to...")
C *AAA*

After a few moments, your monitor should display:
```
        *** CONNECTED to AAA
```

13. Type *Hi, there!*, then press (RETURN). Your monitor should echo the same message.

If you've gotten this far, then the DSP and its VHF packet modem is working properly. If you're having difficulties, see *Chapter 13 - Troubleshooting*.

14. You'll now check the DSP's HF modem. Enter a (CTRL-C) so you'll return to the Command mode. After the cmd: prompt, enter:
DISCONNECT

The command HBAUD (or HB for short) controls the data rate of the DSP-232. Currently, the DSP-232 is in 1200 bps (HBAUD 1200) VHF Packet. You want to be in 300 bps HF Packet. After the cmd: prompt, enter:
HB *300*

Your monitor should respond with:
```
HBAUD was 1200
HBAUD now 300
cmd:
```

15. Enter the following command to "connect" to AAA:
C *AAA*

16. Type *Hi, there!*, then press ENTER or RETURN. Your monitor should echo the same message.

17. Now you'll exit out of the packet mode. The following command will force the DSP to "disconnect" from a station and exit the packet mode:
(CTRL-C)

```
cmd:D
```

The DSP-232 recognizes the letter *D* to mean "disconnect from..."

Your monitor should respond with:
```
cmd:***DISCONNECTED: AAA
AAA*>AAA (UA)
```

If all of the above steps were successful, you've completed the system check-out for Radio Port 1. Press (CTRL - C) and the `cmd:` prompt will display on your screen. At the cmd:, type RESET.

If you experienced problems with the above procedure, go back to Step 1 *after* checking all the cables and connectors for proper wiring, continuity, and connection. Read each step again carefully. The most common errors made during this procedure are: trying to connect to a callsign different from *AAA*; not having the green-and-white wires connected; or not setting the AFSK level to 50% rotation.

Radio Port 2 Test

Now you need to perform the Loop-back test for Radio Port 2. You will do the VHF and HF Packet tests just as you did before, plus you will test the 9600 bps VHF Packet modem on Radio Port 2.

1. Take the Loop-back jumper that came with your DSP-232, or the jumper you crafted for the previous test an plug one end into 1 hole (TX) and the other end into the 4 hole (RX) of the 8-pin RADIO-2 socket on the DSP's rear panel. This is the 1200 bps VHF & 300 HF Loop-back jumper placement shown below. You will use the 9600 bps placement later in this section.

9600 bps Loop-back jumper placement.

1200 bps VHF & 300 HF Loop-back jumper placement.
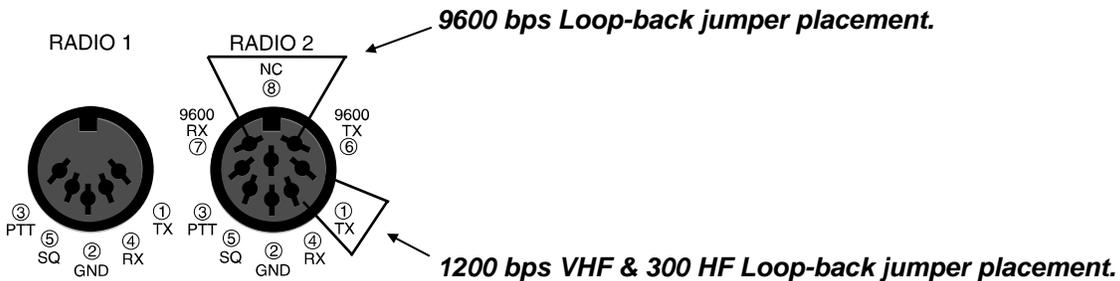
2. Set the RADIO 2 AFSK LEVEL pot on the rear of the DSP to 50% rotation (straight up and down) using a small screwdriver.

The seven segment LCD symbols 'AU' will light. If the above doesn't happen, then refer to *Chapter 13 - Troubleshooting*.

If your serial port is operating at 1200 baud (this is the terminal baud rate), 7-bit even parity as recommended, you'll see the following message:
```
Please type a star (*) for autobaud routine.
```

If your serial port is operating at 2400, 4800, 9600, or 19,200 baud (this is terminal baud), you may see some "garbage" characters. This is normal and you should proceed with Step 10.

3. Type an asterisk (*). When the DSP has recognized your computer's data rate, its 'AU' lights will glow as in the picture above. Your screen will then display the following sign-on message:

```
AEA DSP-232 Data Controller
Copyright (C) 1995 by
Advanced Electronic Applications, Inc.
Release DD.MMM.YY

cmd:
```

At this point the DSP-232 is in its default mode: Radio Port 1, 1200 bps VHF Packet.

4. Enter the following text after the `cmd:` prompt to switch to Radio Port 2
   RAD 2

5. Enter the following text after the `cmd:` prompt to set your test callsign to *AAA*:
   MYCALL *AAA*

After you've entered this, the DSP will print the following on the screen:
```
MYcall was DSP232
MYcall now AAA
```

6. Enter the following command to "connect" to `AAA`: (the DSP-232 recognizes the letter C to mean "connect to...")
   C *AAA*

After a few moments, your monitor should display:
```
        *** CONNECTED to AAA
```

7. Type *Hi, there!*, then press (RETURN). Your monitor should echo the same message.

If you've gotten this far, then the DSP and its Radio Port 2 VHF packet modem is working properly. If you're having difficulties, see *Chapter 13 - Troubleshooting*.

8. You'll now check the DSP's Radio 2 HF modem. Enter a (CTRL-C) so you'll return to the Command mode. After the `cmd:` prompt, enter:
   DISCONNECT

After the `cmd:` prompt, enter:
   HB *300*

Your monitor should respond with:
```
HBAUD was 1200
HBAUD now 300
cmd:
```

9. Enter the following command to "connect" to `AAA`:
   C *AAA*

10. Type *Hi, there!*, then press ENTER or RETURN. Your monitor should echo the same message.

11. Now you'll exit out of the packet mode. The following command will force the DSP to "disconnect" from a station and exit the packet mode:
    (CTRL-C)

    cmd:*D*

The DSP-232 recognizes the letter *D* to mean "disconnect from..."

Your monitor should respond with:
```
cmd:***DISCONNECTED: AAA
AAA*>AAA (UA)
```

Now you need to to the Loop-back test for 9600 bps on Radio Port 2. You need to take your wire Loop-back jumper and plug one end into the 7 hole (9600 RX) and the other end into the 6 hole (9600 TX) of Radio Port 2. For those using the cable method (described previously), unplug the cable and take a paper clip, straighten it out, bend it in half, and insert it into RADIO PORT 2 as described above.

12. Set the 9600 TX AFSK LEVEL pot on the rear of the DSP to 50% rotation (straight up and down) using a small screwdriver.

13. Press (CTRL - C). When the cmd: displays on your monitor, type: RESET.

 The seven segment LCD symbols 'AU' will light. (If the above doesn't happen, then refer to *Chapter 13 - Troubleshooting*.

If your serial port is operating at 1200 baud (this is the terminal baud rate), 7-bit even parity as recommended, you'll see the following message:
```
Please type a star (*) for autobaud routine.
```

If your serial port is operating at 2400, 4800, 9600, or 19,200 baud (this is terminal baud), you may see some "garbage" characters. This is normal and you should proceed with Step 10.

14. Type an asterisk (*). When the DSP has recognized your computer's data rate, its 'AU' lights will glow as in the picture above. Your screen will then display the following sign-on message:

```
AEA DSP-232 Data Controller
Copyright (C) 1995 by
Advanced Electronic Applications, Inc.
Release DD.MMM.YY

cmd:
```

At this point the DSP-232 is in its default mode: Radio Port 1, 1200 bps VHF Packet.

15. Enter the following text after the cmd: prompt to switch to Radio Port 2
RAD 2

16. At the command prmopt type:
MODEM 16
This is an alternate means of selecting a modem. We use HBAUD in previous examples, and you could at this point too. But, in an effort to get you familiar with the DSP-232's commands, we had you use the MODEM command. *(After you are done with this entire Loop-back test type DIRECT at the cmd: to see the whole list of modems available for the DSP-232.)*

17. Now to make the Loop-back test work, at the cmd:, type:
HBAUD 9600

18. Now, at the cmd:, type:
    EXPERT ON
    Press (RETURN) and then type:
    UBIT 0 OFF

19. Enter the following text after the cmd: prompt to set your test callsign to *AAA*:
    MYCALL *AAA*

After you've entered this, the DSP will print the following on the screen:
```
MYcall was DSP232
MYcall now AAA
```

20. Enter the following command to "connect" to AAA: (the DSP-232 recognizes the letter C to mean "connect to...")
    C *AAA*

After a few moments, your monitor should display:
```
        *** CONNECTED to AAA
```

21. Type *Hi, there!*, then press (RETURN). Your monitor should echo the same message.

22. Now you'll exit out of the packet mode. The following command will force the DSP to "disconnect" from a station and exit the packet mode:
    (CTRL-C)

    cmd:*D*

If you've gotten this far, then the DSP and its Radio Port 2 9600 bps VHF packet modem is working properly.

If you still have problems after consulting *Chapter 13 - Troubleshooting*, leave your DSP on and call AEA's Technical Support department at (206) 775-7373. If all tests went well, your DSP's modems and Radio Ports are functioning properly. Any problems that arise from this point on will most likely stem from cabling or radio problems. Now, move on to *Chapter 3 Radio Installation*.

Chapter 3

Radio Installation

Overview

This chapter describes how to connect the DSP-232 to your radio receiver or transceiver.

If You Just Want to Listen

If you're a short-wave listener or are only interested in receiving and not transmitting signals, the audio connection to the DSP is simple—just plug one end of the supplied audio cables into either the RX AUDIO 1 or AUDIO 2 jacks on the rear of the DSP (as shown in Figure 3-1 below) and the other end of the cable is into the external speaker/earphone jack of your radio.

✎   **Note**: some short-wave receivers come with low-level outputs designed for use with a tape recorder. These outputs typically *don't* have enough power to drive the DSP circuitry—the DSP needs at least 200 mV$_{p-p}$ for it to operate correctly.

RX AUDIO
1   2

Figure 3-1 Receive audio connections to the DSP.

If You Want to Transmit. . .

. . . you'll need to make the proper connections to your radio's speaker, microphone and the Push-To-Talk (PTT) circuits.

The best way to connect the DSP to your transceiver is through its rear panel accessory port, if it has one—it'll free up the mike jack so you don't have to swap connectors with your mike and the DSP when you want to use either device. If your radio doesn't have an accessory port, use its microphone connector for hook-up.

✎   **Note**: if your controller is connected to your radio's Accessory port and you leave your mike plugged in, if you accidentally key the mike it'll cause your radio to transmit whatever it hears from the DSP.

Radio Connection Requirements

! **Very Important:** MAKE SURE THAT YOU REMOVE POWER FROM YOUR DSP AND RADIO BEFORE   MAKING ANY OF THE FOLLOWING CONNECTIONS.

You'll need the following items to make a radio cable to connect the DSP to your transceiver:

- the AEA-supplied radio cable for each radio you want to connect
- a microphone or accessory-plug connector for your transceiver
- a pin assignment diagram of your radio's microphone and/or accessory port
- a low-wattage (under 40W) soldering iron and solder
- wire cutters, strippers or a small pocket knife

The lines you'll be connecting from your radio to the DSP are:

- **Receive Audio:** carries the audio signals from your radio's internal or external speaker or headphone jack to the DSP. The audio can usually be tapped from a particular pin in your transceiver's mike connector or through your radio's external speaker jack.
- **Microphone Audio (AFSK):** carries the transmit audio signal from the DSP to your transceiver for transmission.
- **Ground:** provides an electrical return-path for the DSP's DC signals.
- **PTT:** when energized—like when you press the button on your mike—it puts your transceiver into transmit.

If your transceiver has these four lines, then you shouldn't have any problem getting your radio to work with the DSP.

Connections for Specific Transceiver Models

Appendix A contains information and diagrams for connecting the DSP to many modern HF and VHF transceivers. Go there to locate the transceiver model(s) you'll be connecting to your DSP and at the same time, refer to your radio's Operating or Owner's manual to verify that the pin assignments are correct. (If you don't find your transceiver listed there, then locate a model from the same manufacturer that has the same accessory or mike connector and pinouts as the unit you'll be connecting—usually each manufacturer has consistent pin assignments so the hook-ups will be the same.)

!   **Very Important:** IF YOU HAVE ANY QUESTIONS OR DOUBT ABOUT YOUR MANUAL'S WIRING DIAGRAM FOR YOUR RADIO OR THERE'S A DIFFERENCE IN THE PIN-OUT DIAGRAMS BETWEEN YOUR RADIO'S MANUAL AND OURS, CALL OR WRITE YOUR RADIO'S MANUFACTURER OR AEA FOR ASSISTANCE.

Basic Connections and Adjustments

The following table (3-1) and figure (3-2) will help you identify the connection points to the DSP's radio cable.

Pin	Signal Name	Wire Color	Description
4	Receive Audio	Green	Audio from your radio to the DSP
1	Microphone Audio	White	Transmit audio from the DSP to your transmitter
5	Squelch Input	Black	Squelch input from radio (optional)
2	Ground	Brown	Audio and PTT common return
3	Push-To-Talk	Red	Keying line to your transmitter
	Shield/Drain Wire	Silver	Shield of cable / Microphone ground
Radio Port 2 has these 9600bps packet connections also			
6	Receive Audio	Green	Audio from your radio to the DSP
7	Microphone Audio	White	Transmit audio from the DSP to your transmitter

Table 3-1 Radio Port 1 and 2 and Cable Connections

RADIO 1   RADIO 2
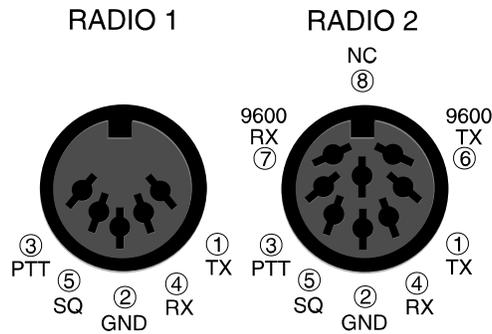
Figure 3-2 DSP to Radio Cable Connections for Radio Ports 1 and 2

If you'll be using a Packet channel that's shared with voice users, then you should connect the black wire to the Squelch status pin of the connector. This will prevent the DSP from transmitting when there's a received signal strong enough to open the squelch. If you connect this pin, you may have to change the setting of the SQUELCH command in the DSP. (Most VHF/UHF Packet operations are no longer shared with voice users so this connection generally isn't needed.)

As an example for determining the Radio cable connection to a radio, let's say you want to hook up an Alinco DR-112 to your DSP. Go to *Appendix A* and turn to the page listing the Alinco radios. There, the DR-112 is listed and to its right—under the Figure column—it refers you to Figure 2 and the Notes column, Note 1. Turn to the first page of the Appendix and read Note 1. It doesn't really apply because if we look at Fig. 2 on the next page, it shows that the green wire in the Radio cable, Receive Audio, is hooked up to pin 6 in the Alinco's mike connector. The brown wire, Ground, is connected to pin 7; the braided cable shield, to pin 8; the white wire, Mike Audio (AFSK) to pin 1, and finally the red wire, PTT, to pin 2.

So, to fashion the radio cable:
1. Locate one of the 5 ft. DSP radio cables included with your DSP.

   ✎   **Note:** that the Radio cables may have been shipped as a single 10 ft. cable which should be cut to length before use.

2. Prepare the bare end of one of the radio cables by removing an appropriate amount of jacket for the mike connector you'll attach. Typically, this is .5 - .75 inches (13 - 19mm).

3. Carefully remove the foil shield exposing the colored wires underneath. *Be careful not to nick or cut the shield wire*.

4. Strip back about .125 inch (7mm) of colored insulation from the green, red, white and brown wires. (Don't strip back the black wire if you don't intend to use it—just cut it short)

5. Feed the connector's backshell over the cable end, then look at the connector closely (with a magnifying glass, if necessary) to locate pin 1. Compare this to the location of pin 1 on the connector drawing in your transceiver's manual and also in *Appendix A*. This is important as some diagrams show the connector from the inside of the transceiver, not the outside of the plug you are wiring. (This will help insure that the plug is not wired backwards.)

6. Warm up your soldering iron and begin wiring.

   ✎   **Note**: when wiring a connector, it's often easier to wire the inside or middle pins first then work your way to the outside pins.

7. Connect the Shield (silver) wire to the mike's ground connection if your transceiver has one. If it doesn't have a separate mike or ground connection, then connect it to the single ground along with the Brown wire. (See the next step.)

8.   Connect the brown wire to the main ground on the connector. This ground is the one used for the PTT and receive audio. You should connect the Silver Shield/Drain wire to this ground *only* if there isn't a separate mike ground as described in the previous step.

For PTT, the DSP keys only positive (+)PTT since most transceivers use this method of keying. If you're connecting a handheld ("handy-talkie") transceiver to your DSP, you'll probably need a resistor and/or capacitor to isolate this connection from the AFSK audio. (Check *Appendix A*).

Connect the green wire to the Receive Audio terminal on the connector. If the connector you're wiring doesn't have Receiver Audio available, then the included 3.5 mm audio cable may be used instead. This cable connects audio from your transceiver's external speaker/earphone jack to the RX AUDIO jack on the DSP. If you're connecting to an Accessory jack, make sure the available level is at least 200 mV$_{RMS}$.

Connections for Direct-FSK on RTTY
Some HF SSB radios provide direct FSK (Frequency-Shift Keying) for RTTY, AMTOR and PACTOR operation.

✎   **Note**: when using narrow filters they can limit the data transfer rate at 110 baud. Consult your transceiver's manual regarding direct FSK operation for further recommendations.

To install and operate your DSP and radio in the FSK mode, connect a shielded cable from the DSP's FSK/AUX (DIN) receptacle, pins 1 or 4, to the radio's FSK input. (See Figure 3-3 below.)

✎   **Note**: polarity of the FSK signals aren't standardized by radio manufacturers—Icom radios most often use FSK-N, while Kenwood radios most often use FSK-R. Consult your transceiver's manual to identify the proper polarity, its power and duty cycle limits so they won't be exceeded.
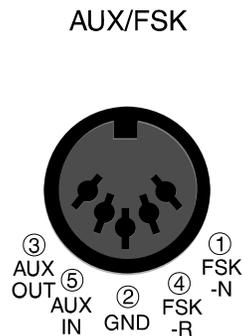
AUX/FSK

Figure 3-3 AUX/FSK Pin Assignments

Transceiver Adjustments

❗   **Very Important:** MAKE SURE YOUR DSP AND RADIO ARE OFF AND ALL THE CABLES ARE CORRECTLY WIRED AND CONNECTED.

This section is split into separate procedures for FM and HF SSB radios. If you're connecting an FM transceiver to one of the radio ports, then we recommend that you adjust that radio, first. This will establish the AFSK level from the DSP. If the only radio you will be connecting is an HF SSB transceiver, then skip the FM section and proceed directly to the *HF SSB Final Adjustments* section.

FM Transceiver Adjustments
1.   Connect a dummy load to your radio and be prepared to monitor your transmissions with another nearby radio such as a handheld transceiver.

✎   **Note**: If you don't have a spare receiver to monitor the tone, a "quick-'n'-dirty" way to set the AFSK level is to turn the AFSK LEVEL pot on the back of the DSP halfway between its stops, but if you happen to have a deviation meter such as AEA's DM-1 Deviation Meter, set the AFSK LEVEL's pot so the DSP's deviation is 3.25 KHz, *peak*.)

2. Verify that your DSP and FM radio(s) are connected as shown in Figure 3-4 and/or 3-5 or 3-6 below.
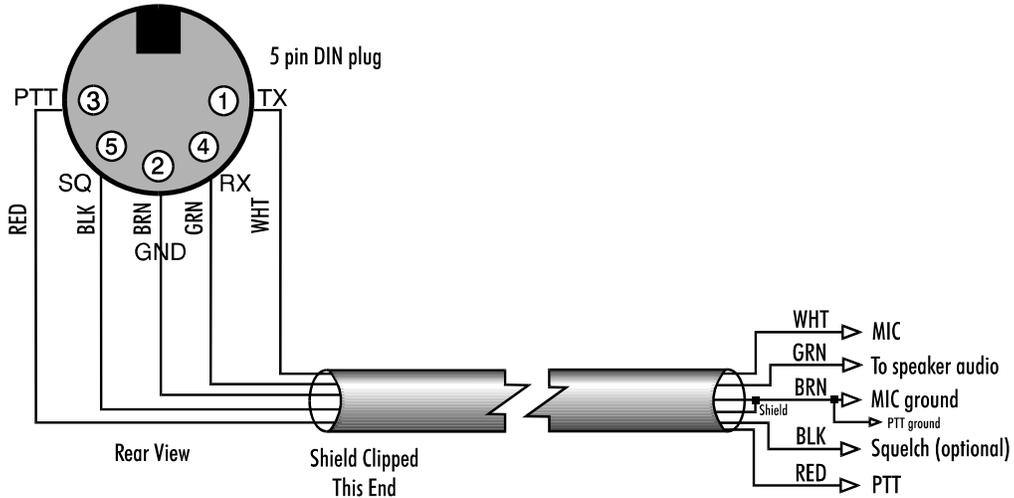
Figure 3-4 Radio-to-DSP Radio Port 1Connections

✎   **Note:** Radio Port 2 can be wired the same as Radio Port one (shown above) or it can be wired specifically for 9600 bps packet operation as in either of the two diagrams shown below. This is the beauty of having both a 5 Pin and 8 pin DIN, you can fit the 5 pin plug into both ports if you don't run 9600 bps packet, and for those you do run 9600 bps you can use Port 2 specifically for this purpose.
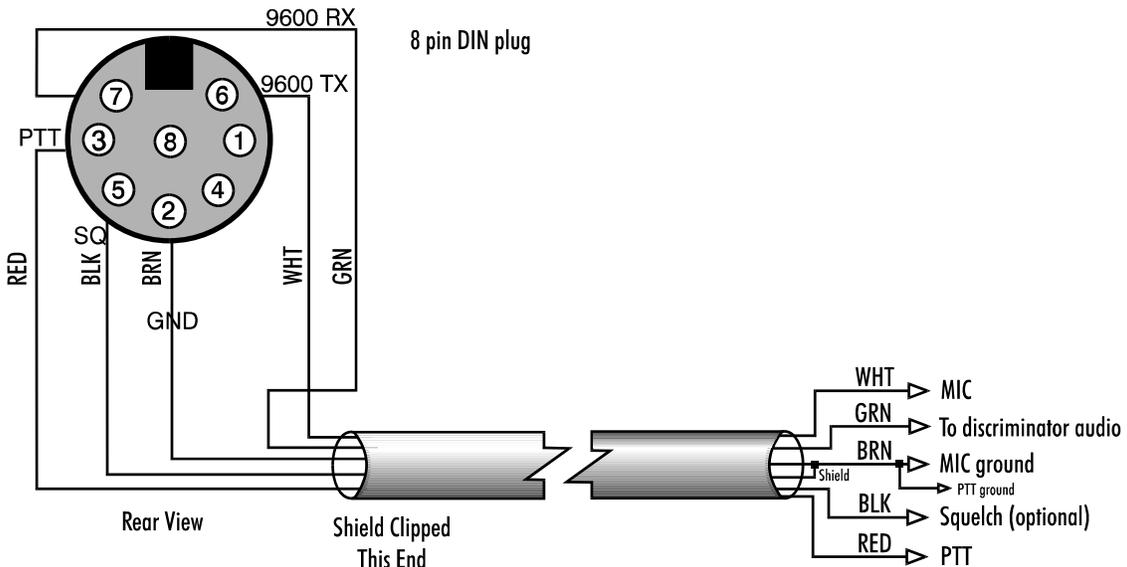
Figure 3-5 Radio-to-DSP Radio Port 2 Connection for 9600 bps packet
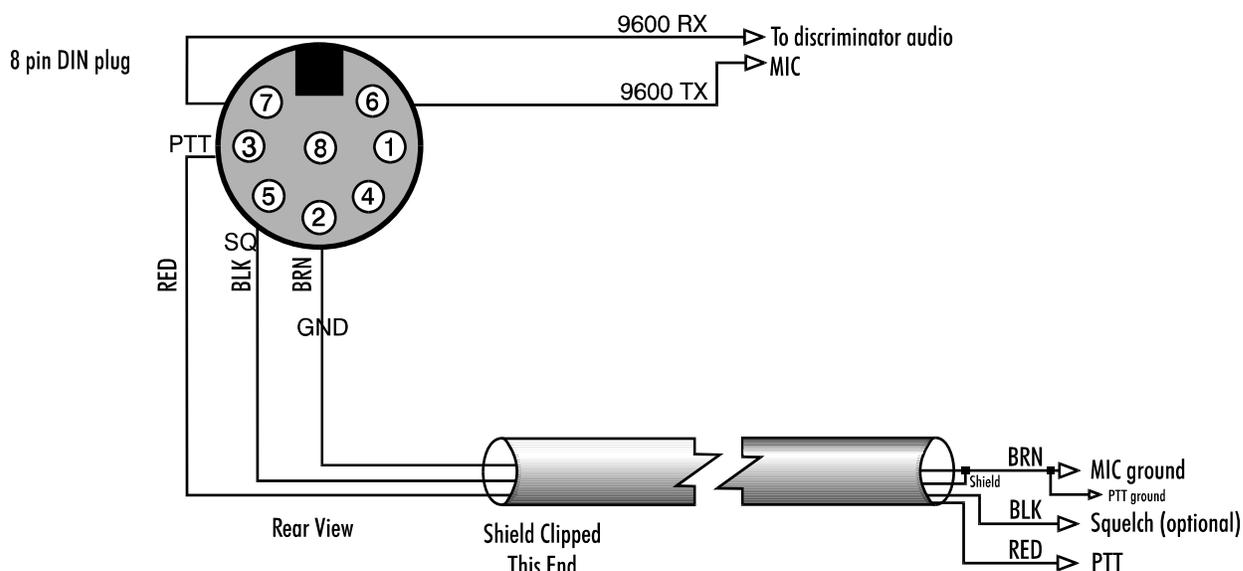
Figure 3-6 Radio-to-DSP Radio Port 2 Connection for 9600 bps packet

3. Turn on your radio and computer. Load your terminal program so that you're operating the DSP in the Dumb Terminal mode.

4. Enter the CALIBRATE mode by entering: *CAL* next to the cmd: prompt.

    In the CALIBRATE mode *only*, the letter *K* toggles the transmitter PTT line on and off; the (SPACE) bar toggles the tone generator from Mark (the lower pitched tone) to Space (the higher pitched tone).

    ✎   **Note**: The DSP has a transmit watchdog timer circuit that unkeys your transmitter automatically after 30 seconds.

5. Press *K* to key the transmitter. You should hear a continuous tone in the spare receiver.

6. Tap the (SPACE) bar several times until the higher pitched of the two tones (Space) is heard.

7. Adjust the transmit audio level as follows:
    a) Set the monitor receiver to your transmitter's frequency and turn up the volume. Turn the DSP's rear-panel AFSK LEVEL pot clockwise until you hear no increase in the audio output level from the monitoring receiver.

    b) Rotate the AFSK LEVEL pot counter-clockwise (CCW) until the audio signal on the monitoring receiver is slightly, but noticeably, reduced.

✎   **Note**:   If you find the "correct" AFSK level setting occurs in the first 20% of the potentiometers range, the adjustment may be difficult. If you find this adjustment difficult, the internal AFSK adjustment level jumper may be moved to the LOW setting which will improve the adjustment range of the potentiometer.

To locate the internal AFSK level jumpers in the DSP-232, remove the six screws that secure the top chassis, and carefully remove it.

Look for jumpers JP10 and JP11 near the fuse at the rear of the DSP-232 as shown in figure 3-6 below. Jumper JP10 controls the output level of radio port 1, and JP11 controls the output level of port 2. When the jumper is towards the right, the output level is high (high and low are printed on the circuit board near the jumper for your convenience). Move the jumper for the radio port

being adjusted to the left two pins to set the AFSK output level to LOWer range. Repeat step 7 when this has been completed.

Figure 3-6   DSP-232 AFSK HIGH/LOW Jumpers

8.   Press *K* to return to receive mode.

9.   Press *Q* to leave the CALIBRATE mode.

10. Enter the packet mode and set HBAUD to 1200 baud. With your radio in the receive mode, set its squelch control "open" so that a steady hash or "white noise" is heard from its speaker.

✎   **Note:** the front panel DCD LED should not be lit.

11. Set the frequency of your FM transceiver to a packet frequency and observe the DCD LED.

12. The DCD LED should light steadily during reception of packets and go out when the channel is clear.

13. This is the proper setting for packet operation. You may now reset your receiver's squelch for normal voice operation.

SSB Transceiver Final Adjustments
Digital modes with an SSB radio require specific settings of the radio's operating controls for proper AMTOR and Packet operation. Be sure to observe the following settings precautions:
   ♦ Set VOX to OFF
   ♦ Set speech compression to OFF
   ♦ Set AGC to FAST (if available)
   ♦ Disconnect the ALC cables between your SSB radio and an external RF amplifier

Baudot, ASCII RTTY, Mode B (FEC) AMTOR, and PACTOR send cause continuous, key-down conditions during the entire length of each transmission. *If your SSB radio isn't designed for continuous transmit operation, you must operate your radio at a reduced power level.* Consult your radio's specifications for details regarding the operating "duty-cycle".

✎   **Note**: make all connections with all power off.

1. Connect your fabricated cable from the DSP's RADIO 1 or RADIO 2 connector to your SSB radio.

2. Connect your SSB radio to a dummy load.

3. Turn on your computer, start its terminal program, enter its Dumb Terminal mode, then turn on the DSP.

4. If your SSB radio has a "monitor" facility that lets you listen to the audio signals entering the microphone or phone patch jacks, turn that monitor circuit on.

5. Switch the radio to LSB (lower sideband).

6. Set the radio's Meter switch to the ALC position. If the radio doesn't have an ALC indication, set the meter switch to I_P or I_C to read the plate/collector current. If a current reading isn't available, set the meter to indicate power output.

7. Enter the CALIBRATE mode by entering: *CAL*

    ✎   **Note**: In the CALIBRATE mode *only*, the letter *K* toggles the transmitter PTT line on and off; the (SPACE) bar toggles the tone generator from Mark (the lower pitched tone) to Space (the higher pitched tone).

    The DSP has a transmit watchdog timer circuit that unkeys your transmitter automatically after thirty (30) seconds.

8. Rotate the microphone gain control CCW so it's off.

9. Press *K* to key the transmitter. Increase the microphone gain control clockwise until hear a continuous tone from the radio's monitor output (through the radio's speaker or headphone jack.)

10. Tap the Space Bar several times until the lower pitched of the two tones (Mark) is heard.

11. Rotate the microphone gain control clockwise from its OFF position about a quarter turn.

12. Turn the DSP's rear-panel AFSK LEVEL pot CW until the ALC meter shows a small deflection from its unmodulated mark. Check the radio's plate/collector current or output power indicators.

13. Adjust the AFSK LEVEL control until the radio's indicators show approximately thirty percent (30%) of the manufacturer's rated full-power reading.

    Example: If the manufacturer's plate/collector current specification for clockwise operation is 200 mA, set the AFSK LEVEL pot and your microphone gain control so that the plate/collector current indicates approximately 75 mA.

14. Press *K* to return to receive mode.

15. Press *Q* to "Quit" (exit) the CALIBRATE routine.

16. Remove the dummy load and connect your antenna line. Then, tune your radio to a clear, unoccupied frequency.

17. Set the receiver's audio volume control (AF GAIN) to the position you would normally use for CW reception. This is the approximate receiver audio output level for best receive performance from your DSP's modem.

18. Adjust the software controlled THRESHLD (default 50) up or down until the DCD light is lit by the noise output from your receiver, then increase it slowly until the DCD light is no longer lit. Alternatively, you can type AUTOTHR at the cmd:, and the DSP will automatically adjust the threshold to the proper setting.

Chapter 4

Terminal Commands

Overview

We know you're ready to get on-the-air, but before you do you should familiarize yourself with the DSP-232's "operating system," a few important commands, some error messages, and its list of available commands.

Most of the commands have a standard (default) value that provide good performance for the mode you select and for an average amateur radio station. Almost all of the commands have initial or default values that are loaded when the DSP is first turned on, but there's no rule that says "you must keep these defaults." You can—and should— change the default values as required for your individual operating needs, type of equipment, and local operating practices or protocols.

Don't be daunted by all the commands that are available to you—an average user needs to understand or change only a handful of them and once set, usually don't need to be reckoned with again. (See EXPERT.) This chapter describes the commands used to control how the DSP-232 communicates with your terminal or PC. Mode specific, MailDrop, and GPS commands are listed and explained in their respective chapters elsewhere in this manual.

There are five TNC control modes you need to be familiar with to make the DSP-232 communicate with your terminal. These are: the Command mode, Converse mode, Transparent mode, Host mode, and KISS mode. Below is a brief desicription of each of these modes. Later in this chapter are the actual commands that you will use to enable the TNC to communicate with the terminal.

Command Mode

Command mode is for configuring and setting the parameters for your TNC. To get to the Command mode if you are in the Converse mode, enter a <CTRL> C. If you are in any of the other operating modes, you can get to the Command mode by entering three <CTRL> C's in quick succession.

Once in the Command mode you will see this— cmd:. You type the system parameters at the cmd: prompt. You will see what you type on the screen, and if you type something wrong, the system will try to help you through the mistake. For example, if you type the wrong type of arguement, such as a numeric value instead of a text arguement, the TNC will respond with— What? If you type a numeric value that is out of the command's range, the system will respond with— Range? See the parameters and arguements explaination below for more information on how to deal with the command arguements. To get a complete list of the TNC's parameters type Disp Z at the cmd: prompt.

Converse Mode

Converse mode is for communicating with someone on the air. Whatever you type on your keyboard will be transmitted by your radio. To enter the Converse mode, type CONVERSE or K at the cmd: prompt.

Once in the Converse mode you will see a cursor on the left-hand side of your screen. As stated previously, whatever you type will be transmitted. You can make changes as to the way your typed messages are transmitted. For example, you can change the settings so that an entire line will be transmitted after a carraige return as opposed

to character by character --these sort of configuration changes are made in the Command mode and are realized in the Converse mode.

Transparent Mode

Transparent mode is used to transfer binary files. No data is echoed, so you don't see the actual data appearing on your screen. The TRANS command switches the DSP-232 from the Command mode to the Transparent mode.

Host Mode

In Command mode, the DSP-232 presents a reasonably user-friendly human interface that uses plain-language to describe exactly what is going on.

All of the DSP-232's Command mode features that make life easy for the user unfortunately produce substantial difficulties for the computer and for the programmers that write terminal control programs.

Host mode does not use human-type dialog. By communicating directly with the 'host' or computer, Host mode provides the computer with much greater direct control over the DSP-232. Host mode permits programmers to eliminate, reduce, or greatly simplify the transfer and subsequent encoding and decoding of critical information. In Host mode, the DSP-232 is unfriendly; humans would find it difficult to operate the DSP in Host mode.

KISS Mode

The DSP-232 provides a simple, asynchronous, computer-to-TNC protocol for a raw HDLC TNC or "KISS" TNC developed by Phil Karn (KA9Q). The computer must provide all AX.25 headers and timing functions. KISS protocol is similar to the Raw HDLC protocol where data from the computer is converted into pure packet frames without adding headers or protocol bytes. However, Raw HDLC is available only in Host mode, whereas KISS is its own mode.

Parameters and Arguments

If a command requires an argument, the type of argument is indicated after the command name as well as its default value. There are three different types of parameters used: Boolean, Numeric, and Text.

Boolean

Boolean arguments use one value out of a choice of only two possible values, such as *ON* or *OFF*, *YES* or *NO*, or *EVERY* or *AFTER*. Boolean arguments can also be changed back and forth (toggled) with an argument of *TOGGLE* or *T*. This is useful, for example, in the case of RXREV and TXREV.

Numeric

An argument designated as "*n*" is a numeric value. Numeric values can be entered by typing them in familiar decimal numbers, or in hexadecimal numbers. When using hexadecimal notation, you must type a $ in front of the number to tell the DSP that this is a "hex" number.

For numeric parameters the arguments *ON* or *Y* set the parameter value to its default. Arguments *OFF* or *N* set the value to zero. The *UP* (*U*) or *DOWN* (*D*) can be used to select the next higher or lower baud rate.

Text Arguments

A text parameter, such as the CTEXT message, can hold most any ASCII character including uppercase and lowercase letters, numbers, spaces, and punctuation.

Some commands, such as CONNECT, require callsigns as arguments. These arguments are usually callsigns, but may be any string of numbers of at least one letter (and up to six characters) in length. Some commands, such as CFROM, have arguments which are actually lists of callsigns. You must separate multiple callsigns with either spaces or commas.

Changing Commands

As you skim through the list of commands, you'll notice that the first few characters in the command are capitalized and the rest aren't. The capitalized letters indicate the minimum abbreviation for a command. For example, with the command DISPlay, DISP, DISPL, DISPLA and DISPLAY will all be accepted. You can also enter commands using lowercase, uppercase, or a combination of lowercase and uppercase letters. Most people find it preferable to enter their commands in lowercase, but for emphasis the commands in this manual are printed in uppercase.

When you change a command's value, the DSP will let you know a change has been made and the change will be automatically saved and an appropriate response will be generated. Say you want to enter your callsign. You'd enter your callsign after the `cmd:` prompt by typing MYCALL [*call*]. If your callsign is WF7A, then this is what you'll type:

    `cmd:` MY *WF7A*

The DSP's response will be:

    MYcall: was DSP232
    MYcall: now WF7A
    cmd:

If you turn off or remove the power cord from your DSP, it will still remember the change(s) you've made. Also, all commands that accept values or parameters may be typed without any arguments to check their present setting. For example, if you enter EXPERT after the `cmd:` prompt, you'll see:

    cmd: EXPERT
    cmd: Expert ON

This means that the DSP is currently set to use VHF (or UHF) tone pairs.

If, while changing timing commands and such, you find that you've "dug yourself into a hole" and the DSP doesn't work as well as it did before, enter REINIT—it'll reinitialize most of the commands to their default settings and perform a RESTART, but it *won't* lose the contents of the MailDrop or NAVTEX message history.

List of General and Terminal Related Commands

Commands are listed alphabetically with their descriptions. Each command entry contains several fields of information: Command Name, Default Value, Mode(s) in which the command is used, Host mode abbreviation (for Host mode programmers), and Parameters. The default value is listed first.

5Bit   Immediate Command
                                                                                   Host: 5B

5BIT is an immediate command allowing the user to store 5-bit Baudot transmissions received then write a program to decrypt codes that involve bit inversion or transposition. In 5BIT, a constant of $40 (64 decimal) is added to each received 5-bit character to make it a printable ASCII character in the range of $40-5F. All characters are treated this way, including CR, LF, LTRS, and FIGS.

When the user enters 5BIT, the DSP-232 displays "OPMODE now BAUDOT". This is not strictly true; however, the 'b' for Baudot will glow in the Mode window.

RXREV, RBAUD, and the MODEM number must be set properly for the monitored transmission. SIGNAL is helpful in determining whether a transmission is 5-bit and the setting for RBAUD and RXREV, but typing OK after SIGNAL selects BAUDOT, not 5BIT.

Do not change modes directly between BAUDOT, 5BIT, and 6BIT. Go through some other mode first, such as Packet. There commands do not function in 5BIT: BITINV, CODE, MARSDISP, TRACE, USOS, WRU, and XMIT.

6Bit   Immediate Command
                                                                                   Host: 6B

Same as 5BIT, except that the unit receives a 6-bit code and adds a constant of $30 (48 decimal) to yield a range of $30-6F. RXREV and RBAUD must be set correctly. SIGNAL is helpful in determining whether a transmission is 6-bit and the settings for RBAUD and RXREV, but OK will not automatically select 6BIT.

When the user enters 6BIT, the DSP-232 displays "OPMODE now BAUDOT". This is not strictly true; however, the 'b' will glow in the Mode window.

Do not change modes directly between BAUDOT, 5BIT, and 6BIT. Go through some other mode first, such as Packet. There commands do not function in 6BIT: BITINV, CODE, MARSDISP, TRACE, USOS, WRU, and XMIT.

ACRDisp *n*   Default: 0
                                                                                                      Host: AA

"*n*"   1 to 255 specifies the screen width, in columns or characters.
0   Disables this function.

The numerical value "*n*" sets the terminal output format for your needs. The DSP sends a (RETURN) + [LF is optional] (LF) sequence to your computer at the end of a line in the Command or Converse modes when "*n*" characters have been printed on the computer screen. Most computers and terminals do this automatically so ACRDISP defaults to *0*.

When the DSP is in the MORSE mode, received data will be broken up on word boundaries, if possible. At a column of 12 less than the ACRDISP value, the DSP starts looking for spaces in the received data. The first space received after this column forces the DSP to generate a (RETURN). If ACRDISP is *0* (default), this occurs at column 60. If there are no spaces at—or after—this column, then a (RETURN) occurs at ACRDISP.

For example: pretend you're sitting in front of typewriter and you set it's right-margin at 60 (characters). This is like setting ACRDISP to *60*. As you reach, and pass, character 48—the "12 less than ACRDISP" value—the DSP will look for a space between the words you're typing in. When it sees this space, it'll force a (RETURN) to put you on the next line. If the DSP *doesn't* find any spaces between 48 and 60, or if ACRDISP is set to zero, it'll force a (RETURN) at *60*.

ADDress *n*   Default: $0000
                                                                                                      Host: AE

"*n*"   Zero ro 65,535 ($0 to $FFFF) setting and Address in the DSP-232 memory.

The ADDRESS sets an address somewhere in the DSP-232's memory map. This command is usually used with the IO, MEMORY and the PK commands. It is used primarily by programmers and is of no use for normal DSP-232 operation.

AFilter *ON*/*OFF*   Default: OFF
                                                                                                      Host: AZ

ON   The ASCII characters in the MFILTER list are filtered out and not transmitted.
OFF   The ASCII characters in the MFILTER list are filtered from monitored packets only.

Some terminals and computers use special characters to clear the screen or perform other "special" functions. Placing these characters in the MFILTER list, and turning AFILTER *ON*, will keep the DSP from transmitting them.

! **Exception**: when ECHO is *ON* and the computer sends a filtered character, the DSP will echo it back to your terminal or computer.

AFILTER works regardless of mode, or COMMAND/CONVERSE/TRANSPARENT status. Leave AFILTER *OFF* during binary file transfers.

ALFDisp *ON*/*OFF*   Default: ON
                                                                                            Host: AI

ON   A line feed is sent to the terminal after each (RETURN).
OFF   A line feed *isn't* sent to the terminal after each (RETURN).

ALFDISP controls the display of (RETURN) characters received, as well as the echoing of those that are typed in.

With ALFDISP *ON*, the DSP adds a line feed (LF) to each (RETURN) it sends to the terminal, *if needed*. If an LF was received either immediately before or after a (RETURN), ALFDISP won't add another LF. Use the DSP's sign-on message to determine how (RETURN)s are being displayed.

✎ **Note**: ALFDISP affects your display, *not* transmitted data.

  ♦ Turn ALFDISP *ON* if the DSP's sign-on message lines are typed over each other.
  ♦ Turn ALFDISP *OFF* if the DSP's sign-on message is double spaced.
  ♦ ALFDISP is set correctly if the DSP's sign-on message is single spaced.

ANalog   Immediate Command
                                                                                            Host: An

ANALOG is an immediate command that switches your DSP-232 into the ANALOG mode.

Most DSP users will not use this mode the way Packet and Baudot are used. Rather, application display programs will use this mode to process FAX signals, allowing gray scale and color images to be displayed. The Analog mode paases data for communications modes that require "gray scales" such as FAX. ANALOG is simplar to the DSPDATA mode, except that in ANALOG the unit samples on a timer interrupt. (Also see the ANSAMPL command)

Analog requires an 8-bit Analog type of DSP modem that samples and digitizes the analog information. After the signal is sampled, it is sent to the RS-232 serial port to the host computer for processing.

Presently, Modems 17, 18, and 19 are available for use in the Analog mode. Modem 17 is designed for HF FM facsimile operation and digitizes the audio frequencies from amplitude of a 1,300 Hz to 2,100 Hz. Modem 19 is designed for HF FM facsimile operation and digitizes audio frequencies from. Modem 18 is designed for satellite APT facsimile operation and digitizes the 2,400 Hz audio carrier.. All Analog modems digitize the samples into b bit binary quantities with the lowest frequency or amplitude represented by $00 and the highest represented by $FF. Analog modems may also be used in the DSPDATA mode.

To use the Analog mode, the computer program should first ANSAMPLE, then enter ANALOG mode. ANALOG initializes in the standby receive state. The following commands function in other operating modes and now control the ANALOG mode as well.

L (Lock):   Force Data receive. (Start the Digitizing Process)
R (Receive): Standby receive. (Stop the Digitizing Process)
X (Xmit):   Data transmit. (Not yet implemented)
The TRACE command also functions in Analog mode. TRACE OFF (default) sends the data as one binary character per sample. TRACE ON causes the data to be sent to the user as a 2 hex characters per sample for test purposes. User BIT 20 (UBIT 20) also affects the data presentation.

ANSample *n*   Default: 2000
                                                                                            Host: As

"*n*"   900 to 65535 decimal specifies a number to be loaded into the DSP to control the Analog mode sample rate.

The value n is sent directly to the DSP chip to control the sample rate of the ANALOG mode.

AUTOBaud *ON|OFF*   Default: OFF
                                                                                          Host: AB

ON   Autobaud routine always present at power-up or RESTART.
OFF   Autobaud routine active at RESET or power-up *only* if battery jumper is removed.

With AUTOBAUD *OFF*, the DSP performs the autobaud function only when powering-up or after a RESET. With
AUTOBAUD *ON*, the DSP performs the autobaud routine *every* time it's powered-up, and *every* time the
RESTART command is entered. The stored parameters (for example, MYCALL) are saved if the battery jumper is
connected. The unit displays the autobaud message at the same rate as the last setting of TBAUD. AUTOBAUD *ON*
is helpful when moving the unit from one computer to another where the terminal data rates are different.

In the autobaud routine, only one asterisk (*) is needed to set TBAUD. The autobaud routine detects 110, 300, 600,
1200, 2400, 4800, 9600, and 19,200 baud at either 7 bits even parity or 8 bits no parity.

AUTOThr   Host: AU

The AUTOThreshold command is used to automatically find the correct threshold setting for the Packet, Pactor,
Amtor, and Morse modes.

To use Autothreshold, tune your radio to a frequency with no signal (make sure the frequency of the radio
corresponds to your currently selected operating mode). Type AUTOT in command mode. The DSP will find the
correct threshold setting using a range from 0-100. If you switch to another mode, you will need to use AUTOT for
this mode as well. Also see the THRESHLD command for manually setting the Threshold.

AWlen *n*   Default: 7
                                                                                          Host: AW

"*n*"   7 or 8 specifies the number of data bits per word.

The parameter value defines the digital word length used by the serial input/output (I/O) terminal port and your
computer or terminal program.

AWLEN will most likely be set properly by the DSP's autobaud routine. Still, you may want to change the ASCII
word-length at some time to accommodate a particular terminal program you want to use.

For plain text conversations with the DSP, AWLEN *7* or *8* may be used. For Transparent mode binary file transfers
and Host mode operation, AWLEN *8 must* be used.

The RESTART command must be issued before a change in word length takes effect. *Don't* change AWLEN
unless the terminal can be changed to the same setting.

BKondel *ON|OFF*   Default: ON
                                                                                          Host: BK

ON   The sequence BACKSPACE - SPACE - BACKSPACE is echoed when a character is deleted from the
          input line.
OFF   The backslash character (\ ) is echoed when a character is deleted.

BKONDEL determines how character deletion is displayed in the Command or Converse mode. With **BKONDEL** *ON*, the (BACKSPACE) + (SPACE) + (BACKSPACE) sequence is produced which updates your computer screen, erasing the character you want to delete.

On a printing terminal, the (BACKSPACE) + (SPACE) + (BACKSPACE) sequence will result in overtyped text. Set BKONDEL *OFF* if you have a paper-output display, or if your terminal doesn't respond to the BACKSPACE character, ^H (CTRL-H). When BKONDEL is *OFF*, the DSP displays a backslash for each character you delete. You can get a display of the corrected input by typing the REDISPLAY-line character.

CALibrate   Immediate Command
                                                                                                       Host: Not Supported

CALIBRATE is an immediate command that starts the AFSK transmit tone calibration routine. The DSP-232 provides a continuous on-screen display of AFSK generator tone frequencies in Hertz. The Calibrate command simplifies transmitter calibration of AFSK levels.

When Calibration is checked all packet connections will be lost, and the time-of-day clock will not advance until you quit the calibration routine.
Commands available in the calibration routine are:

K   Toggles the DSP-232's PTT between on and off.
Q   Quits the calibration routine.
<space>   Toggles the audio tone between "mark" (low) and "space" (high) tones.
D   Toggles between transmitting a continuous tone or alternating the mark and space tones at a rate set by
           the radio baud (Hbaud) rate.

CANline *n*   Default: $18 (CTRL-X)
                                                                                                       Host: CL

"*n*"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

The argument "*n*" is the ASCII code for the character you want to use to cancel the line of text you're typing. You can enter the code in either hex or decimal.

Say you type some characters or a sentence that you want to erase and haven't yet pressed the (RETURN) key. Simply enter (CTRL-X). If you plan to assign a different ASCII character, you'd still press the (CTRL) key first, then the ASCII character you've chosen for CANLINE. For example, say you want to assign $7E (~) as your CANLINE character. Enter:
          cmd: CAN *$7E*

So, when you want to cancel a line of text while in the Command mode, you'd enter ~.

When you use the CANLINE character to cancel an input line in the Command mode, the line ends with the backslash (\ ) character and a new prompt (cmd:) appears on the next line to accept a new command. When you cancel a line while in the Converse mode, only a (\ ) and a new line appears.

! **Remember:**
          ♦ You can cancel only the line you're currently typing.
          ♦ Once (RETURN) has been pressed, you can't cancel the line of text you just typed in.

✎   **Note**: If your SENDPAC character isn't RETURN, the CANLINE character cancels only the last line of a multi-line packet

---

CASedisp *n*   Default: 0 (as is)
                                                                                                       Host: CX

"*n*"   0 to 2 specifies how your DSP sends characters to your terminal.

CASEDISP allows you to set the case of the characters your DSP sends to your terminal; it offers three possible modes:

> CASEDISP *0*   "As is" - characters' case isn't changed.
> CASEDISP *1*   "lower" - all characters are displayed in lowercase only.
> CASEDISP *2*   "UPPER" - all characters are displayed in uppercase only.

CASEDISP has no effect on transmitted data from your DSP.

CMdtime *n*   Default: 10 (1000 msec.)
                                                                                                    Host: CQ

"*n*"   0 to 250specifies TRANSPARENT mode time-out value in 100-mS intervals. If "*n*" is 0 (zero), exit from the Transparent mode requires sending the BREAK signal or interruption of power to the DSP.

CMDTIME sets the time-out value in the Transparent mode. A guard time of "*n*" x 10 seconds allows escape to the Command mode from the Transparent mode while permitting any character to be sent as data.

The same Command mode entry character COMMAND (default CTRL-C) is used to exit the Transparent mode, although the procedure is different than from Converse mode. Three Command mode entry characters must be entered less than "*n*" x 10 seconds apart—with no intervening characters—after a delay of "*n*" x 10 seconds following the last characters typed.

The following diagram illustrates this timing:

```
Last            First           Second          Third           DSP now
Terminal        Command         Command         Command         in Command
Input           Character       Character       Character       mode
|               Entry           Entry           Entry           |
|               |               |               |               |
|               |               |               |               |
| <longer than n> | <shorter than n> | <shorter than n> | <——n——> |
```
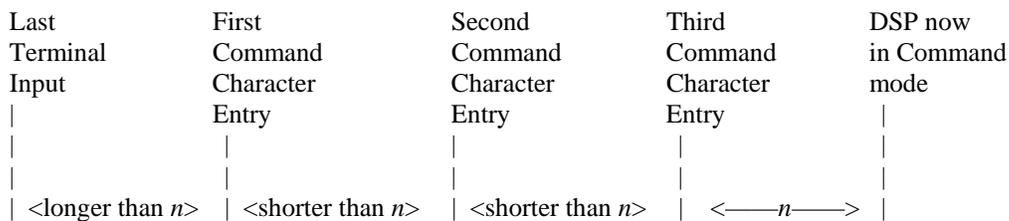
COMmand *n*   Default: $03 (CTRL-C)
                                                                                                    Host: CN

"*n*"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

COMMAND changes the Command mode entry character. Type the COMMAND character to enter the Command mode from either the Converse or Transparent mode. After you enter the COMMAND character, the Command prompt (cmd:) should appear, indicating successful entry into the Command mode. See CMDTIME.

CONVerse (or **K**)   Immediate Command
                                                                                              Host: Not Supported

CONVERSE is an immediate command that causes the DSP to switch from the Command mode to the Converse mode. The letter K may also be used.

Once the DSP is in the Converse mode, all the characters typed into the keyboard are transmitted by your radio. To return the DSP to the Command mode, type the Command mode entry character, (CTRL-C).

CUstom *n*   Default: $0A15
                                                                                                    Host: Cu

"*n*"   0 to $FFFF (0 to 65,535 decimal) specifies a four-digit hexadecimal value, where each bit controls a different function described below.

CUSTOM was originally introduced to allow specialized features for custom applications to be added to AEA Data Controllers without burdening you with extra commands. Since the CUSTOM command is quickly filling up, UBIT has been added to replace CUSTOM to allow for additional features. The CUSTOM command is retained for compatibility, but we recommend using the UBIT command as it's more flexible and easier to use.

For those applications that can't take advantage of the UBIT command, the following terminal-related CUSTOM features are available in the DSP-232. See Appendix C for a complete list.

Bit2, position $0004:   If bit 2 is set to *1*, (default), a break on the RS-232 line will put the DSP into the Command mode (except for Host mode). If set to *0*, a break on the RS-232 line will not affect the DSP.

Bit 5, position $0020:   If bit 5 is set to *0*, (default) the DSP will always power up in the Command mode. If bit 5 is set to *1*, then the DSP will remain in the previous mode, that is, Converse, Command, or Transparent mode.

Bit 14, position $4000:   If bit 14 is set to *0* (default), the transmit buffer for data sent from the computer to the DSP is limited only by the DSP memory. If bit 14 is set to *1*, the serial flow control will permit only a maximum of 7 I-frames to be held by the DSP before transmission. This solves a problem with the YAPP binary file transfer program which relies on a small TNC transmit buffer to operate correctly.

Bit 15 is unused at the present time. To (RETURN) CUSTOM to the default setting, type CU *Y* or CU *ON* at the command prompt.

DAYStamp *on/off*   Default: off
                                                                                       Host: DS

on   The DATE is included in CONSTAMP and MSTAMP displays.
off   Only the TIME is included in CONSTAMP and MSTAMP displays.

DAYSTAMP activates the date in CONSTAMP and MSTAMP. Set DAYSTAMP ON when you want a dated record of packet channel activity, or when you're available for local packet operation.

DAytime *date and time*   Default: none
                                                                                       Host: DA

date and time   Current date and time used to set the DSP'S internal clock.

DAYTIME is used in many modes and should be set when the DSP is initially powered up.

The clock isn't set when the DSP is first turned on. The DAYTIME command displays the `?clock not set` error message until it's set as follows:

        YYMMDDHHMMSS

Example: `cmd: daytime 951125065923`

where:		
YY is the last two digits of the year	1995	
MM is the two-digit month code (01-12)	Nov	
DD is date (01-31)	25	
HH is the hour (00-23)	6 (am)	
MM is the minutes after the hour (00-59)	59	
SS is seconds (optional)	23	

If you want the DSP to keep current time, either keep its power supply on, have the software program you're using set the clock upon start-up, or install a dedicated clock chip. The clock chip of choice is the SmartWatch clock chip (DS1216C) by Dallas Semiconductor, 4350 Beltwood Parkway, Dallas, TX 75244. Phone: (214) 450-0400. (You can also order the chip from JDR Microdevices, 1-800-538-5000.) The only time the SmartWatch is read is upon power-up, RESTART or RESET.

Installation is easy: Carefully remove U5, install the SmartWatch chip into U5's socket, then insert U5 into the top of the SmartWatch chip. Enter the time and date in DAYTIME and you're all set.

DELete *ON|OFF*   Default: OFF
                                                                                    Host: DL

ON   The DELETE ($7F) key is used for editing your typing.
OFF   The BACKSPACE ($08) key is used for editing your typing.

Use the DELETE command to select the key to use for "backing up" and deleting text.

Refer to BKONDEL to see how the DSP indicates deletion.

DIRect *"m n"*   Immediate command
                                                                                    Host: DQ

DIRECT is an immediate command that displays a directory listing of all available DSP-232 Modems. When the DIRECT command is given, the modem list is displayed as shown below:

The DIRECT command can also take a modem number as an arguement to display only the information on that particular modem including the argument of 0 which displays only the date of the modem EPROM. A range of arguments can also be entered, for example DIRECT 1 9 will display the directory of all the RTTY/TOR modems contain in the MODEM EPROM.

```
1:  FSK    45   bps  2125/2295
2:  FSK    100  bps  2125/2295
3:  FSK    45   bps  1615/1785
4:  FSK    100  bps  1615/1785
5:  FSK    200  bps  2110/2310
6:  FSK    200  bps  1600/1800
7:  FSK    200  bps  2125/2550
8:  FSK    200  bps  1275/1700
9:  FSK    200  bps  2125/2975
10: FSK    200  bps  1275/2125
11: FSK    300  bps  2110/2310
12: FSK    300  bps  1600/1800
13: FSK    1200 bps  VHF
14: PACSAT 1200 bps  BPSK
15:
16: FSK    9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
```

`cmd:`

DSPdata   Immediate Command
                                                                                Host: DP

DSPDATA is an immediate command that places the DSP-232 into the DST DATA mode. In this mode, a host computer program may communicate directly with the Analog Devices 2105 chip. In this mode, the DSP-232 is functionally only a modem. All protocol conversion or translation of the data must be done by the host computer program.

The DSP DATA mode is not a mode most users will ever need to use directly. Rather it allows programmers to use the Modems in the DSP-232 for their own applications.

DISPlay *class*   Immediate Command
                                                                           Host: Not Supported

class   Lists commands and their current settings, depending which argument you enter for *class* and how
          EXPERT is set. When DISPLAY is typed without a parameter, the DSP responds with a short list of oft-
          used parameters.

One of the most important commands is DISP—it generates a list of commands and their saved (current) arguments or values. To see a brief list, enter DISP. Your screen should now display:

```
(See also DISPLAY A,B,C,F,I,L,M,R,T,Z)
Connect    Link state is: DISCONNECTED
Opmode     PAcket
EXPert     OFF
FRack      5 (5 sec.)
HBaud      1200
MAXframe   4
Monitor    4 (UA DM C D I UI)
MYcall     none
MYSelcal   none
PACLen     128
RBaud      45
TXdelay    30 (300 msec.)
Vhf        ON
WIdeshft   OFF
cmd:
```

By typing an argument after DISP, like DISP *A*, you can call up a sub-list with a different set of commands. If you want to list *all* of the available commands and their settings, enter DISP *Z*.

The arguments for *class* are:

(A)sync	displays asynchronous port parameters
(B)BS	displays AMTOR and packet MailDrop parameters
(C)haracter	displays special characters
(F)ax	displays fax parameters
(I)d	displays ID parameters
(L)ink	displays link parameters
(M)onitor	displays monitor parameters
(R)TTY	displays RTTY and PACTOR parameters
(T)iming	displays timing parameters
(Z)	displays the entire command/parameter list

...and here are their default listings, with EXPERT *OFF*:

cmd:DISP *A*
```
8Bitconv  OFF
AWlen     7
PARity    3 (even)
TBaud     1200
```

cmd:DISP *B*
```
3Rdparty  OFF
MAildrop  OFF
MDMon     OFF
MDPrompt  Subject:/Enter message, ^Z
          (CTRL-Z) or /EX to end
MMsg      OFF
MTExt     Welcome to my personal
          mailbox.
MYMail    none
TMail     OFF
TMPrompt  GA subj/GA msg, '/EX' to
          end.
```

cmd:DISP *C*
```
CHSwitch  $00
PTOver    $1A (CTRL-Z)
```

cmd:DISP *F*
```
ASPect    2 (576)
FSpeed    2 (120)
GRaphics  1 (960 dots)
PRCon     OFF
PRType    2
```

cmd:DISP *G*
```
GENDchar  $0D
GINIText
GLOCtx     0 (00 sec.)
GNMEA1     GPGLL (0-8 char.)
GNMEA2
GPSMode    0
GREMprog
GSYMChar
GUNSTart
```

cmd:DISP *I*
```
Unproto   CQ
AAb
CMSg      OFF
CText
HId       OFF
MId       0 (00 sec.)
MYcall    WF7A
MYGate    none
MYIdent   none
MYPTcall  none
MYSelcal  none
```

cmd:DISP *L*
```
Connect   Link state is: DISCONNECTED
GUsers    0
HBaud     1200
MAXframe  4
PACLen    128
REtry     10
TRIes     0
USers     1
Vhf       ON
XMITOk    ON
```

```
cmd:DISP M                              cmd:DISP R
CONStamp   OFF                          ABaud      110
DAYStamp   OFF                          ADelay     4 (40 msec.)
MCon       0 (none)                     ARXTor     OFF
MDigi      OFF                          DIDdle     ON
MFIlter    $80                          EAS        OFF
Monitor    4 (UA DM C D I UI)           MOPtt      ON
MStamp     OFF                          MSPeed     20
WHYnot     OFF                          PT200      ON
                                        PTHuff     0
                                        PTRound    OFF
                                        RBaud      45
                                        RXRev      OFF
                                        TXRev      OFF
                                        USOs       OFF
                                        WIdeshft   OFF
                                        WOrdout    OFF

cmd:DISP T                              cmd:DISP Z
FRack      5 (5 sec.)                   Lists all the above commands in alphabetical order
PErsist    63
SLottime   30 (300 msec.)
TXdelay    30 (300 msec.)
```

Echo *ON|OFF*   Default: ON
                                                                        Host: EC

ON   Characters received from the terminal are echoed by the DSP-232.
OFF   Characters *aren't* echoed.

The ECHO command controls local echoing by the DSP-232 when in the Command or Converse mode, but not in the Transparent mode.
   ♦ Set ECHO *ON* (default) if you don't see your typing appear on your display.
   ♦ Set ECHO *OFF* if you see each character you type twice.

ECHO is set properly when you see the characters you type displayed correctly.

EScape *ON|OFF*   Default: OFF
                                                                        Host: ES

ON   The (ESCAPE) character ($1B) is output as "$" ($24).
OFF   The (ESCAPE) character is output as ESCAPE ($1B) (default).

ESCAPE selects the character to be output when an (ESCAPE)character is sent to the terminal. The (ESCAPE)character selection is provided because some computers interpret the ESCAPE character as a special command. Set ESCAPE *ON* if you have an (ESCAPE)-sensitive computer to avoid unexpected results from accidentally receiving this character.

EXPert *ON|OFF*   Default: OFF
                                                                        Host: DL

OFF   Disable some of the less frequently used commands in verbose mode.
ON   Enables all commands in verbose mode.

EXPERT controls your access to the DSP's command set. Because some new DSP-232 owners understandably find the large number of commands confusing or daunting, this command limits the newcomer's access to the commands that are the simplest or the most often used. Generally, about half of the total number of commands are available to you after a RESET (EXPERT OFF).

With EXPERT OFF, expert-level commands may not be accessed and don't appear in any output of the DISPLAY command--an attempt to use one of these commands will result in the error message "?EXPERT command."

All mmediate commands (e.g., CONNECT and PACKET) are 'NOVICE' commands. The error message for an Expert command is separate from the unknown command message:
```
cmd: BBQ
?What?
cmd: FRICK
?EXPERT command
```

In Host mode, all commands are available, regardless of the setting of EXPERT. This command won't affect operation of AEA PakRatt programs.

The following display lists denote when a command is available when EXPERT of OFF ("Novice"). "Retain" means the command keeps its setting during a REINIT operation.

cmd:DISPLAY A

8Bitconv	Novice	Retain
ACRDisp		
AFilter		
ALFDisp		
AUTOBaud		
AWlen	Novice	Retain
BBSmsgs		
CASedisp		
DCdconn		
Echo		
EScape		
Flow		
ILfpack		
NUCr		
NULf		
NULLs		
PARity	Novice	Retain
TBaud	Novice	Retain
TRFlow		
TXFlow		
XFlow		

cmd:DISPLAY B

3Rdparty	Novice	Retain
FREe		Retain
KILONFWD		Retain
LAstmsg		Retain
MAildrop	Novice	Retain
MDMon	Novice	Retain
MDPrompt	Novice	Retain
MMsg	Novice	Retain
MTExt	Novice	Retain
MYMail	Novice	Retain
TMail	Novice	Retain
TMPrompt	Novice	Retain

cmd:DISPLAY C

BKondel		
CANline		

CANPac		
CHCall		
CHDouble		
CHSwitch	Novice	
COMmand		
CWid		
DELete		
ERrchar		
HEReis		
PASs		
PTOver	Novice	
RECeive		
REDispla		
SEndpac		
STArt		
STOp		
TIme		
XOff		
XON		

cmd: DISPLAY F

ASPect	Novice	
FAXNeg		
FSpeed	Novice	
GRaphics	Novice	
LEftrite		
PRCon	Novice	
PRFax		
PROut		
PRType	Novice	

cmd: DISPLAY I

Unproto	Novice	Retain
AAb	Novice	Retain
Beacon		
BText		Retain
CBell		Retain
CMSg	Novice	

CText	Novice	Retain
HId	Novice	
HOMebbs		Retain
MId	Novice	
MYAlias		Retain
MYALTcal		Retain
MYcall	Novice	Retain
MYGate	Novice	Retain
MYIdent	Novice	Retain
MYPTcall	Novice	Retain
MYRemote	Novice	Retain
MYSelcal	Novice	Retain
PASSWord	Novice	Retain
WRu		

MDigi	Novice	
MFIlter	Novice	
MFrom		Retain
Monitor	Novice	
MProto		
MRpt		
MStamp	Novice	
MTo		Retain
MVia		Retain
MXmit		
STATus		
TRACe		
WHYnot	Novice	

cmd:DISPLAY Q

MODem	Novice	
QHpacket	Novice	
QVpacket	Novice	
QData		
QFax		
QMORse		
QPTor	Novice	
QRtty	Novice	
QSignal	Novice	
QTDm		
QTor	Novice	

cmd: DISPLAY L

ACRPack		
ALFPack		
Ax25l2v2		
CFrom	Retain	
CONMode		
CONPerm	Retain	
DFrom	Retain	
FUlldup		
GUsers	Novice	
HBaud	Novice	Retain
LIte		
MAXframe	Novice	
NEwmode		
NOmode		
PACLen	Novice	
PASSAll		
RAdio	Novice	
RELink		
REMote	Novice	Retain
REtry	Novice	
SQuelch		
TRIes	Novice	Retain
USers	Novice	
Vhf	Novice	
XMITOk	Novice	

cmd:DISPLAY R

ABaud	Novice	
ACRRtty		
ADelay	Novice	
ALFRtty		
ANSample	Novice	
ARQTmo		
ARQTOL		
ARXTor	Novice	
ATxrtty		
BItinv		
CODe		
CRAdd		
DIDdle	Novice	
EAS	Novice	
MARsdisp		
MOPtt	Novice	
MSPeed	Novice	
MWeight		
NAVMsg		Retain
NAVStn		Retain
PT200	Novice	
PTHuff	Novice	
PTRound	Novice	
RBaud	Novice	
RFec		
RFRame		
RXRev	Novice	
SRXall		
TDBaud		

cmd: DISPLAY M

CONStamp	Novice	
DAYStamp	Novice	
HEAderln		
MBEll		
MBx		Retain
MCon	Novice	

```
TDChan                                  PPersist
TXRev          Novice                   RESptime
USOs           Novice                   RQtime
WIdeshft       Novice                   SLottime        Novice
WOrdout        Novice                   TXdelay         Novice
XBaud                                   TXTail


                                        Commands not displayed:
cmd:DISPLAY S
                                        ADDress
SCan                                    AGc                          Retain
STep                                    ALTModem
STEPLen                                 BARgraph
STEPRest                                BRight          Novice
STEPSize                                CCitt
STEPUp                                  EXPert          Novice    Retain
                                        HOST            Novice    Retain
                                        HPoll           Novice
cmd:DISPLAY T                           JUstify         Novice
                                        KEyword         Novice
ACKprior                                KIss            Novice    Retain
AUdelay                                 KISSAddr
AXDelay                                 MARK                      Retain
AXHang                                  QWide
BXDelay                                 RAWhdlc
CHeck                                   RKeyword
CMdtime                                 SEGment
CPactime                                SETPass         Novice    Retain
DWait                                   SPACe                     Retain
FRack          Novice                   UBit
FRIck                                   UCmd
HHang                                   ZFree
PACTime                                 ZStatus
PErsist        Novice
```

Flow *ON|OFF*   Default: ON
                                                                      Host: FL

ON   Type-in flow control is active.
OFF   Type-in flow control is inactive.

With FLOW *ON* (default), any character typed on your keyboard halts the output from your DSP to the computer to stop until any of the following occurs:

♦ A packet is sent (in Converse mode)
♦ A line is completed (in Command mode)
♦ The packet length (PACLEN) is exceeded
♦ The current packet or command line is canceled
♦ The REDISPLAY character is typed
♦ The packet channel is changed

Setting FLOW *ON* prevents received data from interfering with your keyboard data entry. With FLOW *OFF*, data is sent to the terminal whenever it's available.

FREe   Immediate Command
                                                                      Host: FZ

Typing "FREE" displays the number of usable bytes left in the MailDrop, as in "FREE 16996." This may be useful to a Host mode application using the MailDrop.

Help   Immediate Command
Host: Not Supported

While in Command mode, type H to read the abbreviated on-line HELP file which lists the available modes to you from your DSP. Your monitor will display the following brief list:

    `cmd`: HELP

AScii	AMtor	PAcket	
BAudot	ARq	Connect	
MOrse	AList	Disconne	
DISPlay	FEc	MHeard	
CALibrat	AChg	CStatus	
NAvtex	SIgnal	FAx	TDm
PACTOr	PTConn	PTSend	PTList
CONVerse	Trans		
Opmode	Xmit	Rcve	Lock
RESTART	RESET	MDCheck	TClear

Host *n*   Default: 0
Host: HO

"*n*"   A hexadecimal value from $00 through $FF setting bits from the table below that define the Host operation of the DSP.

The Host command enables the "computer-friendly" Host communications mode over the DSP's RS-232 link. To exit out of the Host mode, enter three (CTRL-C) characters in rapid succession or type (CTRL-A),O,H,O,N,(CTRL-W). *Sending a Break signal won't cause the DSP to exit from the Host mode.*

    Bit 0:   Controls whether the Host mode is *ON* or *OFF*.
                If bit 0 is equal to *0*, Host is *OFF*.
                If bit 0 is equal to *1*, Host is *ON*.

    Bit 1:   Controls the local MailDrop access.
                If bit 1 is *0*, then the MailDrop Send data uses the $20 block. Read data uses the $2F block as before. Monitored MXMIT data uses the $3F (monitored receive) block type.

                If bit 1 is *1*, then the MailDrop send data uses the $60 block type. Read data uses the $70 block type. Monitored MXMIT data uses the $2F (echoed) block type to differentiate between monitored transmitted and received frames.

    Bit 2:   Controls the DSP-2232 and PK-900 extended Host mode. (This isn't used in the DSP-232.)

    Bits 3-7 are reserved for future use.

To maintain backward compatibility with older programs written to use the *ON*/*OFF* form of the Host command, Host *ON* is equivalent to Host *$01* described above. However, programmers must note that Host now returns a numeric value and not *ON* or *OFF* as before.

HPoll *ON*|*OFF*   Default: ON
Host: HP

ON   The Host mode program must poll the DSP for all data (default).

OFF   The Host mode program must accept data from the DSP at anytime.

With HPOLL *ON*, the Host mode program must poll the DSP—using (CTRL-A),O,G,G,(CTRL-W)—for all data that might be available to be displayed to the screen. With HPOLL *OFF*, the Host mode program must be able to accept any data from the DSP whenever it becomes available.

KIss *n*   Default: 0
                                                                                      Host: KI

"*n*"   Is a HEX number from $00 (KISS disabled) through $FF that enables the KISS mode selected from the table below.

The KISS mode must be entered to prepare the DSP for KISS operation. TCP/IP and other special applications have been written that require the KISS mode be enabled to operate correctly. For normal AX.25 packet operation, this command should be left at *0* or *OFF* (default).

The KISS command, formerly *ON|OFF*, has now been expanded to a numerical value from $00-$FF. This expansion supports G8BPQ's multi-drop KISS protocol. The table below describes available KISS options.

> KISS *$00*: KISS disabled (formerly displayed as KISS *OFF*)
> KISS *$01*: Standard KISS (same as KISS *ON* or KISS YES)
> KISS *$03*: Extended KISS
> KISS *$07*: Extended KISS+KISS polling enabled
> KISS *$0B*: Extended KISS+KISS checksum enabled
> KISS *$0F*: Extended KISS+KISS polling and checksum enabled

Note that KISS *ON* enables standard KISS operation for compatibility with existing applications.

Extended KISS mode adds these commands to the standard commands ($x0-$x5):

> $xC signifies data to be transmitted. Unlike the $x0 command, the $xC byte is followed by two frame ID bytes, then the data; when the TNC transmits the frame, it notifies the host application by echoing back FEND, the $xC byte, the two frame ID bytes, and FEND.

> $xE is the polling command, similar to the Host "GG" command existing in AEA products. Polling makes multi-TNC KISS operation possible. If KISS polling is enabled, the TNC holds received data until the host application sends the poll command. If the TNC is holding no data, it echoes back FEND $xE FEND. The "x" in "$xE" must match the number in the KISSADDR command for the TNC to respond.

If the KISS checksum is enabled, a checksum byte is added to the end (before the final FEND) of all KISS blocks flowing between the TNC and the host application. The checksum is the exclusive-OR of all other bytes between the FEND bytes, taken before KISS escape transpositions. A checksum is helpful when using multiple TNCs on a marginal RS-232 link. If the DSP receives a KISS block with a bad checksum, it does not transmit the data.

In KISS and Raw HDLC modes, communication activity on the RS-232 link is shown by lighting the STA and CON LEDs as follows:

> Host to TNC Communication: STA LED illuminated.
> TNC to Host Communication: CON LED illuminated.

Host *OFF*—entering three (CTRL-Cs)—will force KISS *OFF*. Details on the use of KISS TNC protocol are contained in AEA's *Technical Reference Manual — Model DSP-232 Data Controller*.

KISSAddr *n*   Default: 0
                                                                                      Host: KA

"*n*"   Is a number from 0-15, signifying the KISS address of the TNC's radio port.

Radio port addressing is available in the high nibble of the KISS command byte. The DSP compares the high nibble of the KISS command byte to KISSADDR only if extended KISS mode is enabled. If the command doesn't match KISSADDR, the DSP takes no action. *Exception*: the exit-KISS command $FF works no matter what the value of KISSADDR or the status of extended KISS mode.

MEmory   Default: none
                                                                                          Host: MM

n   A hexadecimal value used to access the DSP-232's memory locations, or read values stored at a specified
         ADDRESS.

The MEMORY command works with the ADDRESS command (ADDRESS $aabb) and permits access to memory locations. Use the Memory channel without arguements to read a memory, and with one arguement $0 to $FF to write to a memory location. The value in ADDRESS is incremented after using the MEMORY command.

MODem   Default: 12
                                                                                          Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
1:  FSK    45   bps  2125/2295
2:  FSK    100  bps  2125/2295
3:  FSK    45   bps  1615/1785
4:  FSK    100  bps  1615/1785
5:  FSK    200  bps  2110/2310
6:  FSK    200  bps  1600/1800
7:  FSK    200  bps  2125/2550
8:  FSK    200  bps  1275/1700
9:  FSK    200  bps  2125/2975
10: FSK    200  bps  1275/2125
11: FSK    300  bps  2110/2310
12: FSK    300  bps  1600/1800
13: FSK    1200 bps  VHF
14: PACSAT 1200 bps BPSK
15:
16: FSK    9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

NEwmode   Default: ON
                                                                                          Host: NE

ON   The DSP automatically returns to the Command Mode at disconnect or return to receive.
OFF   The DSP does not return to the Command Mode at disconnect or return to receive.

You DSP-232 always switches to a data transfer mode at the time of connection, unless NOMODE is ON. NEWMODE determines how your DSP behaves when the link is broken or when the state is changed from Transmit to Receive with the RECEIVE or CWID characters.

When NEWMODE is ON (default) and the link is disconnected, or if the connect attempt fails, your DSP-232 remains in Converse or Transparent Mode unless you have forced it to return to Command Mode.

NUCr *ON|OFF*   Default: OFF
                                                                      Host: NR

ON   Null characters *are* sent to the terminal following RETURNs.
OFF   Null characters aren't sent to the terminal following RETURNs.

NULLS sets the number of null characters that will be sent. Some older printer-terminals require extra time for the printing head to do a (RETURN) and LF. NUCR *ON* solves this problem by making your DSP send null characters (ASCII code $00) to your computer or terminal.

NULf *ON|OFF*   Default: OFF
                                                                      Host: NF

ON   Null characters aren't to the terminal following LFs.
OFF   Null characters aren't sent to the terminal following LFs.

Some older printer-terminals require extra time for the printing head to do a (RETURN) and LF. NULF *ON* solves this problem my making your DSP send null characters (ASCII code $00) to your computer or terminal. NULLS sets the number of null characters that will be sent.

NULLs *n*   Default: 0 (zero)
                                                                      Host: NU

"*n*"   0 to 30 specifies the number of null characters to be sent to your computer or terminal after a (RETURN) or LF when NUCR, or NULF, are *ON*.

NULLS specifies the number of null characters (ASCII $00) to be sent to the terminal after a (RETURN) or LF is sent. NUCR and/or NULF must be set to indicate whether nulls are to be sent after (RETURN), LF or both. The null characters are sent from your DSP to your computer only in the Converse and Command modes.

Opmode   Immediate Command
                                                                      Host: OP

OPMODE is an immediate command that shows the DSP-232's current mode of operation as well as system status. Opmode also displays the MORSE speed when in Morse mode. Use the OPMODE command at any time when your DSP-232 is in the Command Mode to display the present operating mode. Here is a typical example:

```
cmd:o
OPmode      AScii        RCVE
```

PARity *n*   Default: 3 (even)
                                                                      Host: PR

"*n*"   0 to 3 selects a parity option.

PARITY sets the DSP's parity for RS-232 terminal according to the table below:
        0 = no parity

---

1 = odd parity
2 = no parity
3 = even parity

The parity bit, if present, is stripped automatically on input and isn't checked in Command and Converse modes, but in Transparent mode all eight bits (including parity) are transmitted.

The change won't take effect until you enter RESTART. Be sure to change the computer or terminal to the same parity setting after you've entered RESTART.

PASs *n*   Default: $16 (CTRL-V)
                                                                                        Host: PS

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code that you can .

PASS selects the ASCII character*"n"* used for the "pass" input editing commands. The PASS character signals that the following character is to be included in a packet PACTOR or ASCII text string. For example, if you're typing in text and want to enter three RETURNs so you can put a line space between two paragraphs, you'd do this:
> *"...here's the end of the first paragraph."* (*CTRL-V*)+(RETURN)+(*CTRL-V*) (RETURN)+(*CTRL-V*)+(RETURN) .*"Now this line will appear after a line space."*

The line will appear at the other station like this:

> *"...here's the end of the first paragraph."*

> *"Now this line will appear after a line space."*

If you had just pressed (RETURN) at the end of the word, "paragraph," you would've forced a packet to be sent. Press (RETURN) again, and you would've forced an empty packet to be sent. Press (RETURN) yet again, and another empty packet would've been sent. This happens because when you press RETURN, it normally forces a packet to be sent. However, by inserting a (CTRL-V) before entering a (RETURN), you disable the function of (RETURN) in the Command mode and allow it to be used in your outgoing text to act as a "real" (RETURN). So, the PASS character "hides" the next character's function.

PK *n*   Default: none
                                                                                         Host: PK

n   a hex number used to access the DSP-232's memory and I/O locations.

PK (Peek/Poke) permits access to memory locations. To use the PK command:

1)   Set the memory address into the ADDRESS command.
2)   Use the PK command without arguments to read that memory location.
3)   Use PK with one argument 0-$FF to write to that memory location.

DSP-232 RAM locations are $8000-$FFFF. ROM begins at $0000. This command is used primarily as a programmer's aid and is not needed for normal use.

QData *n*   Default: 21
                                                                                         Host: QA

n   Modem number to be selected when the DSP DATA mode is entered.

QDATA sets the DSP-232 modem that will automatically be selected when the DSP DATA mode is entered.

See the DSPDATA and MODEM commands for more information.

RADio *n*   Default: 1
                                                                                              Host: RA

n   0, 1, 2 with 1 meaning Radio Port 1 and 2 meaning Radio Port 2.

The radio command allows the user to control which radio port is selected.

Type RADIO 1 to select Radio Port 1 (default). To select Radio Port 2, simply enter RADIO 2, or RAD 2.

Typing RADIO 0 disables operation of both Radio Ports.

REDispla *n*   Default: $12 (CTRL-R)
                                                                                              Host: RD

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

REDISPLA changes the redisplay-line input editing character.

Parameter *"n"* is the numeric ASCII code for the character you'll use when you want to re-display the current input
line. Type the REDISPLA character to re-display a command or text line you've just typed. This can be helpful
when editing a line, especially if your terminal doesn't support BACKSPACE. It can also be used in packet to
display a packet that might have been received while you were typing. A backslash (\) is appended to the old line,
and the corrected line is shown beneath it.

REINIT   Immediate Command
                                                                                              Host: RI

This is an immediate command that you can use to get out of trouble caused by setting a lot of commands—
especially timing parameters—to strange values. REINIT can be thought of as being halfway between RESTART
and RESET. REINIT re-initializes most of the commands to their default setting, then does a RESTART, but the
contents of the MailDrop and the NAVTEX message history buffers are preserved. The commands that are
preserved are:

MYCALL	MYALIAS	MYMAIL	HOMEBBS	MYGATE	MYSELCAL
MYALTCAL	MYIDENT	MYPTCALL	UNPROTO	AWLEN	PARITY
TBAUD	BTEXT	CTEXT	AAB	MDPROMPT	TMPROMPT
CFROM	DFROM	MFROM	MTO	MBX	LASTMSG
MTEXT	NAVSTN	NAVMSG	HOST		

In Host mode, the REINIT command is acknowledged by a RESTART response (RT).

RESET   Immediate Command
                                                                                              Host: RS

RESET resets all of the DSP's parameters to their default settings and reinitializes the unit. All personalized
parameters, monitor lists and MailDrop messages will be lost.

RESTART   Immediate Command
                                                                                              Host: RT

RESTART reinitializes the DSP while retaining the settings you've changed or entered. The effect of RESTART is the same as turning the DSP off, then on again. RESTART doesn't reset the values stored in its battery-backed RAM.

See RESET.

STArt *n*   Default: $11 (CTRL-Q)
                                                                                                         Host: ST

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the START command to choose the character you want to use to restart output from the DSP to your computer after it has been halted by entering the STOP character.

See XFLOW.

STOp *n*   Default: $13 (CTRL-S)
                                                                                                         Host: SO

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use the STOP command to select character you'll use to stop output from your DSP to your computer.

See the XFLOW command.

TBaud *n*   Default: 1200 baud
                                                                                                         Host: TB

"n"   Specifies the data rate your computer uses to talk to the DSP.

Set TBAUD to specify the terminal baud rate to be activated at the *next* power-on or RESTART. (A warning message reminds you of this.) Be sure you can set your computer and its communications program for the new rate.

The TBAUD command supports the following serial port data rates: 45, 50, 57, 75, 100, 110, 150, 200, 300, 400, 600, 1200, 2400, 4800 and 9600 baud.

TClear   Immediate Command
                                                                                                         Host: TC

The TCLEAR command clears your DSP's transmit buffer on the "Logical Channel" you have selceted and cancels any further transmission of data when in the Baudot, ASCII, AMTOR or Morse operating modes. In Packet mode, all data is cleared except for a few remaining packets.

You must be in command mode to use TCLEAR.

THreshld *n*   Default: 50

n   0-100 sets the threshold for the operating modes.

Fifty is the default for the Threshold control. You can manually enter a threshold value. Alternatively, you can use the AUTOThr command and the DSP-232 will automatically adjust the threshold to the correct setting for the operating mode you are currently in.

TIme *n*   Default: $14 (CTRL-T)

<div align="right">Host: TM</div>

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

TIME specifies which control character sends the time-of-day in the text you type into the transmit buffer or into a text file stored on disk.

At transmit time, the DSP reads the time-of-day from the DSP's internal clock then sends the time to the radio in the data transmission code in use at that time. If DAYTIME hasn't been set, a (CTRL-T) will cause the DSP to send an asterisk (*). With DAYSTAMP *ON*, the date is transmitted with the time.

✎ **Note**: TIME can't be embedded in CTEXT, BTEXT, MTEXT or AAB.

Trans   Immediate Command
<div align="right">Host: Not Supported</div>

TRANS switches the DSP from the Command mode to Transparent mode; the current state of the radio link isn't affected. Transparent mode is primarily useful for computer communications since Transparent mode "human interface" features such as input editing, echoing of input characters, and type-in flow control are disabled.

  ♦ Use Transparent mode for transferring binary or other non-text files.
  ♦ To exit the Transparent mode, type the COMMAND character, (CTRL-C), three times within the time period set by CMDTIME (default:1 second).

TRFlow *ON|OFF*   Default: OFF
<div align="right">Host: TW</div>

ON   Software flow control for the computer or terminal receiving data is *enabled* in Transparent mode.
OFF   Software flow control for the computer or terminal receiving data is *disabled* in Transparent mode.

With TRFLOW *ON*, the type of flow control used by the computer receiving data in the Transparent mode is determined by how START and STOP are set.

With TRFLOW *OFF*, only "hardware" flow control (RTS, DTR) is available to the computer when receiving data from the DSP (while in Transparent mode).

With TRFLOW *ON*, and START and STOP are set to values other than zero, software flow control is enabled for your computer. The DSP responds to the START and STOP characters while remaining transparent to all other characters from the terminal.

TWRcv *n*   Default: 50
<div align="right">Host: Tr</div>

n   0-100 adjusts how the DSP-232 manipulates amplitude of received signals on 1200 bps Packet.

Twist receive (TWRcv) allows you to compensate for poor signal reception by adjusting the amplitude of the high tones. Entering values less than 50 allow you to lower the amplitude of the received signal's high tone. Entering values greater than 50 allow you to increase the amplitude of received signal's high tone.

TWXmt *n*   Default: 50
<div align="right">Host: Tx</div>

n   0-100 adjusts how the DSP-232 manipulates amplitude of transmitted signals on 1200 bps Packet.

Twist transmit (TWXmt) allows you to compensate for transmitter deficiencies by adjusting the amplitude of the high tones. Entering values less than 50 allow you to lower the amplitude of the received signal's high tone. Entering values greater than 50 allow you to increase the amplitude of received signal's high tone. This command allows you to keep high and low signals at their proper levels on the air.

TXFlow *ON|OFF*   Default: OFF
Mode: packet   Host: TF

OFF   Software flow control for the DSP is disabled in Transparent mode.
ON   Software flow control for the DSP is *enabled* in Transparent mode.

With TXFLOW *ON*, the setting of XFLOW determines the type of flow control used in the Transparent mode by the DSP to control transmitted data; with it *OFF*, the DSP uses only hardware flow control to control transmitted data. All data that's sent to the terminal remains fully transparent.

With both TXFLOW and XFLOW *ON*, the DSP uses the Start and Stop characters (set by XON and XOFF) to control the input from the computer.

UCmd *n x*   Default: 0
                                                                                                          Host: UB

n   0 to 15 specifying a User BYTE that may be set.
x   0 to 255 specifying the value of the specific byte to be set.

The UCMD is an extension of the UBIT command which allows up to 15 commands that take numeric arguments to be added to the DSP-232 without burdening users with a large number of commands. The functions controlled by UCMD are things that most users will never have to change. Still they are important enough to some users or applications programs that we have included them under the umbrella command UCMD.

The following are examples of how to use the UCMD command:
UCMD 2   Returns the present status of UCMD 2.
UCMD 4 5   Sets user command 4 to the value of 5.
UCMD 12 OFF   Sets user command 12 to the value of 0.
UCMD ON   Restores user command 8 to its default value.
UCMD Shows the setting of the last UCMD entered.

Listed below are the UCMD functions and the default states that presently have been assigned. The default state of each UCMD is always shown first.

UCMD 0:   This is a Pactor command. It sets the number of correct packets in a row that must be received
                      before generating an automatic request to change from 200 to 100 baud.
UCMD 1:   This is a Pactor command. It sets the number of incorrect packets in a row that must be received
                      before generating an automatic request to change from 200 to 100 baud.
UCMD 2:   This is a Pactor command. It sets the number of packets sent in a speed-up attempt.
UCMD 3:   This is a Pactor command. It sets the maximum number of Memory ARQ packets that are
                      combined to form one good packet. When this number is exceeded, all stored packets are cleared
                      and Memory ARQ is re-initialized.
UCMD 4-15:   are unused for now.

UBit *n ON|OFF*   Default: 0
Mode: All   Host: UB

"n"   0 to 255 specifying a User BIT that may be set *ON* or *OFF*.

UBIT is an extension of the CUSTOM command which allows up to 255 *ON|OFF* functions to be added to the DSP without burdening you with a large number of extra commands. The functions controlled by UBIT aren't things that you'll most likely change—still, they're important enough to some users or application programs that we have included them under the umbrella command of UBIT.

The following are examples of how to use the UBIT:

UBIT 5	Shows the present status of UBIT *5*
UBIT 1 O*N*	Sets the function controlled by UBIT *1* to *ON*
UBIT 10 T	Toggles the state of the function controlled by UBIT *10*
UBIT	Returns the state of the last UBIT value that was accessed

Listed below are the terminal relevant UBIT functions and the default state that presently have been assigned. The default state of each UBIT is shown first. Others are listed in Appendix C.

UBIT *2*:   *ON*:   A Break signal received on the RS-232 line forces the DSP into Command mode from all the modes except Host mode.

     OFF: A Break signal on the RS-232 line is ignored by the DSP.

UBIT *5*:   *OFF*:   The DSP will always power up in Command mode.

     ON: The DSP will remain in the last mode (Converse, Command or Transparent) provided the battery jumper enabled.

UBIT *14*:   *OFF*:   In packet, the transmit buffer for data sent from the computer to the DSP is limited only by the available DSP memory.

     ON: In packet, the serial flow control will permit only a maximum of seven I-frames to be held by the DSP before transmission. This solves a problem with the YAPP binary file transfer program which relies on a small TNC transmit buffer to operate correctly.

XFlow *ON|OFF*   Default: ON
                                                                                                         Host: XW

ON   XON/XOFF (software) flow control is activated.
OFF   XON/XOFF flow control is deactivated - hardware flow control is enabled.

With XFLOW *ON*, software flow control is in effect—it's assumed that the computer will respond to the DSP's Start and Stop characters defined by the XON and XOFF commands. Similarly, the DSP will respond to the computers start and stop characters defined by START and STOP.

With XFLOW *OFF*, the DSP sends hardware flow control commands by way of the CTS line and is controlled by either the RTS or the DTR line.

XMITOk *ON|OFF*   Default: ON
                                                                                                       Host: X0

ON   Transmit functions (PTT line) are active.
OFF   Transmit functions (PTT line) are diabled.

When XMITOK is OFF, the PTT lines to your transmitter on both Radio Ports are disabled - the transmit function in inhibited. All other DSP-232 functions remain the same. Your DSP generates anmd sends packets as requested, but does not key the radio's PTT line.

Use the XMITOK command to ensure that your DSP does not transmit.

Turning XMITOK OFF can be used to enable full break-in CW operation (QSK) on certain transceivers.

X*OFF* *n* <div align="right">Default: $13 (CTRL-S)
Host: XF</div>

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use X*OFF* to select the Stop character to be used to stop input from the computer to the DSP.

The Stop character default value is (CTRL-S) for computer data transfers.

X*ON* *n* <div align="right">Default: $11 (CTRL-Q)
Host: XN</div>

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

XON selects the DSP Start character that is sent to the computer to restart input from it to the DSP.

The Start character default value is (CTRL-Q) for computer data transfers.

ZFree <div align="right">Immediate Command
Host: ZF</div>

This command is primarily of interest to HOST mode programmers. ZFREE is an immediate read-only command that returns the amount of data RAM that is available in the DSP-232. n is the number of free internal memory blocks. Each memory block holds 28 bytes of data.

Use the ZFREE command to avoid the situation in which a host mode application sends a block of data to be transmitted, but the controller connot issue a data acknowledgement (5F X X 00) to the host computer rith away because the TNC is too full. The application should not send data to the controller if it would cause the value of ZFREE to drop below 64. To avoid the transmission of RNR (device busy) packets, the application should make sure ZFREE does not drop below 128.

Note that ZFREE is different from the FREE command, which shows the number of message bytes available to the MailDrop. (ZFREE times 28 is always larger than the value of FREE.)

ZStatus <div align="right">Immediate Command
Host: ZS</div>

This command is primarily of interest to HOST mode programmers. ZSTATUS is an immediate read-only command. that returns a data byte in hexadecimal indicating the status of the unit as shown in the table below.

BIT	Meaning if 0	Meaning if 1
0	Transmit character buffer is empty	RTTY & AMTOR characters are being transmitted
1	No MailDrop command in progress	MailDrop command in progress
2	No MailDrop messages for local sysop	The MailDrop contains messages for local sysop

3-7	Reserved	Reserved

ZSTATUS is meant to be a read-only command for use by host applications in determining the status of the unit, although the user may write a value to ZSTATUS if desired. Bit 0 shows whether all characters have been transmitted in non-packet modes. Bit 1 shows whether the maildrop is busy servicing a command such as Read or List. (Note: bit 1 may show 0 before the hostapplication has polled all the data from a Read or List command out of one of the unit's buffers.) Bit 2 shows whether any mail has been sent to the local sysop (same indication as the front panel MULT bar flashing).

Chapter 5

Packet Operation

Overview

In the brief time that packet radio has been around, it has grown to become the most popular digital mode found on the amateur bands today. Although packet can be found on the HF bands, most of the activity lies in the VHF and UHF FM frequencies. This chapter will begin with general packet operation for the VHF and UHF frequencies, then HF packet operation. (If you're interested in packet just for HF, read the VHF section, first—many of the commands found there are also used in HF packet.) If you are interested in Global Positioning System (GPS) or Automatic Packet Reporting System (APRS) applications, refer to *Chapter 6: Global Positioning System Operation.* Mailbox information can be found in *Chapter 7: Mailbox Operation. Chapter 4: Terminal Commands* will give you information on general DSP-232 commands. The last few pages of *Chapter 4* contain a list of all DSP-232 commands and the page numbers they can be found on.

Before you plunge ahead, a minor "caution": as you can see below, there are a *lot* of commands available to you in this mode, some of them quite esoteric. The average packet user, however, only has to be familiar with about a dozen commands, and of those most of those only need to be set once. If you're a newcomer, set the EXPERT command to its default (*OFF*) so you can filter out the "complicated" commands that you needn't concern yourself with at this time. The commands you should initially familiarize yourself with are: CBELL, CMSG, CONNECT, CTEXT, DISCONNE, MHEARD, MONITOR, MYALIAS, MYCALL, MYGATE, MYMAIL, PACLEN, and UNPROTO. Other commands not mentioned here that are useful to a beginner can be found later in this chapter.

Once you're comfortable with basic packet operation, you might want to explore these commands: 8BITCONV, ACKPRIOR, ACRPACK, ALFPACK, ALTMODEM, AUDELAY, AX2512V2, AXDELAY, AXHANG, BBSMSGS, BEACON, BTEXT, CANPAC, CASEDISP, CFROM, CHCALL, CHDOUBLE, CHECK, CHSWITCH, CONMODE, CONPERM, CONSTAMP, CPACTIME, CSTATUS, DAYSTAMP, DAYTIME, DCDCONN, DFROM, DWAIT, FRACK, FRICK, FULLDUP, GUSERS, HBAUD, HEADERLN, HID, HOMEBBS, ID, ILFPACK, KILONFWD, KISS, KISSADDR, LASTMSG, LITE, MAILDROP, MAXFRAME, MBELL, MBX, MCON, MDIGI, MDMON, MDPROMPT, MFILTER, MFROM, MID, MMSG, MPROTO, MRPT, MSTAMP, MTEXT, MTO, MXMIT, PACTIME, PASS, PASSALL, PERSIST, PPERSIST, RAWHDLC, RELINK, RESPTIME, RETRY, SENDPAC, SLOTTIME, SQUELCH, TRACE, TRIES, TXDELAY, TXFLOW, USERS, WHYNOT, XMITOK. Packet specific commands are listed and defined at the end of this chapter.

Switching Between Radio Ports

If you are using an AEA PakRatt program designed for the DSP-232, switching between Radio Ports is described in the program manual. If you are using a computer terminal, terminal program or the "Dumb Terminal Mode" of an older PakRatt program, this section will describe how to switch between the radio ports.

The RADIO command allows either radio port 1 (default) or radio port 2 to be selected. To operate on radio port 1, simply type RADIO 1 (or RAD 1) at the DSP-232 command prompt. To select radio port 2, simply type RADIO 2.

Tuning in Packet Stations—VHF/UHF
The following steps will help you understand what you need to know about moving around in and configuring your DSP-232. First you have to enter the packet mode—simply enter PACKET (or PA) at the `cmd:` prompt. The DSP responds by displaying the previous mode it was in, then its new mode on the computer screen:

```
cmd: PA
Opmode   was (previous mode)
Opmode   now PAcket
cmd:
```

Look at your DSP's front panel to verify that you're in the packet mode—in the MODE display there will be a 'P'.

Now enter your callsign using MYCALL. For example, if your callsign is WO6P, then you'd enter:

```
cmd: MYCALL WO6P
MYcall   was DSP232*
MYcall   now WO6P
cmd:
```

!   *or AAA if you just came from Chapter 2 (or if don't have a callsign, yet).

Next, enter VHF ON then (RETURN).
Your monitor should respond with:
```
Vhf    was OFF
Vhf    now ON
*** HBAUD now 1200
```

You are currenty in the DSP-232's default radio port -- 1, with the default VHF Packet setting -- 1200 bps. You can change your Radio Port at any time with the RAD command. You can also select other Packet modems that the DSP-232 contains. If you wish to select a different DSP modem for Packet operation, simply type MODEM followed by a modem number. The various modems available in the DSP-232 can be seen with the DIRECT(ory) command. To display all the available modems, simply enter the Command Mode, using (CTRL - C), of the DSP-232 and then type DIR as shown.

DIR (RETURN)

The DSP-232 will respond with the following:

```
1:  FSK    45   bps  2125/2295
2:  FSK   100   bps  2125/2295
3:  FSK    45   bps  1615/1785
4:  FSK   100   bps  1615/1785
5:  FSK   200   bps  2110/2310
6:  FSK   200   bps  1600/1800
7:  FSK   200   bps  2125/2550
8:  FSK   200   bps  1275/1700
9:  FSK   200   bps  2125/2975
10: FSK   200   bps  1275/2125
11: FSK   300   bps  2110/2310
12: FSK   300   bps  1600/1800
13: FSK   1200 bps  VHF
14: PACSAT 1200 bps BPSK
15:
16: FSK   9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
```

```
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

Any modem from this list may be loaded with the MODEM command. For example, let's say that you want to operate 9600 bps VHF packet using the K9NG/G3RUH modem. First, you must switch to Radio Port 2 because this is the port that has the proper radio connections for 9600 bps Packet operation. To switch to Radio Port 2, type this at the cmd: prompt:
```
RAD 2
```

Your DSP will respond with:
```
RADIO was 1
RADIO now 2
cmd:
```

Now you need to load the proper modem for 9600 bps Packet, which is modem number 16. (Use the DIR command for a list of available modems). To load modem 16, first enter the Command Mode, using (CTRL - C), of the DSP-232 and then type MODEM 16 as show below:
```
MODEM 16 (RETURN)
```

The DSP-232 will respond with the following:
```
MODem was 13
MODem now 16
cmd:
```

✎   **Note:**   Do not load modems designed for non-packet modes such as Baudot or Morse when operating packet. They will not function.

After selecting the specific modem you want to use, you need to set the HBAUD to the proper speed. In the previous steps, you chose Modem 16, which is by nature a 9600 bps mode. So, you would enter:
```
HB 9600
```

The DSP-232 will respond with the following:
```
HBAUD was 1200
HBAUD now 9600
cmd:
```

To switch back to Radio Port 1 and operate 1200 bps Packet, type the following:
```
RAD 1
```

You DSP will respond with:
```
RADIO was 1
RADIO now 1
cmd:
```

The DSP-232 is now on Radio Port 1, however it is still configured for 9600 bps Packet operation -- you want 1200 bps operation. You need to switch to MODEM 13, so type the following:
```
MODEM 13
```

The DSP will respond:
```
MODem was 16
MODem now 13
cmd:
```

Set the HBAUD to 1200 by typing:
```
HB 1200
```

The DSP will respond:
```
HBAUD was 9600
HBAUD now 1200
```

You have got a feel for how to switch ports and modems. If you have followed along, your DSP is now configured for 1200 bps Packet using Port 1. The thing to remember is that there are two Radio Ports on the DSP-232 and one MODEM and HBAUD setting. So, even though you switch from Radio Port 1 to Radio Port 2, your MODEM and HBAUD stay the same.

If you know the VHF activity in your area uses a modem from the list above other than the Bell 202 default, you may enter this modem number in the command QVPACKET. The modem in QVPACKET is automatically selected when the VHF parameter is ON and the Packet mode is entered.

If you know there is packet activity in your area, but don't know the frequencies, try some of these:
2 meter (144-148 MHz) band: 144.91, 144.93, 144.95, 144.97, 144.99, 145.01, 145.03, 145.05, 145.07, 145.09.
1.25 meter (222-225 MHz) band: 223.40, 223.42, 223.44, 223.46, 223.48
70 cm (420-440 MHz) band: 440.975, 441.000, 441.050, 441.025, 441.075

You'll know you've found a packet channel when you hear the characteristic "*braaaaaap*" of packet transmissions. High speed packet, such as 9600 bps, may sound like "white noise." When you're properly tuned to a packet signal, the LEDs in the DSP's tuning indicator spread out evenly from the center to both the left and right sides.

Once you've found an active packet channel, make sure you have the volume control in your transceiver adjusted correctly so the DCD light on the DSP's front panel glows *when a packet is received*. If DCD doesn't light, you must increase the audio level from your transceiver.

Conversely, make sure that the DCD light goes out when there *aren't* any packet signals present on the channel. If it doesn't extinguish when the channel is clear, make sure the Squelch control on your transceiver is set high enough to silence the speaker when no signals are present. If the DCD light stays on when the packet channel is quiet, your DSP will think that a signal is present and won't ever key up.

If everything is set properly, packets should scroll up on your screen. Some typical packets you might monitor are shown below:
```
N7ALW*>WA7GCI [C]
WA7GCI*>N7ALW (UA)

N7ALW*>WA7GCI:
Hi Bob, how are you this evening?

K6RFK>N7ALW*>N7GMF:
Goodnight John, its been nice talking to you.

K6RFK>N7ALW*>N7GMF [D]
N7GMF>N7ALW*>K6RFK (UA)

KD7NM*>MAIL:
Mail for: K6RFK N7ML WO6P

WN7ANK-8*>ID:
NET/ROM 1.3 (SEA)

SEA*>N7ML:
SEA:N7HWD-8> Connected to #SEA:N7HWD-7
```

✎ **Note**: You might see data (packets) show up on the DSP's tuning indicator which don't print on the screen. This is normal and is a function of the MONITOR and the MPROTO commands.

What It Means

There are different types of packets that will mean different things to your DSP—it keeps track of and knows what to do with all these packets so you don't have to worry about them most of the time. Since the DSP has the capability of monitoring all the packet activity on a channel, it'd be wise for you to observe what scrolls up on the screen for awhile to see how stations interact with each other.

Examine the first packet exchange in the examples above:
```
N7ALW*>WA7GCI [C]
WA7GCI*>N7ALW (UA)
```

The first callsign is the originator of the packet. The callsign after the ">" is the station the packet's addressed to. So the packet listed above originated from N7ALW and is being sent to WA7GCI. The "[C]" immediately following the two callsigns identifies this packet as a connect request. So, N7ALW is trying to connect with WA7GCI.

The second packet, WA7GCI*>N7ALW (UA), is in response to N7ALW's connect request—WA7GCI responded to N7ALW with a "(UA)" which stands for Un-numbered Acknowledge; WA7GCI sent N7ALW an *ack* signal as if to say, "Yes, I acknowledge getting your packet for a connect request."

The next packet is data (text) sent from N7ALW to WA7GCI.
```
N7ALW*>WA7GCI:
Hi Bob, how are you this evening?
```

The stations are connected and are enjoying a QSO.

One benefit of packet radio is that packets can be relayed, or digipeated. In fact, packets can be "digied" by up to eight other stations to get them to a distant station you can't reach directly. In practice, digipeating through a large number of stations doesn't work very well, but still you will often see packets that are digipeating through one or two stations to get to their destination. A better way to relay packets us by using the node functions of your DSP-232. See nodes and Node Operation later in this chapter. The packet shown below is an example of a digipeated packet:
```
K6RFK>N7ALW*>N7GMF:
Goodnight, John--its been nice talking to you.
```

This packet originated from K6RFK and is intended for N7GMF, but for one reason or another it's being digipeated through N7ALW. Notice the asterisk (*) in the first line—it tells you which station was actually heard by N7GMF when it received the packet. In this case, we can see that we actually heard radio station N7ALW. Without the asterisk, you couldn't tell whether the transmission came from radio station K6RFK or N7ALW. More will be discussed about digipeating later, but the above example is typical.

The next packet:
```
K6RFK>N7ALW*>N7GMF [D]
```

. . . is again from K6RFK to N7GMF and is being digipeated through N7ALW. This packet indicates that K6RFK has finished talking to N7GMF and wants to disconnect. Again you see that you aren't hearing K6RFK directly but N7ALW as indicated by the asterisk (*) after his call.
```
N7GMF>N7ALW*>K6RFK (UA)
```

This packet is an *ack* that lets K6RFK know that N7GMF has *ack*ed the disconnect request. K6RFK and N7GMF are no longer connected.

The following packet:
```
KD7NM*>MAIL:
```

```
     Mail for: K6RFK N7ML WO6P
```

...is a BEACON packet from KD7NM. Since the packet is addressed to "MAIL" we can assume KD7NM is a packet Bulletin Board System (PBBS) broadcasting to the area that there's mail waiting for these three stations to read.

The following BEACON packet is an identification packet from a NET/ROM level-3 packet networking switch.
```
     WN7ANK-8*>ID:
     NET/ROM 1.3 (SEA)
```

In this example, the packet "switch" is operated by WN7ANK-8, but it uses the alias SEA as a MYALIAS callsign. There are many types of packet switches now in use, but NET/ROM is one of the most popular. We will briefly discuss using a NET/ROM switch later in this chapter since most switches operate in much the same way.

The packet below was sent by the network switch SEA to N7ML.
```
     SEA*>N7ML:
     SEA:WN7ANK-8> Connected to #SEA:N7HWD-7
```

This message tells N7ML that he is now connected to another port on the SEA "node" named #SEA. Again, we will talk more about how and why N7ML might want to do this later in the chapter.

Who's Out There?
If you don't have a friend on packet in your local area, then you will want to choose a station you can reach. Fortunately the DSP has a command called MHEARD that displays the list of the last eighteen stations it has heard.

After you've tuned to a packet station for half an hour or so, enter MHEARD prompt. You'll see something like this:
```
cmd:MHeard                          cmd:MHeard (with DAYSTAMP ON)
........ WO6P                        21-Nov-95 13:40:35 WO6P
........ KB6IUX-1                    21-Nov-95 13:40:25 KB6IUX-1
........ SEA*                        21-Nov-95 13:40:01 SEA*
........ N7HWD-8*                    21-Nov-95 13:39:51 N7HWD-8*
........ KD7NM*                      21-Nov-95 13:39:44 KD7NM*
........ KG6ZL*                      21-Nov-95 13:39:20 KG6ZL*
........ WF7A-9*                     21-Nov-95 13:39:12 WF7A-9*
cmd:                                 cmd:
```

✎ **Note:** DAYSTAMP is a virtual 'postmarker' of stations heard, displaying the dates and times stations are heard. DAYSTAMP is not a command that is accessible with EXPERT *OFF*. The factory default for DAYSTAMP is *OFF*, so if you wish to see the dates and times of the stations heard you will need to set DAYSTAMP to *ON*.

The callsigns in the list are the stations heard by your DSP with the most recently heard station at the top of the list. As mentioned earlier, the asterisks (*) indicate that the station was heard directly by the DSP. The callsigns without an asterisk were relayed by another station and so cannot be connected to you directly without you connecting to a node or digipeating.

Talking to Yourself
Most of us are a little nervous when we first get on-the-air in a new mode. In packet, fortunately, you're able to get a lot of practice just by talking to yourself before you send your first CQ or connect to someone else who has sent a CQ. Once you feel comfortable with the basic operation of packet, going on-the-air is a breeze! To get some practice, you'll learn the important commands by talking to yourself.

Remember back in Chapter 2 the "loop-back" test where you tied together the green and white wires at the end of the radio cable? Do this again with either the unused half of the supplied radio cable or you can use a small alligator clip or a jumper wire to short pins 1 and 2 together in either Radio Port 1 or 2, whichever port isn't connected right

now. Once you've made this connection, enter RADIO 1 or RADIO 2 at the cmd: for the corresponding Radio Port you'll now use for practice runs.

Adjust squelch so the DCD light *just* goes out. With your program and DSP up and running so the cmd: prompt is at the ready, you're now all set to have a thrilling monologue.

Connecting
In packet, when you want to chat with a station you "connect" to it; the abbreviation of connect is the letter, C. Go ahead and connect to yourself by entering: C (your call). If your call happens to be KB6IUX, you'll type:
```
cmd:C KB6IUX
*** CONNECTED to KB6IUX
```

You've now gone from the Command mode to the Converse mode and the CON bar is lit on the DSP's status window. Go ahead and type a quick sentence, then press (RETURN). Your sentence will echo back at you, but if you were the other station the echo you see is *exactly* what would appear on your screen. Type in another sentence but as you press (RETURN) this time, watch the DSP's front panel. The TX light and STA bar come on, the TX light will extinguish, then a few moments later the TX light will come on briefly then both the CON and STA bars will go out.

What's happening here? It's all part of packet's error-checking scheme. When you pressed (RETURN), the TX light came on because the DSP is keying up your transmitter and sending your packet to the other station. Once the packet has been sent, the TX light goes out and your transmitter unkeys. The STA bar stays on because the DSP is waiting for the packet you just sent to be acknowledged, or *ack*ed, by the other station. After the other station receives your packet and checks it over to see that it was received okay, it sends back a quick *ack* signal. When your DSP receives the other station's *ack* signal, it "*ack*s the *ack*" and your transmitter is momentarily keyed for this to happen.

Leave the Converse mode by entering a (CTRL-C). Notice that the CON bar is lit because you're still connected with a station. When you enter a (CTRL-C) while you're connected, you've essentially put the other station "on hold" like you would with a telephone. You can go do anything that you can normally do while in the command mode.

You have a couple of options now: you can either return to the Converse mode and continue chatting with the other station, or you can disconnect—which ends the QSO. To go back to the QSO enter the letter K—for "K"onverse— next to the cmd: prompt. You'll be put on a new line and will be able to type text or read what may have come up on your screen in your absence from the QSO. While in the Command mode, if you decide to quit out of the connection, enter the letter D, for Disconnect. In this example with KB6IUX, you'd see:
```
*** DISCONNECTED: KB6IUX
KB6IUX*>KB6IUX (UA)
```

Congratulations! You performed the basic steps you need to initiate and end a basic packet contact. Try this exercise a few more times until you feel comfortable with it. When you are, try the next few exercises before you go on-the-air.

CTEXT
An optional step you might want to take right now is to enter a CTEXT message. CTEXT is like a telephone answering machine message (up to 120 characters) that your DSP will send to a station immediately after it connects to you. A good CTEXT message is something like this:
```
cmd: CTEXT Hi, there! If I don't respond in a few moments to your connect, please leave a
message in my mailbox, WO6P-1. Thanks! (RETURN)
CText    was
CText    Hi, there! If I don't respond in a few moments to your connect,
please leave a message in my mailbox, WO6P-1. Thanks!
cmd:
```

With this message, the connected station has the option of waiting for you to "pick up the phone" or to leave a message in your maildrop.

To enable your CTEXT message, turn CMSG *ON*. If you don't want your DSP to send the message, leave CMSG *OFF*. Go ahead and connect to yourself again to see what your CTEXT message will look like to a connected station.

When you first turn on your DSP, it becomes a standard AX.25 packet TNC (Terminal Node Controller). All TNCs and multi-mode controllers have this capability. When you connect to a TNC, in most cases you'll be connecting directly to someone's computer screen. If you get a message like this . . .

```
Welcome to my packet station. If I don't respond, please leave a
message and Disconnect.
```

. . . when you connect to another station, usually you would type something like "Hello?" If you don't see a response from the other station in a minute or so, simply leave a message—just like a telephone answering machine. The TNC at the other station should then hold your message until the operator returns to the computer or terminal. However, if he should shut off his computer before checking his screen, he'll never see your message. So if the other operator doesn't answer after waiting a reasonable amount of time, try to connect to his mailbox.

Connect/Disconnect Notification (CBELL)
If you're in the ham shack but busy doing other things—or while you're connected to a station—you may want to be alerted when someone (else) connects to you. Turning CBELL *ON* will make your computer beep three times when another station connects or disconnects from you.

Setting Up for Transmitting
(If you're using an AEA program, follow the instructions in the program's manual to set up and use packet.)

Most packet operation is on FM simplex so turn off the repeater offset in your radio, if it's on.

Calling CQ
In order to allow amateurs to send message beacons and to call CQ, the AX.25 protocol has the ability to send packets that are intended for more than one specific packet station to see. Since all packets must have a destination "callsign", the DSP sends Unprotocol packets to the callsign of CQ. This can be changed with the UNPROTO command, but most people like this since it makes an easy way to call CQ.

You can call CQ in one of three ways: locally, by digipeating, or through a node.

Locally: Simply enter *K* to enter the Converse mode, press (RETURN) twice, the (CTRL-C) to return to the Command mode. Your CQ will look like this to anyone that's monitoring you:
```
(your call)*>CQ:
```

If you wanted to digipeat your CQ, say through WF7A, you'd enter it thusly:
U CQ V WF7A (RETURN) (RETURN) (CTRL-C)
To listeners nearby, they'll see this on their screens:
```
(your call)>WF7A*>CQ:
```

...or if they hear your call directly, it'd be:
```
(your call)*>WF7A>CQ:
```

You can use up to eight calls to send your CQ through a distant station.

To change the UNPROTO command to read something other than CQ, enter: UNPROTO (*text*), with (*text*) up to six characters long.

Nodes usually have a CQ command; to call CQ through it, you'd connect, first, then enter *CQ*—it'll send your callsign out for you.

To send a CQ through a couple of nodes to a distant one, you'll have to conect to each node as described in the *Digipeating* section below.

Going On-The-Air
Choose one of the stations with an asterisk displayed in your MHEARD list, or a friend that you know is on-the-air near you and enter:

        cmd: C *call*

A few moments later, you should see:

        *** CONNECTED to *call*

If you see this, you have just connected to your first packet station! Since you initiated the contact, you speak first. As you type, you may notice that the TX light on the DSP's front panel comes on. This means you've typed in a PACLEN's worth of text and the DSP is sending it; just keep on typing until you've finished with your message. After you've finished typing, enter a couple of (RETURN)s or press the "greater than" sign (>), followed by a (RETURN), to let the other station know that you've finished typing and that it's their turn to transmit. The other station will respond—at a PACLEN's worth of characters sent at a you at a time—then will give you a couple of (RETURNS) or a ">" to signal you to start transmitting. This is how it goes, back and forth, until you've finished chatting. Terminate the QSO as you did before with a (CTRL-C).

If you didn't connect according to plan, see below.

I'm Having Trouble Connecting
If the station you're trying to connect to is connected to someone else, you may see the following message:

        *** BUSY *call*: DISCONNECTED

If you see this it means that the other station is connected with someone and can't respond to you now. Simply wait a few minutes and try again or try connecting to a different station from your MHEARD list.

If the distant station can't hear you, you may see the following:

        *** Retry count exceeded
        *** DISCONNECTED: (call)

A number of different things can cause this to occur. It may simply be that the station you're trying to connect to is out of your transmitter's range or for one reason or another, is inaccessible. It's possible, however, that something more serious is wrong. If your connects don't go smoothly or as planned, go to *Chapter 13: Troubleshooting*, the packet section, for assistance.

More Packet Features
Now that you have worked a packet station or two, it is time to learn a little more about the other packet capabilities of the DSP. Rather than explain all the features in detail here, read about them later in this chapter and in the next chapter - *GPS Applications*.

Nodes, and Node Operation
In the early days of packet radio, Amateurs had to "digipeat" through many stations (up to 8) to connect to a distant station. As more users became active on packet, digipeating quickly proved to be an inefficient way of relaying packets through even a few "hops". The reason why is simple: with all the packets on-the-air being leapfrogged and trying to reach their destination, they'd invariably "crash", meaning that stations would transmit (and retransmit) packets at the same time. As you know from voice radio operation, when two stations talk at the same time you get a garbled mess, and that's what happened—packets would crash, stations would retransmit the packets since they weren't *ack*ed, they'd crash again with the same or someone else's packets.

To solve this problem, Amateurs began working on more efficient "higher level" ways of routing packets over long distances. NET/ROM™, ROSE, TCP/IP, TheNet, and TEXNET are some of the higher level protocols that emerged and are currently in use around the world. An analogy to packet node operation is your body: say you stub a toe against the wall. The nerve impulse starts at your toe, is transmitted by branch nerve fibers in your leg, then on to your spine (backbone) and finally the impulse reaches its destination, the brain. Packet communications work pretty much the same way: you (the toe) would send to a node (a branch station) that would be retransmit along a digital backbone to a final destination. Instead of a central clearinghouse for signals, like your brain, packet signals are routed along nodes that would retransmit a message until it reaches its destination. (This doesn't mean you don't need brains to use packet.)

In practice, you'd never connect directly to a backbone station; backbone stations typically operate in the 220 MHz and 440 MHz bands (in the U.S.) are used strictly as retransmitters of packets, not originators in the usual sense. With these stations *not* used for local traffic, they can speed packet traffic along faster and without interruption.

In summary, you don't connect to a distant station anymore but to a node which will do all the connecting and retransmitting for you so you can send mail, or chat with, another station. . . and it doesn't necessarily have to be a distant station. In mountainous or hilly areas, it's common practice for all stations to connect to a node and have it retransmit your signals, rather than have you connect directly to a nearby station. This method, rather than direct connecting, helps solve the packet crash problem that you read about a few paragraphs ago.

When you connect to a NET/ROM node you won't initially see a prompt. Since NET/ROM commands are few and easily memorized, they're not transmitted so airtime will be reduced. Like other automatic systems however, if you send an "H" or a "?" for Help you can expect to get a response. For Seattle's SEA node, you'd see:

```
cmd:c sea
*** CONNECTED to SEA
?
SEA:WN7ANK-8} Invalid Command - Choose from :
Connect CQ Bye Help Info Nodes Routes Talk Stats BBS MHeard Users Quit
```

In the above example, the Seattle node is addressed as `SEA` and it's operated by WN7ANK-8. `Invalid Command` means that the node didn't understand the command a connected station sent, so it returned the above "help" line to remind its user of the commands it knows, which are listed below its I.D.

Your DSP acts as a node!

Your DSP-232 node firmware supports local acknowledgment (*acks*) of packets like a full-service BBS/node does, so instead of users having to digipeat through your MYALIAS or MYCALL callsign to connect to a destination station, they can now simply connect to your MYGATE callsign. From there, they can then issue a connect request to the station they want to reach and your station will be responsible for accepting and sending packet data and *acks*. (Users *can't* digipeat through your MYGATE callsign.) All this allows for increased throughput. Users can also enter the MHEARD command to see the last 18 stations *your* TNC has heard.

The features of your node firmware are as follows:
• AEA packet "node"helps eliminate the need for digipeating.
• In AMTOR-listen mode, link and conect attempts are shown.
• Enhanced packet MHEARD function identifies TCP/IP, NET/ROM, and TheNet stations.
• EXPERT command is included so you're no longer burdened with a large number of commands to view.
• MOPTT command simplifies full brea-in CW operation.
• Automatic selection of AMTOR mode when a received signal is tuned with the ARXTOR command.
• The CODE command includes upper/lower case extensions used by many AMTOR MSO and APLINK stations.

For your node to work, simply enter a call into MYGATE—but not the same one as your MYCALL, MYALIAS or MYMAIL—and set GUSERS to a value greater than zero. To disable the node function, enter MYGATE *NONE* or GUSERS to zero.

✎ **Note**: with each station connected to your node you'll lose a "logical" channel. So, if you have GUSERS set to *3* and three source stations have connected to three destination stations through your node, they'll take up six of your ten channels, leaving you with only four channels to accept and initiate contacts. (If a station connects to your Maildrop that'd leave you three channels.)

Operating Your Node
Here's what a user would see when using your node as a packet node. In this example, your MYGATE call is set to *N7ML-7*:

```
cmd:C N7ML-7
*** CONNECTED to N7ML-7
+++ N7ML node. Type ? for help.
de N7ML-7 (B,C,D,J,L,N,S,?) >
```

The first line is the user's connect request to your TNC. The second line is the connect message from the user's TNC. The third line is the greeting. And the fourth is the command prompt from the node. The user sends a question mark, *?*, to obtain the following help menu:

```
B(ye)          Log off node
C(onnect) n    Connect to station 'n'
C n STAY       Stay connected to node when 'n' disconnects
D(isconnect)   Cancel a connect attempt
J(heard)       Display stations heard
L(isten)       Toggle monitoring
N(odes)        Display nodes heard
S(end)         Broadcast unproto
de N7ML-7 (B,C,D,J,L,N,S,?) >
```

The commands' functions are:

B(ye)   This is similar to the Bye command used in the AEA Maildrop and BBS stations. When a user enters a *B* the node will "disconnect."

C(onnect) *n*   Similar in operation to the CONNECT command in the packet mode. (Also used to connect in AMTOR and PACTOR instead of using the ARQ and PTCONN commands, respectively.)

For a packet connection, the user may connect to your node, then specify a string of digipeaters: *C W1AW VIA W2XY, W1XXZ*

Your node will try to establish a connection with W1AW as the destination; the user's callsign will be shown as the source but with a difference: the user's SSID is decremented by one to avoid protocol conflicts on the same frequency.

Here is an example of the frames sent in establishing a typical connection (with the MONITOR command set to *5*):

```
USER>GATE [C]
GATE>USER (UA)
GATE>USER [I]:
   +++ N7ML node. Type ? for help.
   de GATE (B,C,D,J,L,N,S,?) >
USER>GATE (RR)
USER>GATE [I]:
   c remote
GATE>USER (RR)                          USER-15>REMOTE [C]
                                        REMOTE>USER-15 (UA)
GATE>USER [I]:
   +++ CONNECTED to REMOTE at GATE
USER>GATE (RR)
USER>GATE [I]:
   hello.
```

```
GATE>USER (RR)                                    USER-15>REMOTE [I]:
                                                      hello.
                                                  REMOTE>USER-15 (RR)
                                                  REMOTE>USER-15 [I]:
                                                      Yes?
GATE>USER [I]:                                    USER-15>REMOTE (RR)
    Yes?
USER>GATE (RR)
```

Once the connection is established with the destination station, the node notifies the user that the connection has been made then goes from the "Command" mode into the "Converse" mode. Now, whatever the user sends goes to the destination station as data instead of to the node as a command.

Normally, when someone disconnects from your node, no link will remain. However, if a user adds the word *STAY* as the last argument in a Connect request, (e.g., *C callsign STAY*), the user will remain connected to your node even after disconnecting from the destination station.

If the connect attempt to the destination station retries out or is busy, your node sends the user a `Retry count exceeded` or `(Remote) busy` message, but remains connected to the user even if *STAY* *wasn't* entered.

D(isconnect)   (to cancel a connect attempt.) Since the source station remains in the Command mode until the connection to the destination station is established, there's no need for the user to wait for your node to cycle through a full number of retries to attempt a connection—the user can send your node a Disconnect request which cancels the Connect request the same way it would in a TNC's Command mode. (The user stays connected to your node even if *STAY* wasn't used in the original Connect command.) The Disconnect command may be used at any time before the connection is established, regardless of any preceding commands.

Once a connection is established and your node is in the Converse mode, the user can end the connection either by sending a B(ye) command to the destination station if that station supports it, or by issuing a Disconnect request to the user's own TNC. If the user disconnects from your node this way, it'll force your node to disconnect the destination station.

J(heard)   Your node sends its MHEARD list to the user: A maximum of eighteen stations are kept in the JHEARD list.

L(isten)   The node toggles packet monitoring on or off.

N(odes)   Your node sends the user a list of nodes heard. The format is the same as that of the JHEARD command, the difference being that a callsign is put in the Nodes list only if the monitored packet was a UI frame with a PID of CF (NET/ROM) or CD (IP). A maximum of ten stations are kept in the Nodes list. You clear the nodes list and the MHEARD list simultaneously with the same command, MHEARD %.

S(end)   Your node responds with. . .
`+++ Sending. To end, type '='.`

. . . and sends all subsequent data in the broadcast mode "unproto." The data characters are held until the user sends a (RETURN), whereupon the held data is broadcast.

In all operating modes, the user can stop sending unproto by sending the "=" character—the node will then issue a command prompt. The "=" character shouldn't be used within the user's broadcast text.

Digipeating

Sooner or later, you'll want to connect to a packet station that's beyond your immediate radio range or is inaccessible from your location. If a third packet station is on the air and both you and the station you want to talk to are in range of that third station, the third station can act as relay station for your packets—you simply enter the digipeater routing path in your connect request. Here's a sketch that shows how digipeating can solve a simple problem:

```
              KB6IUX
                |
                /\
               /\/\/\
WO6P      /\/\/\/\/\/\      KG6ZL
```
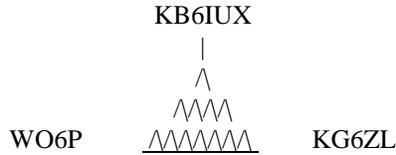
You're station WO6P and you want to have a packet QSO with KG6ZL but there's a mountain between you which completely blocks your radio path. However, you know that there's a packet station located on the mountaintop, KB6IUX, which is accessible by *both* you and KG6ZL.

To digipeat through (*VIA*) KB6IUX, enter:
        `cmd`: *C KG6ZL V KB6IUX*

. . . but KB6IUX doesn't have DFROM *ON*, so no one can use him as a digipeater. What now? Pick up the telephone and call your friend at KG6ZL? Not necessarily. You listen some more and you can hear another station, KD7NM off to the side of the mountain, chatting with WF7A in a location that you know *he* can reach KG6ZL. So, you enter the linear, point-to-point path you need to use to connect to KG6ZL:
        `cmd`: *C KG6ZL V KD7NM,WF7A*

They both have DFROM *ON*, so a few seconds later you receive an *ack* back from KG6ZL and you're all set.

Are You a Digipeater?

Your packet station can be a digipeater for other stations. You don't have to "do" anything—your DSP will digipeat other stations *unless you tell it not to* using DFROM.

If your transmitter keys when you're not using it or during lulls in your own conversations, you're being used as a digipeater by someone. Don't worry—this won't interfere with your chat with your partner. (As a courtesy, leave DFROM *ON*.)

If you want to see, or monitor, the text the other stations are sending through you, set MDIGI *ON*.

Identifying as a Digipeater

If your DSP is being used as the primary digipeater in a local area, you may want to enable HID—it will automatically identify your station for others to see.

You may also want to choose a simpler identifier for others to use by setting it with MYALIAS. Examples are: SEA for Seattle; PTLD for Portland; LYNN for Lynnwood, and so on.

Time-stamping Packets and Messages

Monitored packets can be time-stamped if the DSP's internal clock has been set with DAYTIME. To time-stamp *monitored* packets, turn MSTAMP *ON*. Turning DAYSTAMP *ON* adds the date to the time-stamp provided by MSTAMP.

Sometimes it is useful to know what time someone connected to you—perhaps for logging purposes. To time-stamp your packet *connects* and *disconnects* turn CONSTAMP *ON*. As discussed in the last paragraph, turning DAYSTAMP *ON* will add the date to this time-stamp as well. The DAYTIME command must be set first for DAYSTAMP to operate.

Multiple Connection Operation

Because packet radio supports multiple QSOs on the same frequency, you can converse with more than one station at a given time. The DSP offers ten channels, (0-9), each of which can support a conversation. This capability is a powerful feature of your DSP, let alone a mentally challenging one when you have more than a couple of QSOs going on at once! This is when Windows and Mac users will appreciate AEA's TNC control programs: PC PakRatt for Windows and MacRatt.

Multiple connect operation is like a 10-line telephone with automatic "hold." When you're connected to multiple stations you'll automatically receive everything sent *to* you, but you must select the proper channel to send data to a particular station on a particular channel; in effect, it's just like having to push the proper "line" button on the telephone to talk to someone—you can't talk to someone on Line 1 while you're talking on Line 3.

As mentioned before, you can step down to Command mode while you're connected to someone, and you'll need to jump down there in order to change channels. (This is true for any and all of the channels that are active.)

By the way, you'll know you're connected to more than one packet station when the MULT light on the front panel of the DSP lights.

✎   **Note**: The MULT light will blink if the DSP's receive buffer is filled. This can happen if your computer is not connected to the DSP, its maildrop is full, or if your communications program no longer can accept any further inbound data.

Setting Up

You can select any channel you want to initiate a connect, but to enable your DSP to allow *incoming* multiple connections, you need to set the USERS parameter to a value greater than one (*1*); The number you enter in the USERS command tells the DSP how many users you'll allow to connect to you at a given time. So, if you set USERS *5*, five stations can connect to, or digipeat through, you concurrently. With USERS set to *0* (zero), no one can connect to you.

✎   **Note**: With all ten channels enabled with the USERS command, stations that connect with you will connect to the DSP's channels in ascending order, starting from 0. Stations that connect to your maildrop are automatically connected to your DSP's Channel 9.

The Channel Switching Character

Once you've set the USERS command you need to set the CHSWITCH character, a character that you don't normally type such as the vertical bar "|" (ASCII $7C), or the tilde "~" (ASCII $7E). You'll use this character to tell your DSP that you want to change channels numbered zero through nine (0-9). To change channels, press the CHSWITCH character you just defined, and then a number from 0-9. For example, if your CHSWITCH character is the tilde, you're chatting with somone on Channel 0, and you want to to chat with a station that connected to your DSP's Channel 1, you'd enter:

```
cmd:~1 (RETURN)
~1: cmd:
```

✎   **Note**: Even though you've changed to Channel 1, you still can access all the commands normally available to you that you had in Channel 0, the DSP's default channel. This is true for all ten channels

When you change channels, the channel you just changed to will have the packet header information of the station that just connected to you. Remember, that the text that you'll now type will only be sent out to the station connected to the channel your DSP is now on. If, while talking on Channel 1, the station still connected to you on Channel 0 sends data to you, it'll be held in the DSP's memory until you return to Channel 0, whereupon the data will scroll up on your screen.

Say, by coincidence, the station you're connected to sends a character which is the same one you've set for CHSWITCH. If you want to be able to tell the difference between the CHSWITCH characters you type and the same character from other station, set CHDOUBLE *ON*.

CHCALL
Multiple connection operation can be confusing, especially when trying to remember who's connected on which channel. To help the situation, turn CHCALL *ON* to display the callsign of the station which is connected to you on a given channel number.

Checking Your Connect Status with CSTATUS
To check which channels are available to you as well as who's connected to you, enter CSTATUS—it will show you the connect status of all 10 packet channels—connected or unconnected—as well as the status of the channel you're currently on. By entering CSTAT *SHORT*, the DSP' will display only the channels that are currently connected.

HF Packet Operation
HF packet requires a bit more patience to use than VHF packet; the mode suffers from lower throughput because of its 300 baud "speed limit", static crashes and man-made noise. Because of this, PACTOR has taken over where HF packet was once the only true error-correcting mode on the HF bands. At this writing, however, HF packet is still widely use and now with the integration of Global Positioning System technology it is becoming popular to map the location of packet users around the world. Some users even use packet to map DX spots while communicating in CW.

Where To Operate
Most HF packet operation is on the 20-meter amateur band starting at 14.103 MHz and every 2 KHz above that up to 14.111 MHz. Note that 14.103 MHz is the calling frequency and a good place to start. The higher frequencies such as 14.109 and 14.111 are used mostly by HF PBBS systems and aren't good places to look for a QSO.

Settings
With your computer and DSP up and running, change the following parameters for 300 baud HF packet. The VHF settings are also shown to make it easier to switch back to VHF when you're finished.

300 baud HF packet	1200 baud VHF packet	9600 baud VHF packet
SLOTTIME *8*	SLOTTIME *30*	SLOTTIME 30
PACLEN *64* (or less)	PACLEN *128*	PACLEN 128
MAXFRAME *1*	MAXFRAME *4*	MAXFRAME 4
FRACK *15*	FRACK *8*	FRACK 4
HBAUD *300*	HBAUD *1200*	HBAUD 9600

The last command is the most important. If you don't set the packet baud rate (HBAUD) to 300, you'll be operating at a different speed than everyone else, won't be able to copy and packets, and you'll cause all kind of adjacent signal QRM.

HF Receiver Settings
Set your HF receiver (or transceiver) to LSB unless you connected your DSP through the direct FSK keying lines, in which case you should select your radio's FSK operating mode. Adjust the volume to a comfortable listening level.

Tuning-in HF Packet Stations

Perhaps the most difficult thing about HF packet operation is making sure the station you're talking to is tuned properly and stays tuned. Since HF packet uses 200 Hz Frequency Shift Keying to send data (2110/2310 Hz), tuning accuracy is very important. Being off-frequency by only 20 Hz makes a noticeable difference in the DSP's ability to copy. Once you are tuned in, the superior filtering ability of the DSP-232 improves HF packet performance. Follow the tuning procedure below carefully for the best results in tuning in HF packet stations.

1) Make certain your HF receiver is either in LSB or FSK, depending on your DSP' set-up.
2) Turn any IF-Shift and Passband-Tuning controls to the Center or off position.
3) Tune your receiver to 14.103 MHz (or another frequency where you know there's HF packet activity) and listen to the packets.
4) Slowly vary the tuning knob on your receiver and look for a display on the DSP tuning indicator like the one shown below:

■□□□□□■■□□   ■■□□□□□□■■   □□■■□□□□□■
     Frequency too low   Tuned in!   Frequency too high

5) Adjust the DSP's THRESHOLD so that the DCD light glows when a properly tuned packet is being received. (You must also make certain that the DCD light goes out when no packet signals are present on the frequency.)

After you have a packet station tuned in, you should start seeing HF packet stations on your display.

Transmitter Adjustments
Make sure your DSP is adjusted for your SSB transmitter as described in Chapter 3, *SSB Transceiver Final Adjustments*. These are very critical adjustments. If your DSP's AFSK level and transmitter microphone gain are not adjusted properly, other stations will not be able to copy your packets. Check your plate or collector current or the power output of your rig before going on the air.

Going On-the-Air
On HF there are two ways you can go about talking to another station:
   ♦ Monitor the frequency for packet traffic (or check your MHEARD list) for calls you can hear well and choose one of them to connect to;
   ♦ You can also "Call CQ" by entering the Converse mode and pressing (RETURN).

Either way you decide to go on-the-air, remember that things happen much more slowly on HF packet than they do on VHF and UHF packet. HF packet requires patience and careful tuning in order to be used successfully.

If you're having problems connecting to other HF packet stations, try working with an experienced HF packet operator in your area and listen to each other's signals. See if you can copy each other's packet signals. If he can't copy you, have him listen to your signal while you're in the CALIBRATE mode to make sure you're transmitting a pure tone. As mentioned earlier, any distortion caused by overmodulation or RF feedback will make your signal difficult or impossible to copy.

Packet Meteor Scatter Extension
A new packet protocol extension has been added for meteor scatter work that allows a Master/Slave packet connection to be established. This is done to reduce the possibility of simultaneous transmissions by both sides of a packet connection over a long meteor scatter path.

This experimental protocol is activated by turning UBIT 18 *ON*; the packet station that initiates a packet connect will become the master station and the station that acknowledges the connect becomes the slave.

After a meteor scatter connection has been established, the master station will continually send either information frames (I-frames) or polling frames and await an acknowledgment from the slave. The Master station therefore sends packets constantly, even if all its I-frames have been acknowledged. The slave station sends nothing, not even

I-frames, until it receives a polling frame from the master. The slave station may only send an I-frame to the master after a poll frame has been received.

The packet timing of the master station is critical for proper meteor scatter operation. In a normal AX.25 packet connect, the FRACK timer counts down until it reaches zero and then a RETRY of a poll frame is sent. The FRACK timer counts in units of seconds, however, and a finer timing resolution is desirable for meteor scatter work. A new timer, called FRICK, has been added which times in 10 mS increments. The FRICK timer can be set from 0 (disabled) to 250 which corresponds to a time of up to 2.5 seconds.

The following settings are recommended for this method of meteor scatter work. Both packet stations should use the same settings:

UBIT 18 *ON*
RETRY *0*
AX25L2V2 *ON*
MAXFRAME *1* (CHECK doesn't matter)
FRICK *n*, where *n* is large enough to allow the other station time to send the start of an acknowledgment frame.

✎ **Note**: Don't operate the unit with multiple packet connections while FRICK is active (1-250). In contrast to FRACK, which provides one retry timer per multi-connect channel, there is only one FRICK timer in the DSP. Each logical channel will try to use the same FRICK timer, causing interference to the operation of the other channels.

Digipeaters shouldn't be used when in the meteor scatter mode. The FRICK timer (unlike FRACK) doesn't allow any extra time when digipeater stations are specified. To return to normal AX.25 packet operation, turn UBIT 18 *OFF*. Also, be sure to disable the FRICK timer (by setting FRICK to *0*) when you're through operating in meteor scatter mode.

Intermediate and Advanced Packet Commands

Your DSP has many commands that are not necessary for day-to-day connects or casual conversations. Still, as you become more familiar with packet, these commands and features may become important to you.

1200/9600 bps Operation

To select the speed you want to operate packet at on VHF, simply change the value of HBAUD--for 1200 bps packet, enter HBAUD 1200; for 9600 bps packet, enter HBAUD 9600.

Monitoring Other Stations While—or While *Not*—Connected

When you're connected, MCON determines what packets are shown. The default of MCON is *0* (zero) which tells the DSP' *not* to monitor any packets while you're connected. Most users prefer it this way so they're not disturbed with monitored channel data while they're connected with another station. However, if you want to monitor packets while connected, refer to MCON for user settings.

Use the MONITOR command to determine what kinds of packets you'll see when you're *not* connected to any stations. The higher the argument number (1-6), the more information you'll see. If you don't want to see extraneous information associated with sent packets, use a lower value like *2* or *3*.

✎ **Note**: If you'll be leaving your DSP on to accept connects from other stations while your computer is off, set MONITOR to *0* (zero). This way, you won't fill up the DSP's buffer with "junk" copy and will devote its memory to its MailDrop.

Monitoring the Packet Networking Switches
There are other types of frames used by networking switches that the DSP doesn't normally display. These frames can be seen with MPROTO—turning it on allows *all* AX.25 frames to be displayed. Some packets you might see with MPROTO *ON* will contain information that may interfere with the display on your terminal or computer causing it to look "funny". For this reason, MPROTO's default is *OFF*.

Selective Monitoring
After you've monitored channel activity for awhile, you may decide there are only a few stations you want to copy. To "screen" stations for monitoring purposes, use MTO and MFROM. With the MBELL command, you can even be alerted when a certain station transmits on the frequency. These commands work in conjunction with MONITOR and MCON commands.

MFILTER
Some terminals and computer programs are sensitive to certain characters that may appear in monitored packets. You'll know this is happening if occasionally the cursor on your screen moves to strange places, causing the received copy to be garbled.

The DSP default for MFILTER is *$80* which prevents most control characters from interfering with your display.

Monitor Without Callsign Headers
Sometimes you may want to monitor certain stations without having to look at the packet callsign headers. This can be useful when monitoring message traffic from a large PBBS. The MBX command allows you to choose the callsign of a station, or a pair of stations, you want to monitor without having to see packet headers.

Beacon Operation
In the early days of packet, the beacon was useful to show your presence on the packet channel. With the growth of packet, many users feel that beacons have outlived their usefulness and interfere with traffic. Use your beacon with discretion.

The DSP can send an automatic "beacon" message at a specified time interval. A beacon can send special announcements, or let others know you're on the air. To enable beacon operation:
- ♦ Enter your beacon message in BTEXT.
- ♦ Set the beacon interval using the BEACON *EVERY* or *AFTER* command.
- ♦ A beacon frame is sent to the path set in UNPROTO.

As a reminder, if you set the BEACON timing at a value considered too small for busy channels (less than "90"), you'll see:
```
WARNING: BEACON too often
```

Packet Transmit Timing
The DSP has a number of built-in timers used to control the packet protocol and transmit timing. The default values have been set at the factory to provide reasonable performance, but the values may not be optimum for your local area. Most protocol parameters should be adjusted only after carefully reading about them later in the chapter. You *should* adjust TXDELAY for your transmitter as described below.

Radios vary in the time it takes it to switch from receive to transmit. If your DSP' starts sending data before your transmitter is up to power, the packet will not be received properly at the distant end. TXDELAY controls the delay between your transmitter's key-up and the moment when your DSP' starts sending data. The default value of *30* corresponds to a time of 300 mS and works with most VHF/UHF FM transceivers. With modern transceivers, TXDELAY can often be reduced from its default value which will improve packet performance in your area. You should perform the following procedure to optimize TXDELAY for your station:
1) Find another station who can reliably digipeat your signals.
2) Set your UNPROTO path to *TEST* via the call of the station that will digipeat your signals. For example: *U TEST V WO6P*.

3) Set MONITOR to at least *1*.
4) Go to Converse mode by entering *K*, then send a few packets by pressing the (RETURN) key. You should see the outgoing packets on your own screen echoed back as they're digipeated by the other station.
5) Start reducing TXDELAY by units of *5* each time, making sure the other station is still digipeating *all* of your UNPROTO packets.

Eventually you'll find a value where the other station can no longer copy your packets accurately enough to digipeat them.When this happens, increase TXDELAY in units of one or two until the other station again digipeats *all* of your packets again. This will be the optimum setting of TXDELAY *for that particular radio*.

After TXDELAY has been adjusted, you may want to adjust the audio delay (AUDELAY), too, using the same procedure as above. (See AUDELAY for more information.)

Packeting Through Voice Repeaters

Although it isn't common, packet can be used through voice repeaters. When sending packets through a repeater you may require a longer key-up delay than is normally needed for direct communications. AXDELAY adds more key-up delay in your DSP so that the repeater can key-up at the proper time. AXHANG sets the timespan needed for the repeater to "drop."

Although it's seldom needed, the DSP does have an input for squelch information from a transceiver through the RADIO connectors. This input should be used with the SQUELCH command.

Packet Formatting and Editing

Some of your DSP's command parameters affect how your packets are formatted—how your typing appears to the rest of the world. Other commands let you correct typing errors before your packet is sent, cancel lines, or entire packets.

(RETURN)s and Linefeeds

Most hams use packet radio for sending and receiving messages or just for conversation. The character used to send a packet is defined with the command SENDPAC which defaults to a (RETURN) ($0D). You can change the SENDPAC character, but you'll find the (RETURN) or (ENTER) key to be a natural choice.

Similarly, your DSP will include a (RETURN) in the packet you send to the other station since this makes for a more natural conversation. ACRPACK controls this feature, and most people will never want to change this.

The DSP also has the capability of adding a linefeed character ($0A) automatically to packets that you send to others. If you encounter a station or two says your packets are overprinting, you may want to turn the ALFPACK or ILFPACK *ON* for them.

Canceling Lines and Packets

Most of the time, the Backspace key—or the Delete key on some machines—is all that's needed to edit a line *before* it's sent. Occasionally, it may be helpful to cancel a typed line or the entire packet you're entering with one keystroke. The CANLINE character, (CTRL-X), will cancel the entire line you're typing; the CANPAC character, (CTRL-Y), will delete the entire packet.

Redisplaying Text

If you've erased and retyped lots of characters, you may want to see a "fresh" screen (especially if BKONDEL is *OFF*.) The REDISPLAY character (CTRL-R) will refresh your screen and will display any packets you might have received while you were typing.

The PASS Character

Sometimes you may want to include a special input character such as a (RETURN) in a packet without forcing an action to happen. For example, to send several blank lines in the same packet, you must include a (RETURN) at the

end of each line. However, if you press (RETURN), you'll force a packet to be sent. You can get around this problem using the PASS (CTRL-V) character. You can include any character in a packet (including all special characters) by prefixing that character with the PASS character. For example, if you're in Converse mode, you can type:

>   *I wasn't at the meeting.*(CTRL-V)+(RETURN)
>   *What happened?*(RETURN)

Without the PASS character, this message would go out as two separate packets because you entered two (RETURN)s, but by prefixing the first (RETURN) with a (CTRL-V), you send all the above text in only one packet while maintaining its two-line format. The PASS character can be useful in formatting text messages such as CTEXT as well.

Packet Protocol Basics

Here we will talk a little about the AX.25 packet protocol. You don't need to understand this to use packet, but it is helpful in understanding some packet protocol parameters.

There are two modes of packet transmissions: connected and unconnected. Most of the time when you use packet, you'll be conversing with another packet station in a connected state. Still, the unconnected, or unprotocol, mode comes in handy for beacon transmissions and roundtable exchanges.

All packets are constructed basically the same: they contain source and destination callsigns (and any digipeaters if they are used) as well as information identifying the type of packet. (This packet identification can be seen with the MONITOR command discussed earlier.) All packets contain an error check code called the CRC. This ensures that when a packet is received, it won't contain any errors. PASSALL can disable the CRC error check, but this should only be done for experimental purposes.

Connected packets

When you connect to another station, the AX.25 packet protocol ensures that the station to whom you're connected to receives all the packets that you send. Likewise, the protocol ensures you will receive all the packets that the other station sends to you. The following describes briefly how the protocol does this.

FRACK and RETRY

When the DSP is connected and sends a packet to another station, it expects an *ack* packet back from the other station to confirm that the packet was received. The AX.25 packet protocol will automatically retransmit (retry) packets when an acknowledgment isn't received from the distant end of the link within a specified time.

FRACK sets the timespan before the originating station retransmits (retries) the packet that hasn't been *ack*ed, yet.

RETRY sets the maximum number of retransmissions before your DSP' "gives up" and terminates the connection attempt (disconnects). The TRIES counter keeps track of the retries that have occurred on the current packet.

PACLEN and MAXFRAME

Packets will be sent either when the (RETURN) pressed or when the maximum packet size is exceeded—which is set by PACLEN. When large amounts of data need to be sent, this value can be increased to *256*. When conditions are poor or the channel is crowded as on HF packet, this value should be reduced to *64* or less.
The packet protocol allows more than one frame to be sent in a single transmission, which set by MAXFRAME. When conditions are good, up to 7 frames can be sent to speed data transfer. When conditions are poor or the channel is crowded, MAXFRAME should be reduced to *1*.

Reducing Errors through Collision Avoidance

Since packet operates over the radio, there are usually many stations operating on the same frequency that can't hear each other. The digipeaters and network nodes allow these stations to communicate with each other, but this increases the chances of collisions.

The first attempt to avoid collisions was through the use of the DWAIT and RESPTIME timers. DWAIT forced the TNC to delay the transmission of any packet except for digipeated frames by the time selected. This fixed timer helped, but packet was still plagued by collisions. RESPTIME was added to help with large file transfers. Still, more needed to be done to reduce collisions.

Another attempt to reduce collisions was the introduction of AX.25 version 2 protocol. On VHF packet, most everyone uses version 2 which is controlled by the AX25L2V2 command. On VHF this helps, but some users on HF packet turn this command off.

An exponentially distributed random wait method was proposed by Phil Karn (KA9Q) called P-persistent CSMA. When PPERSIST is *ON*, the DSP' uses the number set in PPERSIST and the time value set by SLOTTIME to more randomly distribute the transmit wait time. This is more efficient than using the DWAIT time.

As a further attempt to improve packet performance, Eric Gustafson (N7CL) proposed giving priority to acknowledgment packets (acks); this protocol is controlled by ACKPRIOR. Check with the experienced packet users in your area and find out if they are using priority acknowledge or have changed any other parameters.

DAMA Support
AEA has added DAMA (Demand Assigned Multiple Access) to the DSP-232. DAMA allows for a master/slave connection to reduce packet collisions. At times, a node's receiver can hear too many signals at once and remote users can get lost in the noise. A good example of this situation is when ships on the open sea try, but can't connect to communication satellites; the stations have a clear shot at the satellite, yet can't connect.

To solve this problem using existing equipment and still using only one frequency, DAMA has been implemented to organize all node users' communications. With DAMA, the master station identifies all slave stations and polls each of them for information. Slave stations are 'asked' by the node if they have any information to send. If a slave station does, the information is sent and the node 'remembers' that this station sent information this time around. If a slave station does not send information, the master 'remembers' and skips this person next time around, coming back to them at a later time. Those stations replying with information when polled are considered active. Stations that do not send information are considered inactive. Active stations are given a higher priority than inactive stations and thus, more opportunity to send information. As the node traffic increases, inactive users fall down through the priority list. Low priority stations can become active (and have higher priority) at anytime by sending information when the master station polls. Using DAMA can increase overall channel throughput by organizing stations based on their state of activity. Stations sending data are given more chances to send data and stations not sending data are given less chances.

AEA has added the UPlink command to the DSP-232 for use with DAMA communications. Information on this command can be found at the end of this chapter.

CHECK and RELINK
If a station connects to you and then turns its TNC off, you would probably not want to stay connected to the station. The CHECK timer determines the amount of time your DSP will wait before testing the link if no data has been exchanged.

RELINK sets what happens *after* the CHECK timer has expired. If RELINK is *OFF*, the DSP will change to the disconnected state to terminate the link. If *ON*, the DSP' will attempt to reconnect to the distant station to re-establish the link.

Transparent mode
One of these features is the Transparent mode—it allows any 8-bit binary character to be sent by your packet station. You usually must use the Transparent mode to transfer binary and executable files to and from other stations. See Chapter 4 for terminal commands.

You can either enter the Transparent mode by typing TRANS at the command prompt after you connect, or by setting CONMODE to *TRANS*. Either way, once you enter the transparent mode any character you type will be sent automatically after the PACTIME setting. This way, any character can be sent by the DSP. Although we recommend using hardware flow control in Transparent mode, software flow control is available through the TRFLOW and TXFLOW commands.

To return to the Command mode after you're finished with transparent mode, you must type the Command character (CTRL-C) three times within the "guard time" set by CMDTIME (default: 1 second), then wait an additional CMDTIME for the cmd: prompt to appear.

Sometimes you may need to send a file that contains some 8-bit data, but you don't need all the features of the Transparent mode. In this case, you may find turning the command 8BITCONV *ON* is all that is needed.

Full-Duplex Operation
Most packet activity is conducted through half-duplex transceivers that transmit or receive, but not both at once. In some systems where a separate transceiver and receiver is used (such as satellite operation), set FULLDUP *ON*.

Morse ID in Packet
In most countries, packet is an accepted mode of identification so MID should be left *OFF*. (Your callsign appears in the header information.) If a Morse ID is required where you reside, turn MID *ON*.

The QRA Feature
The DSP recognizes UI frames with a destination field of "QRA" and will respond by sending an ID packet. This is helpful for others new to your area that are looking for other packet stations to talk to. To disable this feature and remain anonymous, simply set UBIT 22 *OFF*.

If you want to see who's available in your local area, simply set your UNPROTO path to *QRA* and send a packet. Within 1 to 16 seconds, other stations should respond to your QRA request by sending an ID packet of their own. This feature is compatible with TAPR's QRA feature introduced in their 1.1.8 firmware release.

Packet Mail
Although standard TNCs allow incoming messages to be saved, there's no way for the owner to leave a message for someone who will connect at a future time. The ability to both send and receive messages without the owner being present is accomplished by a mailbox.

There are many different packet mailbox systems in use. Some systems are large and require the use of a dedicated computer to that end. Other systems are relatively small like the personal PakMail™ MailDrop built into your DSP.

Large systems are often called Packet Bulletin Board Systems (PBBS) since they serve as electronic message centers for a local area. PBBS's are a source of information as well as a gateway for messages that can be sent to, and received from, other parts of the country or world. You will probably want to locate the PBBS nearest you and connect to it from time to time.

Most mailbox systems are easy to use and whether they are small or large, operate in much the same way. Another nice feature of mailboxes and other automatic systems is that they usually have a Help file or menu available by the caller entering an "H" or "?" after a command line. Feel free to experiment with mailboxes and other packet systems, but be courteous and experiment during off-peak hours.

For more information on setting up and using your maildrop, read *Chapter 7: Maildrop Operation.*

PACKET COMMANDS
Other commands can be found in the following mode, mailbox, and GPS chapters. A complete list of commands is in Appendix C and an explaination of terminal commands are found in Chapter 4.

8Bitconv *ON*/*OFF*   Default: OFF
Mode: packet/ASCII   Host: 8B

OFF   The high-order bit is stripped in Converse Mode.
ON   The high-order bit *isn't* stripped in Converse Mode.

8BITCONV permits packet and ASCII transmission of 8-bit data in Converse mode. When 8BITCONV is *OFF*, the high-order bit (bit 7) of characters received from the terminal is set to 0 (zero) before the characters are transmitted.

ACKprior *ON*/*OFF*   Default: OFF
Mode: packet   Host: AN

ON   Priority acknowledgment is enabled.
OFF   This feature is disabled.

This command implements the Priority acknowledge scheme described by Eric Gustafson, N7CL, which proposes to improve multiple-access packet performance on HF and VHF simplex channels with "hidden" terminals. When a busy channel clears, the acknowledgments are sent immediately while data and poll bits are held off long enough to prevent collisions with the *ack* packets. By giving priority to data *ack*s, fewer *ack*s will collide with other station's data, reducing retries. Digipeated frames are sent immediately. RAWHDLC and KISS force ACKPRIOR *OFF*.

These are the defaults for a P-persistence system with no Priority acknowledgment: *ack*PRIOR *OFF*, PPERSIST *ON*, PERSIST *63*, SLOTTIME *30*, RESPTIME *0*, MAXFRAME *4*, and FRACK *5*.

The following are the recommended command settings for Priority acknowledge:

1200 baud VHF packet	300 baud HF packet
ACKPRIOR *ON*	ACKPRIOR *ON*
PPERSIST *ON*	PPERSIST *ON*
PERSIST *84*	PERSIST *84*
SLOTTIME *30*	SLOTTIME *8*
RESPTIME *0*	RESPTIME *0*
MAXFRAME *1 - 7*	MAXFRAME *1*
FRACK *8*	FRACK *15*
HBAUD *1200*	HBAUD *300*
DWAIT - doesn't matter	DWAIT - doesn't matter

Stations using neither the Priority acknowledge nor the P-persistence schemes should set DWAIT *73* for 1200 baud and DWAIT *76* for 300 baud work. Stations using P-persistence but not Priority acknowledge should set PERSIST and SLOTTIME to the same values that ACKPRIOR stations are using.

AEA and TAPR use some different command names to handle P-persistence. The following table should help with the AEA/TAPR command differences:

TAPR SLOTS	MFJ SLOTMASK	AEA PERSIST	Remarks
1	$00	255	Disables slotting
2	$01	127	
3		84	
4	$03	63	Default setting
6		42	
8	$07	31	Very busy channel
12		20	
16	$0F	15	Extremely busy channel
64	$3F	3	

AEA products calculate the TAPR ACKTIME value based on the setting of HBAUD. The TAPR DEADTIME command is similar to AEA's SLOTTIME command.

ACRPack *ON*/*OFF*   Default: ON
Mode: packet   Host: AK

ON   The SENDPAC character is added to packets sent in Converse mode.
OFF   The SENDPAC character *isn't* added to the packets.

With ACRPACK *ON*, all packets sent in the Converse mode include the SENDPAC character, normally a (RETURN), as the last character of the packet.

When ACRPACK is *OFF*, the SENDPAC character is interpreted as a command, and isn't included in the packet or echoed to the terminal.

ACRPACK *ON* and SENDPAC *$0D* produce a natural conversational mode.

ALFPack *ON*/*OFF*   Default: OFF
Mode: packet   Host: AP

ON   A line feed *is* added after each (RETURN) sent in outgoing packets.
OFF   A line feed isn't added to outgoing packets (default).

ALFPACK is similar to ALFDISP, except that the LF characters are added to outgoing packets rather than to text displayed on your computer screen. If the person you're talking to reports overprinting of packets from your station, set ALFPACK *ON*.

ALFPACK is disabled in the Transparent mode.

AUdelay *n*   Default: 2 (20 msec.)
Mode: Baudot, ASCII, FEC, PTSEND, and packet   Host: AQ

"*n*"   0 - 120 specifies in units of 10 mS intervals, the delay between PTT going active and the start of the
          transmit AFSK audio tones.

In some applications you may need to make a time delay from the moment the radio PTT line is keyed and the time that audio is produced from the DSP. Most notably, on HF when an amplifier is used, arcing of the amplifier's relay contacts may occur if drive to the amplifier is applied before the contacts have closed. If arcing occurs, increase AUDELAY slowly until the arcing stops.

In VHF or UHF FM operation, some synthesized transceivers may produce undesirable spurious emissions if audio and PTT are applied at the same time. These emissions may be reduced by setting AUDELAY to roughly half of TXDELAY.

Please note that AUDELAY must *always* be less than TXDELAY. It's advisable that AUDELAY be set lower than TXDELAY by a setting of 10. For example, you've determined that TXDELAY *20* works well for your transceiver. Subtracting 10 from 20 yields 10, which is the recommended setting for AUDELAY. If a setting of AUDELAY *10* is too short, then set *both* TXDELAY and AUDELAY higher.

Ax25l2v2 *ON*/*OFF*   Default: ON
Mode: packet   Host: AV

ON   The DSP uses AX.25 Level 2 Version 2.0 protocol.

OFF   The DSP uses AX.25 Level 2 Version 1.0 protocol.

This command allows the selection of either the old (version 1) version of the AX.25 packet protocol or the current (version 2.0) protocol. Some implementations of version 1 of AX.25 protocol won't properly digipeat Version 2.0 AX.25 packets. Most users run AX.25 version 2, but this command allows you to (RETURN) to the older version, if necessary, for compatibility.

AXDelay *n*   Default: 0 (00 msec.)
Mode: packet   Host: AX

"*n*"   0 to 180 specifies a key-up delay for voice repeater operation in 10mS intervals.

AXDELAY specifies the period of time the DSP will wait—in addition to the delay set by TXDELAY—after keying the transmitter and before data is sent. Packet groups using a standard voice repeater to extend the range of the local area network may need to use this feature.

Repeaters with slow electromechanical relays, auxiliary links, or other circuits which delay transmission after the RF carrier is present require more time to get RF on the air. Try various values to find the best value for "*n*" if you're using a repeater that hasn't been used for packet operations before. If other packet stations have been using the repeater, check with them for the proper setting. AXDELAY acts together with AXHANG.

AXHang *n*   Default: 0 (000 msec.)
Mode: packet   Host: AH

"*n*"   0 to 20 specifies voice repeater "hang time" in 100mS intervals.

AXHANG allows you to increase efficiency when sending packets through an audio repeater that has a hang time greater than 100mS. When the DSP hears a packet sent within the AXHANG period, it doesn't add the repeater key-up delay (AXDELAY) to the key-up time. Try various values to find the best value for "*n*" if you're using a repeater that hasn't been used for packet operations before. If other packet stations have been using the repeater, check with them for the proper setting.

BBSmsgs *ON|OFF*   Default: OFF
Mode: packet, PACTOR   Host: BB

OFF   The DSPs status messages work as before (default).
ON   Makes the DSP status messages look like the TAPR-style output.

With BBSMSGS *ON*, some of the status messages change or are suppressed which may improve operation of the DSP with some BBS software. The following status messages are suppressed or changed with BBSMSGS *ON*:

      No: (parm) was (value)
             (parm) now (value)

             (Connect messages:) ; v2; 1 unACKed
             xxx in progress: (dest) via (digis)

             Sends carriage (RETURN) before all other "***"
             (callsign) busy message

Beacon *EVERY|AFTER n*   Default: *EVERY 0* (00 sec.)
Mode: packet   Host: BE

EVERY   Sends a beacon at regular intervals.
AFTER   Sends a beacon after the specified time interval without any packet activity.
"*n*"   0 to 250 sets beacon timing in 10-second intervals.

0   Zero turns off the beacon (default).

The BEACON command sets the conditions under which your beacon will be sent. A beacon frame contains the text that you've typed into the BTEXT message slot in a packet addressed to the UNPROTO address. When the argument *EVERY* is specified, a beacon packet is sent every "*n*" x 10 seconds. When *AFTER* is specified, a beacon is sent *after* (*n* x 10) seconds have passed without any packet activity being heard.

If you set the BEACON timing less than *90*—a value judged as too short for busy channels—you'll see the following message at each command prompt:

```
WARNING: BEACON too often
```

BText *text*   Default: empty
Mode: packet   Host: BT

text   Any combination of characters up to a maximum length of 120 characters.

BTEXT is the message you want broadcasted as a beacon packet. The default text is an empty string (no message). When and how packet beacons are sent is discussed in more detail under the BEACON command.

Although the beacon subject is controversial in packet circles, you *can* use beacon texts intelligently *and* benefit the packet community.
  ♦ *Don't* type your call sign in BTEXT - the normal packet header shows it.
  ♦ *Don't* fill BTEXT with screen graphics; use BTEXT for meaningful information.
  ♦ After you've beaconed for a week or two and people know who you are, follow the practice used by more experienced packeteers: set BEACON *EVERY 0.*
  ♦ Use *%*, *&*, *N*, *NO*, *NONE*, or *OFF* as arguments after you enter BTEXT on the command line to clear the text you previously typed in for that command.

For example: cmd: BTEXT *OFF*

CANPac *n*   Default: $19 (CTRL-Y)
Mode: packet, Command   Host: CP

"*n*"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

The parameter "*n*" is the ASCII code for the character you choose to cancel a packet message you just typed in or to cancel the screen display output from the DSP.

You can only cancel the packet that's currently being entered in the Converse mode. When you cancel a packet, the line is terminated with a (\ ) and your cursor is put on a new line. You must cancel the packet before typing the SENDPAC character.

In the Command mode, this character cancels all the output from the DSP to your computer screen. Entering the CANPAC character again restores normal output from your DSP.

CBell *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR   Host: CU

OFF   "Bells" aren't sent with the CONNECTED or DISCONNECTED message.

ON   Three BELL characters (CTRL-G) are sent to your computer with the "***CONNECTED to" or "DISCONNECTED from (call)" message.

Set CBELL *ON* if you want to be notified when someone connects to, or disconnects from, your station in packet or upon establishing a link in AMTOR or PACTOR.

CFrom *ALL, NONE, YES/NO call1,call2...*   Default: all
Mode: packet   Host: CF

call   *ALL, NONE, YES list, NO list.* (list = up to 8 call signs, separated by commas.)

CFROM determines how your DSP responds to connect requests from other stations. CFROM is set to *ALL* when you first start your DSP. This means your DSP will respond to all the connect requests addressed to it.

To reject all connect requests, type CFROM *NONE*. Your DSP sends the calling station a DM packet, or "busy signal." (This is like leaving your telephone off the hook.)

To accept calls from one or more specific stations, type CFROM *YES* (followed by a list of calls signs). Connect requests will be accepted from stations whose callsigns are listed after CFROM *YES*. For example:
        cmd:CFROM *YES WF7A,KG6ZL,KB6IUX,WO6P*

To *reject* calls from one or more specific stations, type CFROM *NO* (followed by a list of call signs). Connect requests will be ignored from stations whose call signs are listed after CFROM *NO*. For example:
        cmd:CFROM *NO WF7A,KG6ZL,KB6IUX,WO6P*

You can include optional SSIDs specified as "-*n*" after the call sign. With CFROM *NO KB6IUX*, connect attempts from all SSIDs of KB6IUX (KB6IUX-0 through KB6IUX-15) will be ignored. If CFROM is set to *YES KB6IUX-1*, then *only* KB6IUX-1 will be allowed to connect to you. Clear CFROM with *%*, *&*, or ,*OFF* as arguments.

CHCall *ON|OFF*   Default:OFF
Mode: packet   Host: CB

OFF   Callsign of originating station isn't displayed (default).
ON   Callsign of the originating station *is* displayed in a multiple connection packet operation.

With CHCALL *ON*, the callsign of the originating station appears after the channel identifier even if you're connected through more than one packet station. With CHCALL *OFF*, only the channel number is displayed in a single or multiple-connection operation.

With CHCALL *OFF*, the monitored activity looks like this:
        :0Hi, Rich--howya doin'?
        Things could be better--the high winds turned my 10M vertical into a sloper!
        :1*** CONNECTED to KB6IUX
        :0Consider it a blessing: now you can work satellites!
        :1Hey guy--did you survive the winds okay?

With CHCALL *ON*, the same contact now lists the connect path:
        :0:KG6ZL:Hi, Rich--howya doin'?
        Things could be better--the high winds turned my 10M vertical into a sloper!
        :1:KB6IUX*:*** CONNECTED to KB6IUX
        :0:KG6ZL:Consider it a blessing: now you can work satellites!
        :1:KB6IUX:Hey guy--did you survive the winds okay?

CHDouble *ON|OFF*   Default: OFF
Mode: packet   Host: CD

OFF   Received CHSWITCH characters appear once (not doubled).
ON   Received CHSWITCH characters appear twice (doubled).

Set CHDOUBLE *ON* when operating with multiple connections to tell the difference between CHSWITCH characters received from other stations and CHSWITCH characters generated by your DSP. In the following example CHDOUBLE is *ON* and CHSWITCH is set to "|" ($7C):
        || this is a test.

The sending station actually transmitted:
        | this is a test.

The same packet received with CHDOUBLE *OFF* would be displayed as:
        | this is a test.

CHeck *n*   Default: 30 (300 sec.)
Mode: packet   Host: CK

"*n*"   0 to 250 specifies the CHECK time in ten-second intervals.
0   Zero disables this feature.

CHECK sets a time-out value for a packet connection if the distant station hasn't been heard from for CHECK x 10 seconds.

Without the CHECK feature, if your DSP were connected to another station and the other station disappeared, your DSP would remain connected indefinitely, perhaps refusing connections from other stations. Your DSP tries to prevent this sort of lock-up from occurring—depending on the settings of AX25L2V2 and RECONNECT—by using the CHECK timer as follows:
        ♦ If a Version 1 link is inactive for CHECK x 10 seconds, your DSP tries to save the link by starting a reconnect sequence. The DSP enters the "connect in progress" state and sends "connect request" frames.
        ♦ If a Version 2 link (AX25L2V2 *ON*) is inactive and packets haven't been heard from the other station for "*n*" x 10 seconds, your DSP sends a "check packet" to test if the link still exists. If your DSP doesn't get an answer to the "check packet" after RETRY+*1* attempts, it will attempt to reconnect to the other station.

See the RELINK command.

CHSwitch *n*   Default:$00
Mode: packet   Host: CH

"*n*"   0 to $FF (0 to 255 decimal) specifies an ASCII character code.

CHSWITCH (CHannel SWITCHing) selects the character used by both you and the DSP to show that a new connection channel is being addressed. *DO NOT USE $30 to $39 (0 to 9)*.

If you plan to engage in multiple packet connections, you *must* select a CHSWITCH character. This character will be interpreted by the DSP to indicate that you want to select another packet channel.

The vertical bar "|" ($7C) is a seldom used punctuation mark and makes a good switching character. To make the CHSWITCH character the vertical bar, simply enter the command and the vertical bar's ASCII code: CHSWITCH *$7C*.

To change packet channels, simply type the vertical bar "|" followed by a number between 0 through 9, indicating which channel you want to use. So, to go from Channel 0 to Channel 1, you'd enter:
        cmd:|1

See CHDOUBLE and CHCALL for further information on the use of CHSWITCH.

CMSg *ON|OFF*   Default: OFF
Mode: packet   Host: CM

OFF   The text message isn't sent.
ON   The entered CTEXT message is sent as the first packet after a connection is established after a connect
         request from a another station.

CMSG enables or disables automatic transmission of the CTEXT message when your DSP accepts a connect
request from another station. Set CMSG *ON* to send the connecting station your CTEXT message. One idea is to
put in your CTEXT message an invitation for the connecting station to leave a message in your Maildrop if you're
not available.

CONmode *CONVERSE|TRANS*   Default: CONVERSE
Mode: packet, PACTOR   Host: CE

CONVERSE   Your DSP enters the Converse mode when a connection is established.
TRANS   Your DSP enters the Transparent mode when a connection is established.

CONMODE selects the mode your DSP enters after entering the "connected" state. For general operation, use the
default setting.

Connect *call1* (**Via** *call2,call3,...call9*])   Immediate Command
Mode: packet   Host: CO

call1   Callsign of the station you want to connect to.
call2-9 Optional callsign(s) of up to eight stations you can leapfrog through to reach *call1*.

Use the CONNECT command to send a packet connect request to station *call1*, directly or VIA (through) one or
more "digipeaters" (*call2* through *call9*). Each callsign can include an optional SSID-*n* immediately after the
callsign.

For example, say you want to digipeat through two stations that are on a linear radio path to the third station, the
one you want to talk to. You'd type something like this after the `cmd:` prompt:
         C *WF7A V KG6ZL,KB6IUX-1,WO6P*

This string means that you want to *C*onnect to *WF7A V*ia (through) station *KG6ZL*, then *KB6IUX-1*, then *WO6P*.
The path looks like this:
         You → KG6ZL → KB6IUX-1 → WO6P → WF7A

You can type CONNECT at any time to check the DSPs connect status. If you're in the process of trying to connect
to another station, you'll see the message:
         `Link state is: CONNECT in progress`

If the other station doesn't *ack* your connect request after the number of tries set with RETRY, the connect attempt
is canceled. Your monitor would display:
         `cmd:*** Retry count exceeded`
         `*** DISCONNECTED: call1`

CONPerm *ON|OFF*   Default: OFF
Mode: packet   Host: CY

OFF   The current channel can be disconnected from the other stations.

ON   The connection on the current channel is maintained.

With CONPERM *ON*, the DSP is forced to maintain the current connection, even when the number of frames to the other station exceeds RETRY attempts for an acknowledgment.

CONStamp *ON|OFF*   Default: OFF
Mode: packet, PACTOR   Host: CG

OFF   Connect status messages aren't time stamped.
ON   Connect status messages *are* time stamped.

CONSTAMP activates time stamping of `*** CONNECTED` status messages. If CONSTAMP is *ON* and DAYTIME (the DSPs internal clock) is set, the time is sent with CONNECT and DISCONNECT messages. For example, if the clock is set and CONSTAMP is *ON*, a connect and disconnect sequence would appear like this:

```
cmd:10:55:23*** CONNECTED to KB6IUX
cmd:10:55:59*** DISCONNECTED: KB6IUX
```

CPactime *ON|OFF*   Default: OFF
Mode: packet   Host: CI

OFF   packet transmit timer isn't used in the Converse mode.
ON   packet transmit timer *is* used in the Converse mode.

CPACTIME activates automatic, periodic packet transmission in the Converse mode.
With CPACTIME *ON*, characters are "packetized" and transmitted periodically as if in Transparent mode. Local keyboard editing and display features of the Converse mode are available. See the PACTIME command for a discussion of how periodic packetizing works.

CStatus *SHORT*   Immediate Command
Mode: packet   Host: Not Supported

CSTATUS is an immediate command helpful in keeping track of your DSP's activity while singly or multiply-connected to other stations. When CSTATUS is typed, your monitor displays the link status of all ten channels as well as the current input/output channel as follows:

```
Not connected                   Connected to two stations
cmd:cs                          cmd:cs
Ch. 0 - IO DISCONNECTED         Ch. 0 - IO CONNECTED to WF7A
Ch. 1 - DISCONNECTED            Ch. 1 - CONNECTED to WF7A-1
Ch. 2 - DISCONNECTED            Ch. 2 - DISCONNECTED
Ch. 3 - DISCONNECTED            Ch. 3 - DISCONNECTED
Ch. 4 - DISCONNECTED            Ch. 4 - DISCONNECTED
Ch. 5 - DISCONNECTED            Ch. 5 - DISCONNECTED
Ch. 6 - DISCONNECTED            Ch. 6 - DISCONNECTED
Ch. 7 - DISCONNECTED            Ch. 7 - DISCONNECTED
Ch. 8 - DISCONNECTED            Ch. 8 - DISCONNECTED
Ch. 9 - DISCONNECTED            Ch. 9 - DISCONNECTED
```

CSTATUS will give a short display if desired. CSTATUS *SHORT*, or CS *S*, displays only the current input/output channel or those channels which are connected.

CText *text*   Default: empty
Mode: packet   Host: CT

text   Any combination of up to 120 characters, including spaces.

CTEXT is the "answering machine" mesage sent when CMSG is *ON*. The message is sent only when another
station connects to you. A typical CTEXT message might be:

> Hiya! I'm not available right now, so please leave a message in my Maildrop, WO6P-1.

Clear CTEXT text by using the following arguments: *%*, *&*, *NO*, *NONE* or *OFF*, or simply set CMSG *OFF*.

DCdconn *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR, KISS and RAWHDLC   Host: DC

OFF   RS-232 cable Pin 8 is permanently set high (default).
ON   RS-232 cable Pin 8 follows the state of the CON (or DCD) LED.

DCDCONN defines how the DCD (Data Carrier Detect) signal affects pin 8 in the RS-232 interface to your
computer or terminal. Some programs such as PBBS software require that DCDCONN be *ON*.

DCDCONN also works in the RAWHDLC and KISS modes. In RAWHDLC and KISS, no packet connections are
known to the DSP. With DCDCONN *ON*, the state of the radio DCD is sent to the RS-232 DCD pin (pin-8). This
may be necessary to some Host applications that need to know when the radio channel is busy.

DFrom *ALL, NONE,YES/NO call1,call2...*   Default: All
Mode: packet   Host: DF

call   *ALL, NONE, YES list, NO list.* (list = up to eight call signs, separated by commas and no spaces.)

DFROM determines how your DSP responds to stations trying to use your station as a digipeater. DFROM is set to
ALL when you first start your DSP. Type DFROM to display the *ALL, NONE, YES list/NO list* status of station's
callsigns whose packets will or won't be digipeated.

To allow one or more specific stations to digipeat through your station, type DFROM *YES*, followed by a list of
callsigns. To *prevent* one or more specific stations from digipeating through your station, type DFROM *NO*
(followed by a list of call signs). To prevent all stations from digipeating through your station, type DFROM
NONE.

Clear DFROM with *%, & or OFF* as arguments.

DIGipeat   Default: on
Mode: packet

ON: Equivalent to DFOM ALL
OFF: Equivalent to DFROM NONE

In host computer applications that use a Boolean parameter switching routine rather than numeric values, the
DIGIPEAT command can be used with ON and OFF instead of ALL or NONE.

This alternate DIGIPEAT command is appropriate in certain electronic mail and bulletin board systems.

Note that DIGIPEAT ON and OFF as Boolean commands do not provide the same capability for selective
digipeating as with DFROM YES)calls) and DFROM NO(calls).

Disconne   Immediate Command
Mode: packet   Host: DI

DISCONNE is an immediate command that initiates a disconnect command to the station to you're connected to. If your disconnect command is successful, your monitor will display:
*** DISCONNECTED: (call)

Other commands can be entered while a disconnect is in progress. New connections aren't allowed until the disconnect is completed.

✎   **Note**: if another disconnect command is entered while your DSP is trying to disconnect, your DSP will
instantly switch to the disconnected state.

DWait *n*   Default: 16 (160 mS)
Mode: packet   Host: DW

"*n*"   0 to 250 specifies wait time in 10 mS intervals.

Unless the DSP is waiting to transmit digipeated packets, DWAIT forces your DSP to pause DWAIT x 10 mS after last hearing data on the channel before keying your transmitter.

DWAIT is an old way collisions with digipeated packets were avoided. These days, the P-Persistent method is generally used. With PPERSIST *ON* (default) the DWAIT timer is ignored.

FRack *n*   Default: 5 (5 sec.)
Mode: packet   Host: FR

"*n*"- 1 to 15, specifying timeout in 1 second intervals.

FRACK is the FRame *ack*nowledgment time in seconds that your DSP will wait for *ack*nowledgment of a sent protocol frame before "retrying" that frame.

After sending a packet requiring *ack*nowledgment, the DSP waits for FRACK seconds before incrementing the retry counter and sending another frame. If the packet address includes any digipeaters, the time between retries is adjusted to:
        Retry interval (in seconds) = n x (2 x m+1), where "m" is the number of intermediate relay stations.

When a packet is retried, a random wait time is added to any other wait times. This avoids lockups where two packet stations repeatedly collide with each other because of timing conflicts.

FRIck *n/n*   Default: 0/0 (0 sec.)
Mode: packet   Host: FF

"*n*"   0 to 250, specifying the FRACK timeout for meteor scatter work in 10 mS increments.

FRICK is a short version of FRACK, meant to be used in packet radio meteor scatter work. If FRICK is *0* (default), the FRACK timer is then used and the DSP operates as before with the retry timer in units of whole seconds. If FRICK is 1 to 250, it overrides FRACK as the unit's retry timer, and the retry timer is in units of 10 mS up to 2500 mS (2.5 seconds).

Unlike FRACK, FRICK doesn't take into account the number of digipeaters in the connect path. FRICK assumes that no digipeaters are being used.

✎ **Note**: Do not attempt multiple packet connections while FRICK is active (1-250). In contrast to FRACK, which provides one retry timer per multi-connect channel, there is only one FRICK timer in the DSP. Each channel will try to use the same FRICK timer, causing interference to the operation of the other channels.

Due to the sporadic nature of meteor scatter work, a Master/Slave mode can be enabled in the DSP with User BIT 18 (UBIT *18*). With UBIT *18 OFF*, FRACK operates the same as in previous firmware versions.

With UBIT *18 ON*, a master/slave relationship is established in packet radio connections. This is done to reduce the possibility of simultaneous transmissions by both sides of a packet connection. In this mode, the master station sends either an I-frame or a polling frame upon the expiration of FRICK (or FRACK if FRICK = *0*). The FRICK or FRACK timer then starts counting
again. The master station therefore sends packets constantly, even if all its I-frames have been acknowledged. The slave station sends nothing, not even I-frames, until it receives a polling frame from the master. A station becomes the master upon its transmission of a SABM (connect) frame; a station becomes the slave upon its transmission of a UA (acknowledgement of the SABM) frame.

Recommended settings for this method of meteor scatter work (both stations should use these settings):

UBIT *18*	*ON*
RETRY	*0*
AX25L2V2	*ON* (default)
MAXFRAME	*1*
CHECK	(doesn't matter)
FRICK	*n*, where *n* is large enough to allow the other station time to send the start of an acknowledgement frame

✎ **Note**: This is an experimental mode and we welcome any comments or suggestions you might have. Please make them in writing and direct them to AEA's Engineering Department. Thanks!

FUlldup *ON|OFF*   Default: OFF
Mode: packet   Host: FU

OFF   Full duplex mode is disabled.
ON   Full duplex mode is enabled.

When full duplex mode is *OFF* (default), the DSP makes use of the DCD (Data Carrier Detect) signal from its modem to avoid collisions. When, *ON* the DSP ignores the DCD signal and acknowledges packets individually.

Full-duplex operation is useful for full-duplex radio operation, such as through OSCAR satellites. It shouldn't be used unless both stations can operate in full-duplex.

GPS Commands are listed in the GPS Operation chapter, Chapter 6

GUSERS *n*   Default: 0
Mode: packet, AMTOR, PACTOR   Host: GU

"*n*"   0 to 3 specifies the maximum number of users allowed to use your node.

GUSERS allows up to *n* number of stations to connect to your MYGATE call. The argument "*n*" may be 0-3, with zero meaning no station can use your node. Alternatively, *n* can be thought of as the maximum number of *pairs* of stations which may be connected through your Gateway.

Your must have your MYGATE call entered and GUSERS set to a number greater than 0 to enable the DSPs node function.

HBaud *n*   Default: 1200 bauds
Mode: packet   Host: HB

"*n*"   values specifying the data rate in bauds from the DSP to the radio.

HBAUD sets the radio on-the-air baud rate only in the packet operating mode and has *no* relationship to your computer terminal program's baud rate. So, with HBAUD *300*, data leaves the DSP and your radio at a speed of 300 baud, at HBAUD *1200*, it leaves at 1200 baud, and with HBAUD 9600, it leaves at 9600 baud.

Available HDLC packet data rates "*n*" include 45, 50, 57, 75, 100, 110, 150, 200, 300, 400, 600, 1200, 2400, 4800 and 9600 bauds. Internal **HBAUD** modems are provided for 45-9600 bauds.

HEAderln *ON|OFF*   Default: ON
Mode: packet   Host: HD

ON   The header in a monitored packet is printed on a separate line from the text.
OFF   The header and text of monitored packets are printed on the same line.

With HEADERLN *ON*, the address is shown followed by a (RETURN)+LF that puts the packet text on a separate line as shown below:

```
KG6ZL>WF7A:
Go ahead and send the file, Rich.
```

With HEADERLN *OFF*, the address information is shown on the same line as the packet text as shown below:

```
KG6ZL>WF7A:Go ahead and send the file, Rich.
```

HId *ON|OFF*   Default: OFF
Mode: packet   Host: HI

OFF   Your DSP doesn't send HDLC identification.
ON   Your DSP sends HDLC identification as a digipeater.

Set HID *ON* to force your DSP to send an ID packet every 9.5 minutes when it's being used as a digipeater. Otherwise, leave HID *OFF* (default). This identification consists of a UI-frame with your station identification (MYCALL) and MYALIAS in the data field. The packet is addressed to "ID."

✎ **Note**: You can't change the 9.5-minute automatic interval timing.

Id   Immediate Command
Mode: AMTOR/ASCII/Baudot/Packet   Host: ID

In AMTOR, the ID command acts like the RCVE command only it adds a Morse ID before going back to receive. In ASCII and Baudot, the ID command causes a Morse ID to be sent much like an immediate version of the CWID character (CTRL-F). Because the ID command is immediate, the message "Transmit Data Remaining" will be displayed if any unsent data remains in the transmit buffer. To clear the data from the buffer, enter *TC* at the cmd: prompt.

In packet, ID is an immediate command that sends a special identification packet. The ID command allows you to send a final identification packet when you take your station off-the-air. (HID must also be set *ON*). The identification consists of a UI-frame, with its data field containing your MYALIAS (if it's entered), MYCALL, and the word "digipeater". The ID packet is sent only if your DSP has digipeated any transmissions since the last automatic identification.

ILfpack *ON\OFF*   Default: ON
Mode: packet   Host: IL

ON   The DSP ignores all LF characters sent by your computer.
OFF   The DSP transmits all LF characters sent by your computer.

The ILFPACK command permits you to control the way the DSP sends LF characters received from your computer while in the packet mode.

Maildrop Commands are completely listed in the Maildrop chapter, Chapter 7

MAXframe *n*   Default: 4
Mode: packet   Host: MX

"*n*"   1 to 7 signifies a number of packet frames.

MAXFRAME limits the number of *nack*ed packets your DSP permits on the radio link and the number of sequential packets your DSP will send.

The optimum value of MAXFRAME depends on your local channel conditions. In most cases, the default value of MAXFRAME *4* works well. When the amount of traffic is heavy, the path in use is poor, or if you're using many digipeaters, you can actually improve your throughput by reducing MAXFRAME.

Use MAXFRAME *1* for best results on HF packet.

MBEll *ON\OFF*   Default: OFF
Mode: packet   Host: ME

OFF   The DSP won't send any BELL characters to your computer while monitoring packets.
ON   Will send 3 BELL characters to the terminal when the callsign(s) of the station(s) monitored match the MFROM and MTO lists.

MBELL can be used to alert you to the presence of a particular packet station (or stations) on the frequency. For example, if you want to be alerted when KG6ZL comes on frequency, you'd enter:
        cmd:MBELL *ON*
        cmd:MONITOR *4* (or the value you prefer)
        cmd:MFROM *YES KG6ZL*
        cmd:MTO *NONE*

With MBELL *ON*, packets from—and to all—stations are displayed, but only those packets matching the MFROM and MTO lists cause BELL to ring.

MBx *call1*[,*call2*][-*n*][*ALL*]   Default: NONE
Mode: packet   Host: MB

call   The callsign(s) of one or two stations to be monitored.
"*n*"   0 to 15, indicating an optional SSID.

MBX lets you read or record useful or needed data without having to connect or log on to the source station(s). MBX filters the received packet data so that only packets from the selected station(s) entered above are shown, without headers or repeated frames. MBX overrides normal monitor functions and can show one or both sides of a conversation.

The operation of MBX command is as follows:

MBX *NONE*   All monitored frames are shown with their headers.

MBX *ALL*   Only the data fields in the I-frames and UI frames are shown. Data from retried frames will be shown each time such a frame is monitored. The MFROM and MTO commands are active.

MBX *call1*   Only the data in the I and UI frames to or from *call1* are shown. *call1* can be either the source or destination station. Retried frames are not shown. The MFROM and MTO commands are ignored.

MBX *call1,call2* Only the data in the I and UI frames are shown when *call1* is the source and *call2* is the destination or vice-versa. Retried frames aren't shown. The MFROM and MTO commands are ignored.

A packet connection on any channel inhibits monitoring if MBX isn't set to *NONE*. MCON will only work if MBX is set to *NONE*. Clear MBX with *%, &,* N, NO, *NONE,* or *OFF* as arguments.

MCon *n*   Default: 0 (none)
Mode: packet   Host: MC

"*n*"   0 to 6 signifies various levels of monitor indications

MCON works similarly to MONITOR, but MCON affects your display *only while you're connected to another station*. If MCON is set to a value between *1* and *5*, frames meant for you are displayed as though MONITOR was *OFF*—you'll see only the data and not any header information. With MCON *6*, frames meant for you are displayed as any other monitored frame—the headers appear with the data.

Starting with *0*, as you increase the value of *n* the more "stuff" will be visible with each packet you receive:

0   You won't monitor any packets while you're connected.
1   Only unnumbered (UI) frames resulting from an unconnected transmission are displayed. Use this for an "unproto," roundtable-type conversation where you want to read other station's packet text—sent unproto—while you're connected. This setting also displays beacons.
2   Numbered (I) frames are also displayed. Use this to monitor connected conversations in progress outside your own.
3   Connect request (SABM or "C") frames and disconnect (DISC or "D") frames are also displayed with the headers.
4   Unnumbered *ack*nowledgment (UA) of connect- and disconnect-state frames are also displayed with either the characters "UA" or "DM" and a header.
5   Receive Ready (RR), Receive Not Ready (RNR), Reject (RJ), Frame Reject (FRMR) and (I) Frames are also displayed.
6   Poll/Final bit, PID and sequence numbers are also displayed.

See MONITOR about monitoring packets while you're *not* connected.

MDCheck   Immediate Command
Mode: Maildrop   Host: M1

MDCHECK is allows you to log on to your own Maildrop. After logging on, you can *EDIT*, *LIST*, *READ*, *SEND* or *KILL* Maildrop messages.

To use MDCHECK, your DSP mustn't be connected to or linked to any packet, AMTOR, or PACTOR stations. For monitoring purposes, local access of the Maildrop is considered a connection. Enter "*B*" (B)ye to exit the Maildrop.

MDigi *ON|OFF*   Default: OFF
Mode: packet   Host: MD

OFF   Normal monitoring as determined by the monitoring mode commands.
ON   I and UI frames having your callsign (MYCALL or MYALIAS) as the next digipeater in the field are
         displayed, regardless of connected status.

MDIGI lets you display packets when another station uses your station as a digipeater. If you want to monitor *all* traffic that flows through your packet station, set MDIGI *ON*.

You may not want to see all the data passing through your station, especially if many others use you as a digipeater. In this case set MDIGI *OFF*.

MFilter *n1*[,*n2*[,*n3*[,*n4*]]]   Default: $80
Mode: Morse, Baudot ASCII, AMTOR, PACTOR and packet   Host: MI

"*n*"   0 to $80 (0 to 128 decimal) specifies an ASCII character code.
         (Up to four characters may be specified separated by commas.)

Use MFILTER to select up to 4 characters to be "filtered" or excluded from Morse, Baudot, ASCII, AMTOR, PACTOR and monitored packets with parameters *n1 - n4*, the ASCII codes for the characters you want to filter. The special value of $80 (default) filters all characters above $7F and *all* control-characters except (RETURN) ($0D), LF ($0A), and (TAB) ($09).

MFrom *ALL|NONE* or *YES|NO call1*[,*call2*...]   Default: ALL
Mode: packet   Host: MF

call   *ALL|NONE* or *YES_list|NO_list* (*list* = up to eight call signs, separated by commas).

MFROM determines what packets are or aren't to be monitored. To monitor all packets set MFROM to ALL. To stop all packets from being displayed set MFROM and MTO to *NONE*.

To display packets from one or more *specific* stations, type MFROM *YES* followed by a list of call signs you want to monitor packets from. To block packets from one or more specific stations, type MFROM NO followed by a list of call signs you *don't* want to hear packets from. When using MFROM, set MTO to *NONE*.

You can include optional SSIDs specified as "-*n*" after the callsign. For example, with MFROM *NO WF7A*, packets from WF7A-0 through WF7A-15 won't be monitored. With MFROM *YES WF7A-1*, then only WF7A-1 will be monitored. When MFROM and MTO contain different arguments, the following priority applies:

     1. *ALL*
     2. *NO_list*
     3. *YES_list*
     4. *NONE*

Clear MFROM with *%*, *&* or *OFF* as arguments.

MHeard   Immediate Command
Mode: packet/AMTOR Maildrop   Host: MH

MHEARD displays a list of the 18 most recently heard stations.

When DAYTIME has been set, entries in the Heard log are time stamped. With DAYSTAMP *ON* the date is also shown. An example of the MHEARD display is shown below:

      DAYSTAMP *ON*   DAYSTAMP *OFF*
      05-Nov-93 21:42:27 KG6ZL   21:42:27 KG6ZL
      05-Nov-93 21:42:24 KB6IUX*   21:42:24 KB6IUX*

Previously, stations heard directly were displayed with an asterisk ("W1AW*") and digipeated stations were shown without ("W2SZ"). Digipeating isn't used as much as it used to be—most stations now use nodes so we've stopped using the asterisk. However, for those few cases in which a station is heard indirectly through a digipeater, that station's callsign is displayed with the message, "`via digi`".

In addition, I- and U-frame packets with PIDs of CF and CD are shown with the indicators "N/R" (for Net/ROM) and "IP" respectively. AMTOR and PACTOR stations accessing the Maildrop or the gateway are shown in the MHEARD list with an "AMTOR" or "PACTOR" indicator.

Clear the MHEARD list with a *%*, *&*, *N*, *NO*, *NONE* or *OFF* as arguments.

MId *n*   Default: 0 (00 sec.)
Mode: packet, AMTOR, PACTOR   Host: Mi

"*n*"   0 - 250 specifies the Morse ID timing in units of 10-second increments.
0   Zero disables this function.

If "*n*" is set to a value between 1 and 250, the DSP will periodically issue a 20 wpm Morse ID. For example, a MID of *177* would cause a Morse ID to be sent every 1,770 seconds (29.5 minutes). A Morse ID will be transmitted only if a packet was sent since the last Morse ID. The Morse ID uses TXDELAY, PPERSIST and DCD.

If MID is set to a value other than *0*, ID will force a Morse ID immediately. If both HID and MID are active, the Morse ID will be sent first.

MID normally sends a Morse ID using on/off keying of the low tone. If FSK keying of both tones is desired to prevent stations from transmitting over your Morse ID, see the UBIT *12* command.

Morse ID now works in AMTOR and PACTOR modes on both ARQ and broadcast transmissions. Because of the nature of these operating modes, the destination station will go into an error state when your TNC sends a Morse ID, but should recover data synchronization immediately afterwards.

MODem   Default: 12
                                                                                 Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
1:  FSK   45   bps  2125/2295
```

```
2:   FSK   100  bps  2125/2295
3:   FSK   45   bps  1615/1785
4:   FSK   100  bps  1615/1785
5:   FSK   200  bps  2110/2310
6:   FSK   200  bps  1600/1800
7:   FSK   200  bps  2125/2550
8:   FSK   200  bps  1275/1700
9:   FSK   200  bps  2125/2975
10:  FSK   200  bps  1275/2125
11:  FSK   300  bps  2110/2310
12:  FSK   300  bps  1600/1800
13:  FSK   1200 bps  VHF
14:  PACSAT 1200 bps BPSK
15:
16:  FSK   9600 bps  K9NG/G3RUH
17:  Analog FAX HF 1450/2500 FM
18:  Analog FAX APT 2400 Hz AM
19:  Zero-Crossing FAX 1300/2100
20:  Morse 750  Hz.
21:  OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

Monitor *n*   Default: 4 (UA DM C D I UI)
Mode: packet   Host: MN

"*n*"   *0* to *6* sets different levels of monitoring while the DSP *isn't* connected.

Starting with *0*, as you increase the value of *n* the more "stuff" will be visible with each packet you intercept:

 0   You won't monitor *any* packets while you're unconnected.
 1   Only unnumbered (UI) frames resulting from an unconnected transmission are displayed. Use this for an "unproto," roundtable type conversation where you want to read other station's packet text—sent unproto—while you're not connected. This setting also displays beacons.
 2   Numbered (I) frames are also displayed. Use this to monitor connected conversations in progress.
 3   Connect request (SABM or "C") frames and disconnect (DISC or "D") frames are also displayed with the headers.
 4   Unnumbered *ack*nowledgment (UA) of connect- and disconnect-state frames are also displayed with either the characters "UA" or "DM" and a header.
 5   Receive Ready (RR), Receive Not Ready (RNR), Reject (RJ), Frame Reject (FRMR) and (I) Frames are also displayed.
 6   Poll/Final bit, PID and sequence numbers are also displayed.

If you want to save your DSPs buffer from filling up with unwanted packets, set MONITOR to zero. That way, you'll still be able to store mail sent to you and receive connect requests, but the DSPs 18K buffer won't fill up with "junk mail."

See MCON about monitoring packets while you *are* connected.

MProto *ON|OFF*   Default: OFF
Mode: packet   Host: MQ

ON   Monitors all "I" and UI frames as before.
OFF   Monitors only those "I" and UI frames with a PID byte of $F0.

This is in response to NET/ROM, which sends frames that have a PID of $CF and that contain control characters. If you want to monitor every frame including those used by NET/ROM, you must turn MPROTO *ON*.

MRpt *ON|OFF*   Default: ON
Mode: packet   Host: MR

ON   Show digipeater path in the packet header.
OFF   Show only originating and destination stations in the packet header.

MRPT affects the way monitored packets are displayed. With MRPT *ON*, the callsigns of all stations in the digipeat path are displayed. The callsign of the station heard directly are flagged with an asterisk (*) as shown:
    KB6IUX-4*>KG6ZL>W1AW-5>W1AW-4:

With MRPT *OFF*, only the originating station and the destination stations are displayed in the monitored packet header as shown below:
    KB6IUX-4*>W1AW-4:

MStamp *ON|OFF*   Default: OFF
Mode: packet   Host: MS

ON   Monitored frames *are* time stamped.
OFF   Monitored frames aren't time stamped.

MSTAMP activates time stamping of monitored packets. When your DSPs internal software clock is set, date and time information is available for automatic logging of packet activity and other applications. Remember to set the date and time with the DAYTIME command, first!

With MSTAMP *OFF*, the packet header display looks like this:
    KB6IUX-4*>KA2EYW-1>AI2Q:

With MSTAMP *ON* and DAYSTAMP *OFF*, the display looks like this:
    22:51:33   KB6IUX-4*>KA2EYW-1>AI2Q:

MTo *ALL|NONE* or *YES|NO call1[,call2...]*   Default: none
Mode: packet   Host: MT

call   *ALL|NONE* or *YES_list|NO_list* (list = up to eight call signs, separated by commas).

MTO determines which packets are to be monitored. To monitor all packets, set MTO to *ALL*; for no packets, set MTO and MFROM to *NONE*.

To display packets from other stations addressed to one or more specific stations, type MTO *YES* followed by a list of the callsign(s) you want to monitor for their packets; if you *don't* want to see the packets addressed to that (or those) station(s), type MTO *NO* followed by their callsign(s). When using MTO, set MFROM to *NONE*.

You can include optional SSIDs specified as "-*n*" after the callsign. If MTO is set to *NO WF7A*, any variation of WF7A-0,...WF7A-15 *won't* be monitored. If MTO is set to *YES WF7A-1*, then *only* WF7A-1 will be monitored.

When MFROM and MTO contain different arguments, the following priority applies:
    1. *ALL*
    2. *NO_list*

3. *YES_list*
4. *NONE*

Clear MTO with *%*, *&*, or *OFF* as arguments.

MXmit *ON|OFF*   Default: OFF
Mode: packet   Host: Mx

ON   Monitor outgoing packets in the same manner as received packets.
OFF   Don't monitor outgoing packets.

With MXMIT *ON*, outgoing packets are monitored in the same manner as received packets. The monitoring of outgoing packets is subject to the settings of MONITOR, MCON, MFROM, MTO, MRPT and TRACE. Most transmitted packets occur when you're connected to someone, so MCON should probably be set to a non-zero value.

MYAlias *call*[-*n*]   Default: none
Mode: packet   Host: MA

call   Alternate packet digipeater identity of your DSP
"*n*"   0 to 15, an optional SubStation ID (SSID)

MYALIAS specifies an alternate callsign (in addition to the callsign specified in MYCALL) for those households with two operators taking turns using the DSP—your TNC will accept connections to both your MYCALL and MYALIAS. Previously, MYALIAS had been reserved for stations digipeating through your station, only.

If MYMAIL isn't set, the Maildrop also accepts connections to either MYCALL or MYALIAS.

Outgoing connect attempts and Unproto frames use only MYCALL as the source callsign.

MYcall *call*[-*n*]   Default: DSP232
Mode: packet and PACTOR Maildrop   Host: ML

call   Your callsign
"*n*"   0-15, indicating an optional SubStation ID, (SSID)

Use the MYCALL command to load your callsign into your DSP. The `DSP232` default callsign is present in your DSPs ROM when the system is manufactured. This "artificial call" *must be changed* for packet operation.

The SSID is usually added so the DSP can respond to two different tasks—as a "base" station and digipeater, a digipeater and Maildrop, or a base station and Maildrop. An example of using the SSID suffix is given in *Chapter 5: Packet Operation*.

Two or more stations can't use the same call and SSID on the air at the same time. Use a different SSID this is the case.

MYCALL must be entered for you to use the PACTOR Maildrop; the callsign is used for message routing and identification.

MYGate *call*[-*n*]   Default: none
Mode: packet   Host: MY

call   Node callsign used by other stations.
"*n*"   0 to 15, an optional substation ID (SSID)

"Call" is the callsign of the node function of your DSP. Stations can connect to your MYGATE call, then issue a connect request from there. This way, your station takes responsibility for acknowledgements of the user's packets.

PAcket   Immediate Command
Mode: Command   Host: PA

Use the PACKET command to switch your DSP into packet radio mode from any other operating mode.

PACLen *n*   Default: 128
Mode: packet   Host: PL

"*n*"   0 to 255 specifies the maximum length of the data portion of a packet burst, in bytes.
0   Zero is equivalent to 256.

PACLEN sets the maximum number of characters to be sent in each packet burst. Most keyboard-to-keyboard operators use the default value of 128 bytes for routine VHF/UHF packet services. Your DSP automatically sends a packet when you reach "*n*" bytes. For example, if you set PACLEN to 256, after you enter 256 bytes' worth of information the DSP will send out a packet burst.

Reduce PACLEN to *64*, or even *32* when working "difficult" HF radio paths.

PACTime *EVERY|AFTER n*   Default: AFTER 10 (1000 msec.)
Mode: packet   Host: PT

"*n*"   0 to 250 specifies 100 mS increments.
EVERY   packet time-out occurs every "*n*" times 100 mS.
AFTER   packet time-out occurs when "*n*" times 100 mS passes without input from the computer.

The PACTIME parameter sets the amount of time, in 100 mS increments, that the DSP will wait for a character to be entered before sending a packet in the Transparent mode. The PACTIME parameter is always used in Transparent mode but is also used in Converse mode if CPACTIME is *ON*.

When *EVERY* is specified, the characters you type are "packetized" every *n* x 100 mS. When *AFTER* is specified, the characters you type are "packetized" when input from the terminal stops after waiting *n* x 100 mS.

The PACTIME timer is not started until the first character or byte is entered. A value of 0 (zero) for "*n*" means packets are sent with no wait time.

PASSAll *ON|OFF*   Default: OFF
Mode: packet   Host: PX

OFF   Your DSP will accept packets with valid CRCs *only*.
ON   Your DSP will accept packets with valid or invalid CRCs.

PASSALL turns off the packet error-detecting control and displays received packets with invalid CRCs. PASSALL is normally turned *OFF*, which ensures that packet data is error-free by rejecting packets with invalid CRC fields. With PASSALL *ON*, packets are displayed despite CRC errors.

MHEARD logging is disabled since the call signs detected may be incorrect.

PErsist *n*   Default: 63
Mode: packet   Host: PE

"*n*"   0 to 255 specifies the threshold for a random attempt to transmit.

PERSIST works with PPERSIST and SLOTTIME to achieve true p-persistent CSMA (Carrier-Sense Multiple Access) in packet operation.

PPersist *ON|OFF*   Default: ON
Mode: packet   Host: PP

ON   The DSP uses p-persistent CSMA (Carrier Sense Multiple Access).
OFF   The DSP uses DWAIT for TAPR-type 1-persistent CSMA.

With PPERSIST *ON*, the DSP uses the PERSIST and SLOTTIME parameters for p-persistent CSMA instead of the older DWAIT CSMA procedure.

When your computer has queued data for transmission, the DSP monitors the DCD signal from its modem. When the channel clears, the DSP generates a random number between 0 and 255. If this number is less-than or equal to PERSIST, the DSP transmits all the frames in its queue. If the random number is greater than "P", the DSP waits .01 x SLOTTIME (seconds) and repeats the attempt.

PPERSIST can be used in both KISS and normal AX.25 operation.

QHpacket *n*   Default: 10 (Modem 10)
Mode: packet   Host: QH

n   Modem number to be selected when the HF Packet mode is entered.

QHPACKET sets the DSP-232 modem that will automatically be selected when the HF Packet mode is entered. To enter HF packet mode, type: HBAUD 300.

See PACKET and MODEM commands for more infromation.

QVpacket *n*   Default: 12 (Modem 12)
Mode: packet   Host: QV

n   Modem number to be selected when the VHF Packet mode is entered.

QVPACKET sets the DSP-232 modem that will automatically be selected when the VHF Packet mode is entered. To enter the VHF packet mode, the VHF commands must be ON for the selected Radio Port.

See the PACKET and MODEM commands for more information.

RAWhdlc *ON/OFF*   Default: OFF
                                                                                   Host: RW

ON   The DSP operates in a raw HDLC packet mode when HOST is ON.
OFF   The DSP operates in standard AX.25.

The RAWHDLC command enables the DSP-232 to bypass the AX.25 packet implementation and communicate directly with the hardware HDLC (Z8530). HOST mode must be ON to communicate with the DSP-232 in the RAW HDLC mode.

RELink *ON|OFF*   Default: OFF
Mode: packet   Host: RL

OFF   The DSP won't attempt to re-establish the failed link.
ON   The DSP will try to automatically reconnect to the other station after the link has timed out on retries.

Set RELINK *ON* if you want the DSP to automatically try to reconnect to another packet station if the link fails.

RESptime *n*   Default: 0 (000 mS)
Mode: packet   Host: RP

"n"   0 to 250 specifies 100 mS increments.

RESPTIME adds a minimum delay before your DSP sends *ack*nowledgment packets. This delay may run concurrently with the default wait time set by DWAIT and any random wait in effect.

During a file transfer, RESPTIME can help avoid data and acknowledgement collisions caused by the sending stations' TNCs pausing briefly between transmitted data frames.

REtry *n*   Default: 10
Mode: packet   Host: RY

"n"   0 to 15 specifies the maximum number of packet retries before the DSP "gives up" sending that packet.

The AX.25 protocol uses the retransmission of frames that haven't been acknowledged as a means to insure that *all* transmitted frames are received. The number of retries that the DSP will attempt is set by this command. If the number of retries is exceeded, the packet link may be lost.

SEndpac *n*   Default: $0D (CTRL-M)
Mode: packet   or (RETURN)
                                                                                          Host: SP
"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Use SENDPAC to select the character used to cause a packet to be sent in Converse mode. The parameter *"n"* is the ASCII code for the character you want to use to force your typed input to be sent. Use the default SENDPAC value, $0D, for ordinary conversation with ACRPACK *ON* to send packets at natural intervals.

SLottime *n*   Default: 30 (300 mS)
Mode: packet   Host: SL

"n"   0 to 250 specifies the time the DSP waits between generating random numbers to see if it can transmit.

The SLOTTIME parameter works with the PPERSIST and PERSIST parameters to achieve true p-persistent CSMA (Carrier-Sense Multiple Access) in packet operation.

SQuelch *ON|OFF*   Default: OFF
Mode: packet   Host: SQ

OFF   Your DSP responds to negative-going squelch voltage.
ON   Your DSP responds to positive-going squelch voltage.

Normally, your DSP uses its CSMA (Carrier Sense Multiple Access) circuit to decide whether or not it's clear to transmit on a packet channel. If there are non-packet signals on the channel you're using—such as voice—you'll want to use true RF-carrier CSMA by monitoring the squelch line voltage from your radio.

With SQUELCH *OFF*, the DSP inhibits transmissions when there is a positive voltage on the radio connector's squelch input line. When there is no voltage or connection to this pin, the DSP allows packets to be sent.

With SQUELCH *ON*, the DSP will inhibit packet transmissions when no voltage is applied to the squelch input pin on the Radio connector.

✎   **Note**: If you need to use this command, you also need to have the black wire hooked up in the supplied radio cable.

TRACe *ON|OFF*   Default: OFF
Mode: packet/Baudot/AMTOR/PACTOR   Host: TR

ON   Trace function is activated.
OFF   Trace function is disabled.

Packet: TRACE activates the AX.25 protocol display. With TRACE *ON*, all received frames are displayed in their entirety, including all header information. The TRACE display is shown as it appears on an 80-column display. The following monitored frame is a sample:
KB6IUX*>TESTER <UI>:
This is a test message packet.

Byte	Hex				Shifted ASCII	ASCII
000:	A88AA6A8	8AA460AE	6494AAA0	406103F0	TESTER0KB6IUX0.x	......`.d...@a..
010:	54686973	20697320	61207465	7374206D	*449.49.0.:29:.6	This is a test m
020:	65737361	67652070	61636B65	742E0D	299032.80152:..	essage packet...

The byte column shows the offset into the packet of the first byte of the line. The hex display column shows the next 16 bytes of the packet, exactly as received, in standard hex format. The Shifted ASCII column decodes the high-order seven bits of each byte as an ASCII character code. The ASCII column decodes the low-order seven bits of each byte as an ASCII character code.

Interspersed command prompts and even the L and R commands would have no effect on the final data, and it could be translated back to binary data with a computer program.

TRIes *n*   Default: 0
Mode: packet   Host: TI

"n"   0 to 15 specifies the current RETRY level on the selected input channel.

TRIES retrieves (or forces) the count of "retry counter" on the data channel presently selected.

If you type TRIES without an argument, the DSP returns the current number of tries if an outstanding unacknowledged frame exists. If no outstanding unacknowledged frame exists, the DSP returns the number of tries required to get an acknowledgement for the previous frame.

If you type TRIES with an argument, the "tries" counter is forced to the entered value. Using this command to force a new count of tries is *not* recommended.

TXdelay *n*   Default: 30 (300 mS)
Mode: packet, Baudot and ASCII   Host: TD

"n"   0 to 120 specifies 10 mS increments.

TXDELAY tells your DSP how long to wait before sending packet frame data after keying your transmitter's PTT line.

All transmitters experience a certain length of time from the instant the PTT line is keyed to when the signal is actually transmitted. The default value of 300 mS should work with almost all transceivers. In fact, many of the newer transceivers can use smaller TXDELAY values. (Crystal-controlled transceivers can often use smaller values as well.) On the other hand, tube-type transceivers and amplifiers can require a longer time to switch and may

require TXDELAY to be increased. Experiment with the value to determine the shortest setting you can use in reliably in packet.

Baudot and ASCII use TXDELAY to set the timespan between PTT *ON* and the start of transmitted data.

TWRcv *n*   Default: 50
                                                                                                                       Host: Tr

n   0-100 adjusts how the DSP-232 manipulates amplitude of received signals on 1200 bps Packet.

Twist receive (TWRcv) allows you to compensate for poor signal reception by adjusting the amplitude of the high tones. Entering values less than 50 allow you to lower the amplitude of the received signal's high tone. Entering values greater than 50 allow you to increase the amplitude of received signal's high tone.

TWXmt *n*   Default: 50
                                                                                                                       Host: Tx

n   0-100 adjusts how the DSP-232 manipulates amplitude of transmitted signals on 1200 bps Packet.

Twist transmit (TWXmt) allows you to compensate for transmitter deficiencies by adjusting the amplitude of the high tones. Entering values less than 50 allow you to lower the amplitude of the received signal's high tone. Entering values greater than 50 allow you to increase the amplitude of received signal's high tone. This command allows you to keep high and low signals at their proper levels on the air.

Unproto *call1*[VIA *call2*(,*call3*...,*call9*)]   Default: CQ
Mode: packet   Host: UN

call1   Call to be placed in the "To" address field.
call2-9   Optional digipeater call list; up to eight calls.

UNPROTO sets the digipeat and destination address fields of packets sent in the unconnected (unprotocol) mode.

Unconnected packets are sent as Unnumbered I-frames (UI frames) with the destination and digipeat fields taken from *call1* through *call9* options. When a destination isn't specified, unconnected packets are sent to *CQ*.

Unconnected packets sent from other packet stations can be monitored by setting MONITOR to a value greater than "1" and setting MFROM to ALL.

The UNPROTO path and address is also used for beacon packets.

UPlink *call1*

Use the Uplink command to initiate a DAMA connection. After a connection is established, your station will be a slave and will not send any information packets until it is polled by the Master.

You can type UPlink (without any parameters at any time while in Packet to check the DSP's connect status. If you're in the process of trying to connect to another station, you'll see the message:
```
Link state is: CONNECT in progress
```
If the other station doesn't ack you connect request after the number of tries set with the RETRY, the connect attempt is cancelled. You monitor would display:
```
cmd:***Retry count exceeded
***DUSCONNECTED: call 1
```

USers *n*   Default: 1
Mode: packet   Host: UR

"n"   0 to 10 specifies the number of active simultaneous connections that can be established with your DSP.

USERS affects the way that *incoming* connect requests are handled. It doesn't affect the number of *outgoing* connections you initiate. For example:

> USERS *0*   Allows incoming connections on any free channel
> USERS *1*   Rejects incoming connections if there are connections on 1 or more channels.
> USERS *2*   Rejects incoming connections if there are connections on 2 or more channels.
> USERS *3*   Rejects incoming connections if there are connections on 3 or more channels.
>
> ...and so on, through USERS *10.*

WHYnot *ON|OFF*   Default: OFF
Mode: packet   Host: WN

ON   The DSP generates a reason why received packets weren't displayed.
OFF   This function is disabled.

During packet operation, the DSP may receive many packets that aren't displayed. Turning WHYNOT on will cause the DSP to generate a message explaining the reason why the received packet wasn't displayed. The messages and their meanings are:

PASSALL:	The received packet frame had errors, and PASSALL was *OFF*, preventing the packet from being displayed to the screen.
DCD Threshold:	The Threshold control was set too far counter-clockwise. The DCD LED was off when the packet was received.
MONITOR:	The MONITOR value was set too low to receive this frame.
MCON:	MCON was set too low to receive this type of frame.
MPROTO:	MPROTO was set to *OFF*, and the received packet was probably a NET/ROM or TCP/IP frame.
MFROM/MTO:	The frame was blocked by the MFROM or MTO command.
MBX:	The callsign of the sending station doesn't match the callsign setting in the MBX command.
MBX Sequence:	The frame was received out of sequence, probably a retry.
Frame too long:	Incoming packet frame longer than 330 bytes. Probably a non-AX.25 frame.
Frame too short:	Incoming packet frame shorter than 15 bytes. (Only seen if PASSALL is *ON*—probably noise.)
RX overrun:	Another HDLC byte was received before the DSP could read the previous one out of the HDLC chip.

Vhf *ON|OFF/ON|OFF*   Default: ON/ON
                                                                                                        Host: VH

ON   The modem and HBAUD rate selected in QVPacket are automatically selected.
OFF   The modem and HBAUD rate selected in QHPacket are automatically selected.

Use the VHF Command for immediate software control of the DSP-232's modem selection and HBAUD data rate. This command makes changing between HF and VHF packet modems and data rates on each radio port easier.

Set VHF ON for VHF packet operation (default) and set VHF OFF for HF operation.

Chapter 6

Global Positioning System Applications

Overview

This chapter describes how to configure and connect your TNC for GPS operation.

Why do GPS in the DSP-232?

All AEA TNCs can run with Automatic Packet Reporting System (APRS) software. The DSP-232, however, has special firmware which makes Stand Alone Tracking, remote GPS command programming, and Ultimeter II compatibility possible. With the DSP-232, you can use VHF or HF packet for position transmission. AEA also offers an APRS Adapter Cable for the DSP which makes Hardware Single Port Mode (HSP) operation possible.

The DSP-232 contains special GPS features not found in other packet data controllers. The DSP-232 can detect whether or not a GPS receiver is connected with the **GPSAuto** command, it then chooses the appropriate **GPSMode** of operation. If a GPS receiver is detected upon power-up the DSP-232 automatically sends a GPS initialization string. The DSP-232 can be remotely polled by addressing a packet to its **GPOLLCall**, or by the polling features in APRS. The DSP-232's GPS commands can be remotely programmed using the **GREMprog** command which is very convenient in Stand Alone Tracking applications—the unit never needs to be taken out of the vehicle to change GPS settings. GPS receivers can be remotely programmed via the DSP-232. The DSP-232's internal time and date can be set from the information obtained from the GPS receiver. There are provisions for an external input to cause the sending of NMEA strings, such as from a radio control head button. The DSP-232 can even operate packet and GPS at the same time using the commercial mode.

What is APRS?

Automatic Packet Reporting System (APRS) is a copyrighted software program developed by Bob Bruninga (WB4APR) which is distributed as shareware for real-time Packet communications. The software keeps lists of stations heard and displays the locations of stations visually on a computerized map like the one in figure 6-1. The maps can be scaled from .5 to 2000 miles. Few of the maps are complete, however there are tracking features built into APRS which allow you to create maps just by driving down the streets of your town. Amateur operators all over the country are creating maps which can be downloaded from on-line systems for use by all. Stations can appear on the maps and each

Figure 6-1: Bob Bruninga's APRS computerized map

station may be given a symbol such as a house, car, or boat. The real benefit of using APRS software is in mobile tracking applications. Vehicles and people can be tracked and mapped using APRS. APRS also includes the ability
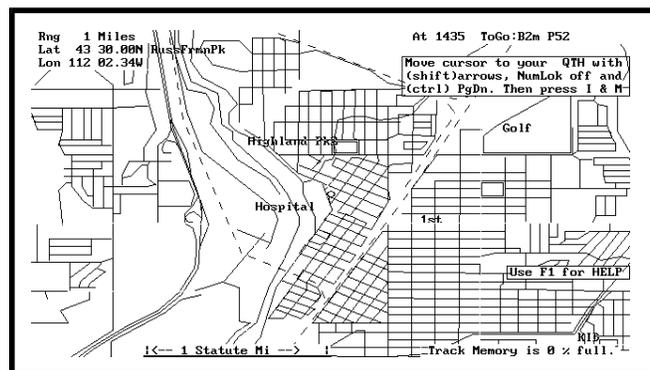
to send short messages and bulletins. Using Ultimeter II weather information can also be shown on the computerized maps.

Hardware Configurations

There are four different hardware configurations you can use when operating within an APRS system, each for a different purpose:

1. A computer running APRS, a GPS receiver, a DSP-232, an APRS Adapter Cable (optional), and a radio:

This complete configuration allows you to track all users on the system in your area (including yourself), and send/receive messages and bulletins. Because only one computer port is used, this configuration is called Hardware Single Port mode. Using AEA's APRS Adapter Cable, you can connect a GPS receiver and a DSP-232 to a single COM port on a computer running APRS, see figure 6-2. Without AEA's APRS Adapter Cable, the DSP-

APRS Hardware Single Port Mode

APRS Adapter Cable
DB-25 to DB-9 Adapter

G P S

Running APRS

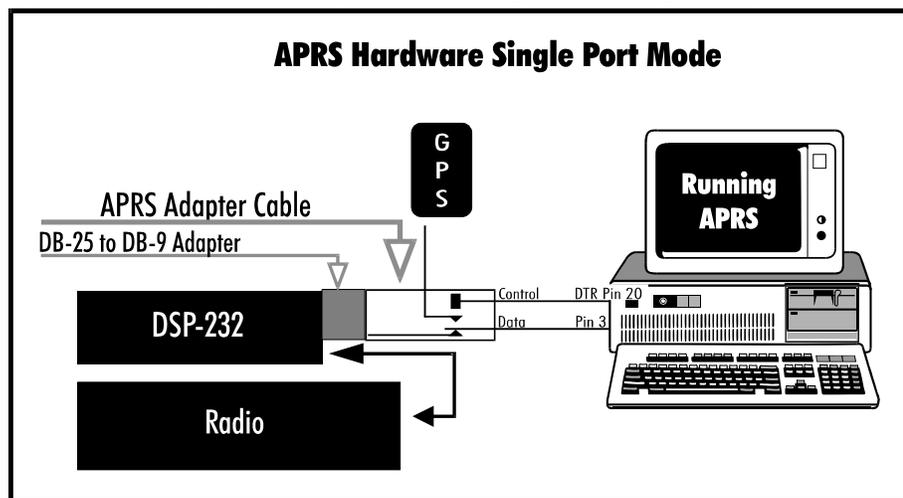DSP-232

Control   DTR Pin 20
Data   Pin 3

Radio

Figure: 6-2

232 and GPS receiver would need to be connected to separate COM ports. Having two COM ports free on most computers is a luxury most us don't have with all the Windows related equipment such as mice and other serial peripherals. Mobile laptop computer users need the APRS Adapter Cable because most only have one COM port.

✎   **Note:** You will need to have a DB25 to DB-9 Adapter for the AEA APRS adapter cable to connecto to the DSP-232.

2. A computer running APRS software, any AEA TNC, and a radio (No GPS receiver):

Because the TNC and GPS receiver use separate computer COM ports (totalling 2), their configuration is called Dual Port Mode. This configuration lets you track all users on the system with your location being entered manually. This also lets you send and receive messages within APRS. All AEA TNCs can be part of a system such as this. This configuration allows anyone with any AEA TNC who is running APRS software in their computer to take part in this GPS technology. You don't need a GPS receiver to pull down location information from the satellites because you enter your position manually on the APRS computerized map, which in most cases is fine because you are at your house which doesn't (shouldn't) move. The only time you really need a GPS receiver is when you are operating packet while mobile because manually updating your position while mobile isn't practical- you need the GPS receiver to pull in those satellite location signals and update your position as you move.

3. A DSP-232, a GPS receiver, and a radio (No PC):

This trio allows you to transmit your location automatically to others in an APRS system without having a computer in the vehicle. This is known as a Stand Alone Tracking Device because others can track your motion without you having to run APRS or even have a computer. The firmware in the DSP-232 allows the TNC to parse the incoming location information from the GPS receiver (without the use of a computer running APRS which usually does the parsing) and then beacon the information over the ham bands.

Because the DSP-232 can work both as a stand alone tracking device and as a connected APRS component, this TNC can be of aid in natural disaster situations, during public service events, and search and rescue missions, among other things.

For example, in a marathon, a pace car, ambulances, and other support vehicles could each have a DSP-232 acting as a Stand Alone Tracking Device. A coordinator can be in a centralized location using a DSP-232, radio, and an

APRS Adapter Cable (optional) to connect with a computer running APRS software to visually track the vehicles. When an emergency arises, such as an injured runner, the coordinator can see which ambulance is closest to the scene and dispatch it appropriately through voice communications.

Further, if all vehicles in the previous example were equipped with a PC running APRS, a DSP-232, a GPS receiver, a radio, and an APRS Adapter Cable, the coordinator could not only see where the vehicles were - he could dispatch them directly through the APRS system. The drivers of the vehicles would receive short messages from the coordinator such as, "Runner down, 4th and Main. Vehicle 2 respond." These short messages appear on the individual driver's computer screen much like typical Packet messages. The messages can also be accompanied by computer 'beeps' to alert the driver to an incoming message. APRS includes a bulletin feature where all vehicles could receive messages simultaneously such as, "Take lunch."

4. DSP-232, ULTIMETER II, and a radio (No PC):

This configuration requires an ULTIMETER II home weather station, see figure 6-3 (information on ULTIMETER II weather station packages can be obtained by calling 1-800-USA-PEET). In case you are not familiar with ULTIMETER II, it is a weather station package including a control panel into which a thermometer, wind gauge, and an optional rain gauge are connected. If you like, you can monitor the temperature of any room in your home, keep track of temperatures in a greenhouse or outbuilding, or set alarm limits on a freezer or other appliance.

Figure 6-3: Illustrates components of a packet stand alone weather station

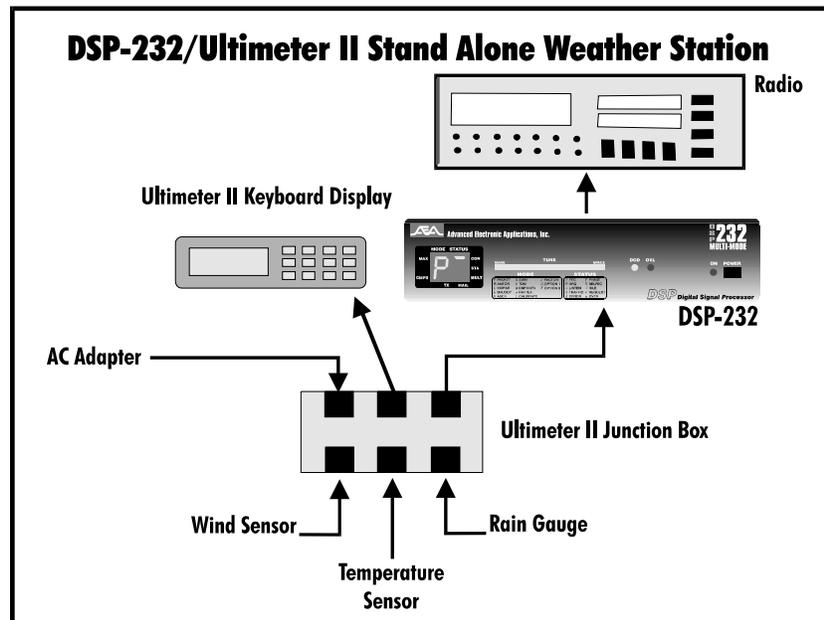The DSP-232 can be connected to the ULTIMETER II weather station, interpret the weather data, and transmit the weather and location information in packet so other APRS users can see your location and the weather at your location. The remotable polling features of the DSP-232 make it easy to set up a weather station in a remote location and receive the remote weather data via APRS at your house, office, or wherever. While at work, you can keep track of the weather situation at your home (inside or outside temperatures—whichever you prefer). Farmers can keep apprised of rain, wind, and temperature at a remote field site. In addition, several weather stations set up in your region can provide you with a comprehensive weather picture of your area—available to you and all other users at anytime. The DSP-232, ULTIMETER II, and APRS add a whole new dimension to packet radio—we hope you experiment with this new application. Set-up procedures for an Ultimeter II weather station are discussed later in this chapter.

Setting Up the DSP-232 for GPS Operation

Below, set up procedures for the DSP-232 are described for three Packet/GPS configurations: Stand Alone Tracking, APRS Hardware Single Port mode, and APRS Dual Port Mode. APRS software automatically sets the parameters for your TNC except when the DSP-232 is used as a Stand Alone Tracking Device (because APRS isn't connected).

Stand Alone Tracking Device Set-up:

To set up the DSP-232 for Stand Alone Tracking, follow these steps:

1.   Connect your TNC to your computer and get it up and running following the directions in Chapter 2.

2.   Type **MY <your call sign>-9**, then press ENTER. For example, if your call sign is WA7GCI you would enter **MY WA7GCI-9,** then press ENTER. The **-9** will cause others to see you as a car on the APRS map.

3.   Program the UNPROTO command to: **UN APRS via RELAY**, then press ENTER. This programs your unproto path to APRS via RELAY.

4.   Type **GLOCtx 6,** then press ENTER. This causes the TNC to transmit its GPS location every 60 seconds. The seconds can range from 0 (disabled) to 255 in ten second increments.

5.   Now you need to program the commands, GNMEA1 and/or GNMEA2, for the desired NMEA (GPS) sentences for the DSP-232 to parse. Not all GPS receivers can send all NMEA sentences. So, the instructions you see below depend on the ability of your GPS receiver to send desired NMEA strings. In any case, the DSP-232 can handle any NMEA strings your GPS or Loran receiver can produce.

      To program GNMEA1, type **GNMEA1 $GPGLL** and press ENTER. This command allows the DSP-232 to parse the Position-Only NMEA string coming from the GPS receiver and place the string in the transmit buffer. The result of $GPGLL is that you will be able receive from the GPS receiver Position-Only information and transmit it over the ham bands. (Any NMEA string your GPS receiver can produce can be entered in this command line.)

      The neat thing about the DSP-232 is that you can choose not one, but two NMEA strings to parse. You can, for instance, use Position-Only and Course/Speed. To program the second NMEA string for the DSP-232, type **GNMEA2 $GPVTG** and press ENTER. This sentence alone allows you to transmit course and speed. When coupled with the GNMEA1, your position, course, and speed will be transmitted together. (Again, you can use any NMEA string your GPS receiver can produce in this command line.)

✎ **Note:** The NMEA sentence $GPRMC is the recommended sentence for tracking moving objects as it contains time, latitude, longitude, course, and speed information--all in one sentence.

6.   Now type **GPSAuto ON** then press ENTER. This will cause the DSP-232 to look for GPS data (coming from an attached GPS receiver) the next time it is powered on, and if it sees GPS data the DSP-232 will automatically switch to **GPSMode 1**.

7.   Now you need to program the DSP-232's terminal baud rate to match that of the GPS receiver, which is normally 4800 baud. To program the DSP-232 terminal baud rate, type **TBAUD 4800**, then press ENTER.

8.   Now turn your DSP-232 off and disconnect your TNC from the computer. Take the DSP-232 to your vehicle, connect the TNC to the GPS receiver and the radio, plug it in, power it up and you're in business.

Connecting the GPS receiver to the DSP-232

Figure 6-4 illustrates the pin assignments for connecting a GPS receiver to the DSP-232. The same pin assignments can be used to connect to a Peet Bros. ULTIMETER II® weather station.

9.   When done using the DSP-232 as a Stand Alone Tracking Device, connect our TNC to the computer gain, verify that your terminal baud rate is at 4800 baud, 8 bits, no parity, one stop bit. A few seconds after powering up, the DSP-232 should display its sign-on message and command prompt.
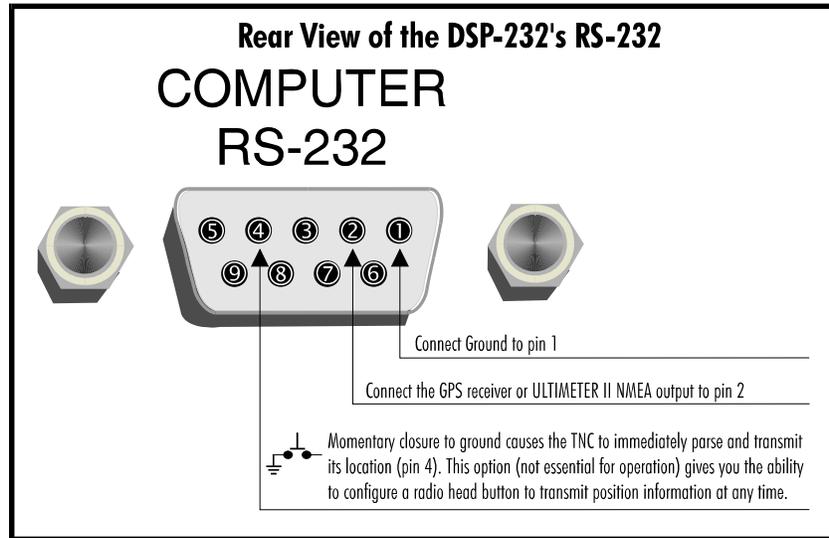

Rear View of the DSP-232's RS-232

COMPUTER
RS-232

Connect Ground to pin 1

Connect the GPS receiver or ULTIMETER II NMEA output to pin 2

Momentary closure to ground causes the TNC to immediately parse and transmit its location (pin 4). This option (not essential for operation) gives you the ability to configure a radio head button to transmit position information at any time.

Figure 6-4: Pin assignments for connecting the DSP-232 to a GPS receiver or Ultimeter II weather station

APRS Hardware Single Port Mode (HSP) Set-Up: *Requires a registered version of APRS*
APRS version 4.03 and higher includes a routine that controls the switching of the Single Port Mode between the TNC and any GPS receiver using the handshaking lines of the COM port. HSP allows you to operate APRS on a computer with limited COM ports, such as a laptop which usually has only one COM port, or your PC which uses one of the two COM ports dedicated to a mouse. This is the only configuration which uses the APRS adapter cable. You will need to have a registered copy of APRS in able to activate the GPS input. Registration information is contained in the APRS shareware readme files. The shareware version of APRS can be obtained through many BBSs.

Follow these steps to connect the APRS Adapter Cable to your equipment:
1.   Look at the APRS adapter cable. It looks like this:

COMPUTER
GPS *AEA ✧ APRS*
A D A P T E R   C A B L E
TNC
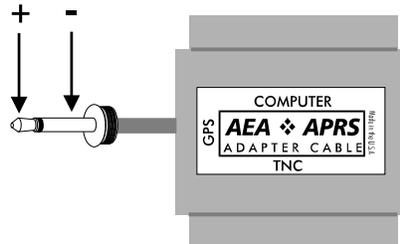
        Notice the words on the outside of the rectangle; they say **TNC**, **Computer**, and **GPS**. This is how the Cable should be connected.

2.   Connect the APRS Adapter Cable to the serial port on the TNC using a DB-9 to DB-25 converter (not supplied with AEA APRS Adapter Cable). The male side of the Adapter Cable, labeled **TNC**, should be connected to the female end of the DB-9 to DB-25 converter. The male side of the converter should be connected to the female serial port on the DSP-232.

3.   Connect an RS-232 (not included) to a free COM port on your computer. Connect the other end of this cable to the RS-232 port marked "Computer" on the APRS Adapter Cable. (The *female side* of the Adapter Cable, labeled 'computer', should be connected to a cable going to the computer.)

4.   The cable that comes out the side of the APRS Adapter, labeled "GPS", connects to the NMEA-0183 port on your GPS receiver.

        The cable is now correctly connected to your equipment.

To set up the DSP-232 for HSP operation, follow these steps:

1. Connect your TNC to your computer, and to your GPS receiver using the AEA APRS Adapter Cable following the steps noted previously. Get the computer running APRS software and the TNC running. Leave the GPS receiver off until you are ready to receive the NMEA string.

2. Press **ALT-S** to bring up the setup menu.

3. Now press **G** for GPS.

4. Press **H** for HSP.

5. Now press **ALT-S** to save.

6. Enter **S** for SAVE.

7. Now follow the prompt from APRS to validate your APRS registration and save the mode changes.

8. Turn your GPS receiver on, and you are ready for APRS HSP operation.

9. When finished using the DSP-232 for APRS HSP operation, simply quit APRS. APRS may ask you for some information before quitting. Answer the questions and when done, your DSP-232 will be ready for non-GPS activities.

APRS Dual Port Mode Set-up:
To set up APRS for dual mode operation, follow these steps:

1. Connect your DSP-232 to one of the COM ports on your computer. Get the TNC up and running following the directions in Chapter 2 of this manual.

2. Connect you GPS receiver to the other COM port on your computer. (You will need to build your own cable for this connection. Since there are many types of GPS receiver, all with different connection, we can't provide you with schematics on how to build this cable).

3. Get the APRS software program running. APRS will ask you some questions, simply answer the questions and your TNC and APRS will be ready for dual port mode operation.

Building your own APRS adapter cable
The APRS adapter cable works as follows:

The adapter allows for Hardware Single Port mode (HSP) operation, so you only need one computer COM port for both your GPS receiver and DSP-232. The adapter normally has the TNC switched to the computer until APRS decides it's time to send its location report. When it's time to send position information, the computer running APRS asserts flow control to the TNC to prevent it from sending any more data. The flow control line is also used to switch the adapter to the GPS receiver. Once the GPS string is received, the computer running APRS releases flow control, switching back to the TNC.

A pre-made and tested cable can be purchased from AEA for $30.00 by calling (206) 774-1722. For best pricing, see your favorite amateur radio dealer.

An APRS adapter cable can be made from the following components with the schematic shown on the next page.

Item	Description	Qty	AEA Part #	Radio Shack Part #
1.	PCB	1	013-141	
2.	1K resistor	1	210-102	271-023
3.	10K resistor	2	210-103	271-034
4.	IN4148 Diode	2	310-001	276-1122
5.	2N3904 NPN transistor	2	320-001	276-2016
6.	DB-25 male connector	1	420-102	
7.	DB-25 female connector	1	420-105	
8.	DB-25 Hood	1	053-065	
9.	Screws for hood	1	053-065-1	
10.	Saddle washers	1	053-065-2	
11.	Hex nuts	1	053-065-3	

12.   6ft shielded cable   1   769-001

Connecting the APRS adapter cable
Once you've made your adapter cable, connect as described above.

Schematic Diagram for the APRS Adapter Cable

DSP-232/ULTIMETER II® Stand Alone Weather Station Set Up
Connect the ULTIMETER II to the DSP-232 following the illustrations of Figure 6-4 and 6-5. Once the connections are made, follow the directions below to configure the TNC.

1. Connect your TNC to your computer and get it running following the directions in chapter 2.

2. Type **MY <your call sign>**, then press ENTER. For example if your callsign is WA7GCI you would enter MY WA7GCI, then press ENTER.

3. Type **UN APRS via RELAY**, then press ENTER. This programs your UNPROTO path to APRS via RELAY.

Figure 6-5: Ultimeter II junction box pin assignments

4. Type **GLOCtx 60**, then press ENTER. This causes the DSP-232 to transmit the weather information every 10 minutes. The seconds can range from 0 (disabled) to 255 in ten second increments.

5. Now you need to program your Btext with the day of the month, time, and your latitude and longitude. For example: if you exact location is 47°49.14'N, 122°15.72'W and the time and date is 9:11 AM June 23 1995, you would enter **BT @230911/4749.14N/12215.72W_Lynnwood weather station,** then press **ENTER**
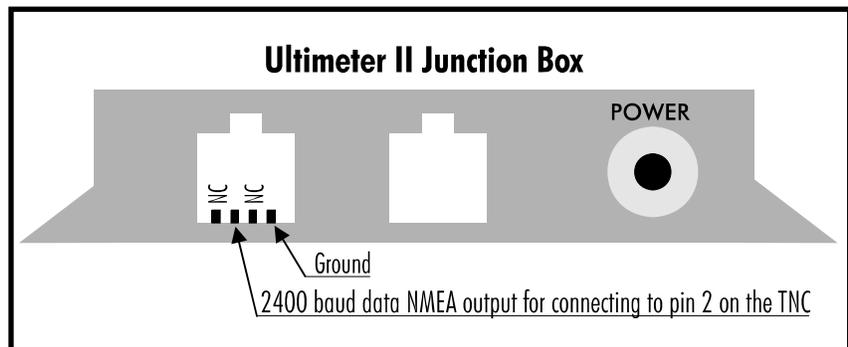
6. Now type **Beacon E 60**, then press ENTER. This will cause your DSP-232 to transmit its beacon text every five minutes. APRS must see the beacon text containing the position information and a weather symbol character before it will display your weather information.

7. Now you need to program the GNMEA1 sentence to match the output of the ULTIMETER II. type **GNMEA1 #**, then press ENTER. This will cause the DSP-232 to begin parsing the ULTIMETER II data starting with the # digit.

✎ **Note:** some ULTIMETER II start their string a # digit and some start their strings with a * digit. This value may have to be changed to a * if it does not work upon installation.

8. Type **TBAUD 2400**, then press ENTER. This sets the DSP-232 serial baud rate to match the output of the ULTIMETER II.

9. Now type **RESTART**, then press enter. This will cause the terminal baud rate to change to 2400 baud matching the ULTIMETER II. Change your terminal baud rate to 2400 baud to match that of the DSP-232.

10. Now type **GPSMode 2**, then press ENTER. Now press ENTER again to enter the stand-alone weather station mode. Now disconnect the serial cable and connect the ULTIMETER II, and you are ready to transmit weather information in an APRS system.

GPS-Specific Commands

GENDchar *n*   Default: $0D (CTRL-M)
Mode: GPS packet

The default GENDchar of $0D requires the string to end with a CR, LF to conform with the NMEA format. If this is changed, the sentence will end with whatever character is programmed. This command does not need to be programmed for use with GPS or Loran devices. It is intended for use with other formats.

GINIText *text*   Default: None
Mode: GPS packet

text - Any combination of characters up to a maximum length of 60 characters.

This text will be sent to the serial port when the DSP is powered up with GPSMode NOT equal to zero. This text is intended for an initialization string for OEM GPS cards requiring setup after power-down. If not programmed, the DSP will send nothing at power-up.

GLOCtx *n*   Default: 0 (00 seconds)
Mode: GPS packet

GLOCtx is used to periodically transmit GPS data received on the serial port. GLOCtx is programmable from 0 (never) to 2500 seconds in 10 second intervals. A transmission will occur if, GPSMode = 1 or 2, GLOCtx is not zero, and the correct NMEA information is received on the serial port.

GNMEA1 *text*   Default: GPGLL (0-8 characters)
Mode: GPS packet

This is the string the DSP will parse from the NMEA device. The text can be any ASCII character.

GNMEA2 *text*   Default: None (0-8 characters)
Mode: GPS packet

This is another string the DSP will parse from the NMEA device. The text can be any ASCII character.

GPOLLCal *call[n]*   Default: None
Mode: GPS packet

call -   The Call Sign you wish to use for polling
n -   Numeral indicating an optional SSID

The POLLCal can be any call sign other than one already programmed in the DSP-232. If programmed the same as one of the other callsigns, this feature will not work. When a packet is received addressed to this callsign, the DSP will begin parsing the programmed NMEA command or commands. When the NMEA sentences are successuflly received, the DSP will transmit the GPS data as a UI-Frame. If no data or incorrect data is received, the DSP will transmit nothing.

GPSAuto *ON|OFF*   Default: OFF

ON   When powered up or restarted, the DSP switches to GPSMode 1 if it parses its GNMEA1 or 2 sentence
         within the first 4 seconds after power up.
OFF   The DSP powers up normally.

If you are using your DSP in your vehicle as a stand alone tracking device and in your home for regular packet operation, this command will save you a lot of hassels. Simply program all your GPS parameters except for the GPSMode command, turn GPSAuto ON and you are set. Each time you turn your TNC on, the DSP will spend the first four seconds after power up trying to parse its GNMEA sentence or sentances. If it successfully parses one or both of them, it will automatically switch to GPSMode 1.

To have the DSP auto detect a GPS receiver, follow these steps:
1) Be sure you have your GPS command programmed.
2) Be sure GPSAuto is turned ON.
3) Connect the GPS receiver to the DSP serial connector.
4) Apply power to the GPS receiver (not the DSP-232 yet!)
5) Be sure that the GPS receiver is outputting its NMEA data before powering up the DSP.
6) Power up the DSP and within 4 seconds, you should notice the DSP transmit (TX) LED lighting to transmit its
   location.

GPSMode *n*   Default: 0 Disabled
Mode: GPS packet

This is a variable ranging from 0-2 that selects a specific mode of opration specific to GPS. Three CTRL-C's returns unit to GPSMode 0.

0 = Normal packet TNC operation. (GPS operation disabled.)

1 = DSP-232 connected directly to a GPS receiver.

The DSP-232 will begin parsing its programmed NMEA sentences only when LOCtx timer expires or if the DSP-232 receives a UI frame address to its "POLLCall". After the NMEA commands are parsed, the DSP-232 will transmit the inofrmation obtained as a UI-Frame.

2 = DSP-232 connected to a PC running APRS. In this mode, the DSP-232 will power-up in converse mode.

GREMprog *ON|OFF*   Default: OFF

ON   Remote programming is enabled in GPS mode.
OFF   Remote programming is disabled in GPS mode.

While operating in one of the GPS modes, the following commands can be programmed: GLOCtx, GNMEA1, GNMEA2, GINIText, GSYMchar, Unproto.

To remotely program the DSP, the programming station must have its Unproto destination callsign set to match the GPOLLcall of the DSP-232.
Example:
Let's say you have a DSP in your car as a stand alone tracker with its GPOLLcall set to CAR. In your house, you would program your TNC's Unproto to CAR (U CAR). Now place your TNC in converse mode by typing either (K or CONVerse). If you wanted to change the DSP in the car's Unproto path, you would simply type U APRS via RELAY <CR>. Your TNC in your home would transmit the following frame:
Home TNC:
```
{your callsign}*>CAR [UI]:
U APRS via RELAY
```
DSP in the car would reply:
```
DSP*>RELAY>APRS [UI]:
++ done
```

Note that the DSP in the vehicle replied with the meddate `++ done`. This indicates that the command was properly received and the parameter was changed. the following is a list of additional messages and their meaning.

Remote programming messages:

Message	Meaning
++done	the parameter was programmed
++bad	not supported, incorrect format, or bad data
++too many	too many parameters entered
++range	numeric entery is too large

GSYMChar *n*   Default: 0 None
Mode: GPS packet

This is a Hex value rangin from 0-255 that represents a symbol in APRS software. The symbol character will be enclosed in curly brackets before all Beacon transmissions.

KA7SYZ*>RELAY>APRS [UI]:
{SYMChar} This is a sample UI frame...

GUNSTart *on/off*   Default: OFF
Mode: GPS packet

ON - The DSP starts in CONVERSE mode after a restart or power-up.
OFF - The DSP will power-up in command mode.

This command allows the DSP-232 to power up in the CONVERSE mode if turned on.

Chapter 7

Maildrop Operation

Overview

The DSP's Maildrop acts like a small post office—it uses a subset of the well-known W0RLI/WA7MBL packet BBS commands to send and receive messages manually or automatically. Not only can you originate and receive messages to you, but with 3RDPARTY *ON*, you can accept and relay messages left for others.

The Maildrop also supports forwarding and reverse-forwarding of packet messages if properly coordinated with a local or "full service" BBS. This means that your station can receive messages from that BBS, hold or send them on to their recipients, then return replies later after they've been answered. Hierarchical message addressing is now supported to simplify the routing of both national and international traffic.

The Maildrop operates in the packet, AMTOR and PACTOR modes—a "user" (another station) can access your Maildrop as long as your station is operating in the same mode. For example, if your radio is in the AMTOR mode, a user can only reach your Maildrop if he, too, is in AMTOR.

At this writing, unattended 3rd party traffic below 30 MHz is not legal for US amateurs unless they hold a Special Temporary Authorization (STA) from the FCC for this purpose. This restriction may soon change, but until then US amateurs must be sure to always have control of their HF transmitters when any automatic device such as the DSP Maildrop is in operation.

✎ **Note**: You needn't have your computer on for your DSP-232's Maildrop to function, but you must leave your radio on to allow other stations to access the Maildrop, or if you want to record the radio traffic the DSP hears.

Maildrop Memory

Approximately 18K bytes of the standard 32K RAM are available to your MailDrop as if comes standard from the AEA factory. Maildrop may be expanded to as much as 242 K (256 K RAM). RAM space is dynamically allocated so that it is possible to store as many messages as you like until all the memory is filled. As your Maildrop fills with messages, the RAM space will decrease until there isn't any space left for messages or any other activities. When this happens, the MULT light will blink on the front panel of the DSP to let you know that all the RAM memory has been used up . If someone tries to connect to your station when this happens, they'll get:

```
     *** (your callsign) busy - DISCONNECTED
```

. . . and will be automatically disconnected from your station.

Along these lines, while you're logged on to your own Maildrop, if a Packet station issues a connect request to your DSP it won't let it—it'll display the message:

```
     *** (your callsign) busy
```

However, once you're finished using your Maildrop—by entering *B* for *B*ye—your Maildrop will be available to other stations.

When users connect to your Maildrop in packet, they'll automatically connect to channel 9.

Before proceeding with the rest of this chapter, review the following commands that are directly applicable to using the Maildrop: 3RDPARTY, HOMEBBS, KILONFWD, LASTMSG, MAILDROP, MDCHECK, MDMON, MMSG, MTEXT, MYMAIL, TMAIL, TMPROMPT. A list and explaination of all Maildrop commands can be found at the end of this chapter.

Expanding Your Maildrop

The DSP-232 comes standard with 18K of battery backed Maildrop space. If you find that your MailDrop fills to quickly and you need more space, you can increase the Maildrop size to up to 256K. The chips necessary are available through AEA directly. See Appendix D of this manual for more information.

Setting Up Your Maildrop

Set MAILDROP *ON* to enable packet Maildrop operation; TMAIL *ON* to start AMTOR or PACTOR Maildrop operation. (Remember to turn TMAIL *OFF* to have a normal ARQ conversation with other stations in the AMTOR and PACTOR modes.)

When operating in packet, your Maildrop can have its own callsign which you enter in MYMAIL. Common practice is to add an SSID after your callsign for this purpose, usually -1. If you don't enter a callsign in MYMAIL, the Maildrop will use your callsign that you entered for MYCALL and all incoming connections will connect automatically to the Maildrop. When operating the Maildrop in AMTOR, your 4-character MYSELCAL or 7-character MYIDENT is used and *must* be entered by the other station to access your Maildrop while in that mode. PACTOR uses MYPTCALL as usual.

By the way, you have full control of your DSP while your Maildrop is on. In Packet you can connect to, and chat with, other stations while someone is using your Maildrop *provided the user has connected to the call you entered in* MYMAIL.

It's a good idea enter a CTEXT message that says that if you're not present to respond in person that the user should re-connect to your Maildrop through your MYMAIL callsign. An example would be:

```
cmd: CTEXT Hi! I'm not available right now, so please reconnect to WF7A-1 to
leave a message in my Maildrop. '73...Rich.
CText was
CText now Hi! I'm not available right now, so please
reconnect to WF7A-1 to leave a message in my Maildrop.
'73...Rich.
```

Accessing and Commanding Your Maildrop

Your MailDrop mustn't be connected or linked to any other station when you access your own Maildrop. To check that you're "clear", enter MDCHECK. If someone is connected to your MailDrop, you'll get the message: `?already connected`. If you're clear, you'll see:

```
[AEA DSP232] 18956 free (B,E,K,L,R,S) >
```

Console Commands

B, E, K, L, R, S are the Maildrop commands available to you, as the "console" operator. The commands mean:

B(ye)	Log off from the Maildrop
E(dit)	Edit a Maildrop message
K(ill) *n*	Kill or delete message number *n*
L(ist)	List the message directory
R(ead) *n*	Read a specific message *n*
S(end) *call*	Send a message to a particular callsign

If you enter any other command—besides these six letters—you'll get the error message:
```
      *** What?
```

Monitoring Your Maildrop

Set MDM*ON ON* to monitor other stations' usage of your Maildrop; it will show you both sides of the Maildrop QSO with your station. (Packet headers aren't shown while a user is connected to your Maildrop.) Conversely, turn MDMON *OFF* to cancel Maildrop monitoring. USER bit *13* allows Maildrop connect and status messages to be disabled as well. (See UBIT 13 for more information in *Chapter 4: Terminal Commands.*)

Packet Maildrop Prompts and Operation

MTEXT is the Maildrop connect-message prompt sent to a user that's connected to your Maildrop. The default message is:
```
      Welcome to my AEA DSP232 Maildrop.
      Type H for help.
```

. . . but you can change it to your liking. For example:
```
      cmd:MTEXT You've reached KG6ZL's mailbox. If you need help, enter H.
      MTExt       was Welcome to my AEA DSP-232 Maildrop.
      Type H for help.
      MTExt        now You've reached KG6ZL's mailbox. If you need help, type
      H.>
      cmd:
```

You must set MMSG *ON* for your Maildrop's "welcome message" to be sent.

The MDPROMPT or TMPROMPT prompt message follows right after the Send command is entered. The default message is:
```
      Subject:/Enter message, ^Z (CTRL-Z) or /EX to end
```

MDPROMPT or TMPROMPT comprises of two different prompts that are sent to the connected station. The first prompt is simply Subject:. When the connected station enters the subject of his message (max. 27 characters), the second prompt will appear:
```
      Enter message, ^Z (CTRL-Z) or /EX to end.
```

You can enter any text in MDPROMPT or TMPROMPT up to a total length of 80 characters for both prompts; both parts of the prompts must be separated by a forward slash (/) as shown—before the slash is your "Subject" line and after the slash is the "Enter message" line.

Packet Maildrop Command Summary

When someone logs onto your Maildrop, the following commands will be available:
```
       A, B, H, J, K, L, R, S, V, ?
```

Here's what they mean:

A(bort)	Aborts the reading of a message
B(ye)	Log off from your Maildrop
H(elp)	Help for the Maildrop commands
J(log)	Sends the DSP's MHEARD list (Packet mode only)
K(ill)	Kill or delete messages
L(ist)	List the message directory
R(ead) n	Read a specific message numbered "n"
S(end) n	Send a message numbered "n"
V(ersion)	Sends the DSP's sign-on message
?	Help for the Maildrop commands. [Same as H(elp)]

A(bort) This is handy if the user decides not to continue reading a long message or a list. The message, `***
Done`, followed by the Maildrop prompt will be sent after an "A" has been received. Although *you*
can't use the Abort command, you can use (CTRL-X) to do the same thing.

B(ye) Logs you—or the calling station—off the Maildrop. As the console operator, you'll see the standard
`cmd:` prompt; a calling station will be simply disconnected.

E(dit) # Available to the SYSOP only, Edit controls the status of the messages in your Maildrop; you must
access the Maildrop before typing this command. Here are all the possible ways to use Edit:

E lists the following short help file:
```
E   msg#
E   msg# B/T/P
E   msg# Y/N/F
E   msg# >/</@ callsign
```

Examples:
E 12	Shows message #12's information line.
E 23 > WF7A	Sets WF7A as message #23's destination
E 35 < WF7A	Sets WF7A as message #35's source
E 48 @ WF7A	Sets WF7A as message #48's destination BBS
E 49 @ KG6ZL.MT.USA.NA	Sets KG6ZL as message #49's destination BBS and adds the hierarchical forwarding information, *.MT.USA.NA*, which directs the message to the KG6ZL BBS located in the state of Montana (*MT*) in the United States, North America (*NA*) continent.
E 58 @	Clears message #58's destination BBS field
E 60 P	Sets message #60's status to Private
E 61 B	Sets message #61's status to Bulletin
E 62 T	Sets message #62's status to Traffic
E 63 Y	Sets message #63's status to Has-Been-Read
E 64 N	Sets message #64's status to Has-Not-Been-Read
E 49 F	Sets message #49's status to Reverse-forward

The command, *E # F*, sets the message status to enable reverse-forwarding of a message number. To
cancel forwarding, set the status to either *Y* or *N*. Please read the section on reverse-forwarding later in
this chapter if you're interested in this feature.

H(elp) This command, available to the user only, sends a list of all available Maildrop help commands; A
question mark will also cause the HELP file to be sent.
```
A(bort)      Stop Read or List
B(ye)        Log off
H(elp)       Display this message
J(log)       Display stations heard
K(ill)       K n:  Kill message number n
             KM :  Kill messages you have read
L(ist)       L  :  List message titles
             LM :  List messages to you
R(ead)       R n:  Read message number n
             RM :  Read messages to you
S(end)       S  :  Send a message to console operator
             S n:  Send a message to station n
V(ersion)    Display TNC firmware version
?            Same as H(elp)
```

J(log)   Another command available only to the user, "J" will cause your Maildrop to send your DSP's
                MHEARD list. (This command isn't available to you as the console operator since you can simply
                enter MHEARD in the command mode to obtain the same list.) This is available in Packet mode only.

K(ill) n   "K n" deletes message number "*n*" from the Maildrop. As console operator, you can kill *any* message.
                A user can kill only messages addressed to (or from) that station. The user may enter *KM* [(K)ill
                (M)ine] to delete all of the messages that have been previously read.

L(ist)   ...shows you, the console operator, a list of all active messages on the Maildrop. The list is preceded
                by the following column header:
                `Msg#   Size To   From   @ BBS   Date    Time    Title`

                All active messages are listed under this line with the most recent message first. DAYTIME must be
                set for the Date and Time information to appear. If DAYTIME isn't set, periods will appear under the
                Date and Time fields.

                When a user enters the List command, the Maildrop lists only the messages that particular user is
                allowed to read, including messages addressed to ALL and QST; messages to other users aren't
                displayed. The Maildrop also accepts the LM (List Mine) command from the user. This shows
                messages addressed only to that particular user, not messages addressed as ALL, QST or Bulletins.

R(ead) *n*   This command displays the header and text of message number "*n*". Messages are read by number, not
                callsign. As console operator, you can read all messages; A user may read only messages addressed to
                his callsign, or to ALL, QST or Bulletins.

                The Maildrop accepts the RM (Read Mine) command from users. This command acts only on
                messages addressed to the user, not messages addressed to ALL or QST. RM displays only messages
                that *haven't* been read.

S(end)   The S (*callsign*) command notifies the Maildrop that either you as console operator, or the user, wants
                to send a message.

                With 3RDPARTY *ON*, the connected station can leave a message for another station or to you.
                However, if you have 3RDPARTY *OFF*, then the calling station will see:
                `*** No 3rd party traffic`
                `[AEA DSP232] 18396 free (A,B,H,J,K,L,R,S,V,?) >`

                See the next section, **Sending Mail**, for information on how to send mail.

V(ersion)   This user command causes the DSP to send the sign-on message and its firmware date.

? (H)elp   Another user-only command, "*?*" sends the user the same list of Maildrop commands as the "*H*"
                command does.

Sending Mail...
...from you, the console operator
To send mail, you have to log onto your Maildrop by entering *MDC* (MDCHECK). When you do, you'll see the
following:
        `cmd:`*MDC*
        `[AEA DSP232] 18956 free (B,E,K,L,R,S) >`

Enter *S* (*call*) of the station you want to send mail to. If you want to send mail to KB6IUX, enter:
        S KB6IUX
        `Subject:`

Type in a subject line (max. 27 characters), then press (RETURN). You'll then be prompted with:
```
Enter message, ^Z (CTRL-Z) or /EX to end
```

Go ahead and enter your message; you can either have the DSP "wrap" your text as you reach the end of the line or press (RETURN) to go to the next line. (You won't have broken text if you use the latter means to start a new line.)

When you've finished writing your message, press the (RETURN) key and enter either a (CTRL-Z)+(RETURN) , or */EX* the (RETURN) on a new line to end the message. The Maildrop prompt should then appear, saying: `Message stored as #n`. It will be then ready to accept your next command.

After ending the message, if you or the calling party see the message `*** No free memory`, this means that the message was too large for the available Maildrop memory and wasn't recorded. If this occurs, you must delete stored mail or re-enter the shortened message to fit into the available memory space.

✎ **Note**: When logged on from your keyboard, if you use the "S" command *without* a callsign, you'll see the error message `*** Incorrect command`. However, when calling stations use "S" without a callsign, the message will to go to you, the console operator.

As soon as a calling station uses "S" to send you (the console operator) a message, the MAIL light starts blinking to let you know that a message has been left for you. When you log on to your Maildrop, the MAIL light will stop blinking.

Sending Other Types of Messages
Each message in the DSP's Maildrop has a flag to show whether it's designated as Private, Traffic or a Bulletin. A "P," "T" or "B" after the message number shows the status of every message. A user sets this with the SP, ST and SB forms of the Send command. You can change or set the status of these messages using the Edit (E) command described above. If only "S" is used as the Send command, the Maildrop will assign the message a Private (P) status.

The Maildrop also accepts Send commands in the form *SP console operator < W1AW*. The callsign after the "<" goes into the "From" field of the message header.

For example, your Maildrop accepts the following additional information in a Send command:
        S KG6ZL @ KB6IUX.CA.USA.NA < WF7A

This means you're going to send a message to KG6ZL at the KB6IUX BBS in California, USA, North America, and that the message is from WF7A.

The Maildrop also supports BIDs (Bulletin IDs); this support is required for reverse-forwarding. The BID begins with a "$" character and is sent and received in the Send command line:
        S KB6IUX @ KG6ZL < WF7A $345_WO6P

This means you're sending a message to KB6IUX who uses the KG6ZL BBS; the message is from WF7A and it's bulletin #345 from WO6P.

With the Maildrop you can also use just the "$" all by itself as shown in the two examples below:
        S KB6IUX @ KG6ZL < WF7A $
        *...*or
        S ALL $

With the "$" sign, the Maildrop will assign its own BID to these messages.

...From the User's Point of View

Assume that your Maildrop (MYMAIL) call is KB6IUX-1 and WO6P wants to connect to it. During his session with your Maildrop, he wants to list your Maildrop's messages, see if there's a message from you, read it if it exists, delete it after he's done reading it, send a return message to you, then finally disconnect from your Maildrop.

From his `cmd:` prompt, he'll type the usual connect request. He'll see this:

```
cmd:C  KB6IUX-1
*** CONNECTED to KB6IUX-1
You have mail.
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
```

The "You have mail" message informs WO6P that there's mail waiting for him. He types "L" to list all the current messages in the Maildrop.

```
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
L

Msg#    Size  To         From      @ BBS     Date        Time     Title
6       PN184 WO6P       KB6IUX    WF7A      25-Nov-95   20:15    Gobble!
5       BY287 ALL        KB6IUX              21-Nov-95   18:42    Question
4       BY178 QST        KB6IUX              19-Nov-95   17:30    Mailbox
1       BY 56 ALL        KB6IUX              23-Nov-95   10:22    APLINK
[AEA DSP232M] 16508 free (A,B,H,J,K,L,R,S,V,?) >
```

He sees the list of messages and the one in particular that's addressed to him. He types "R 6" to (R)ead `MSG# 6`.

```
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
R 6

Msg#    Size  To         From      @ BBS     Date        Time     Title
6       PN184 WO6P       KB6IUX    WF7A      25-Nov-95   20:15    Gobble!

Happy Thanksgiving, guy! Knowing that _you're_ cooking the big meal for
your family tonight, should I rush a case of Pepto-Bismol over to you
now?

73, Rich.

[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
```

He's read your message and now he wants to (K)ill it. He types:

```
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
K 6
*** Done.
[AEA DSP232] 16580 free (A,B,H,J,K,L,R,S,V,?) >
```

He's killed the message and wants to send a reply back to KB6IUX (you). We'll continue from where he left off.

✎ **Note**: As a habit, look to see if enough memory remains for the length of message you intend to send.

```
[AEA DSP232] 16580 free (A,B,H,J,K,L,R,S,V,?) >
S
```

Without a callsign, the Maildrop will address the message to the MYMAIL callsign unless your MYMAIL callsign wasn't entered—then it'd go to your MYCALL callsign. Messages sent with the "S" command are sent (P)rivate unless they are sent to "ALL" or "QST."

```
Subject:
Hey, wise guy...
Enter message, ^Z (CTRL-Z) or /EX to end

...will you be the only turkey at your table?
```

See you later, and all the best to you and Audrey.

```
(CTRL-Z)
Message stored as #7
[AEA DSP232] 16427 free (A,B,H,J,K,L,R,S,V,?) >
B
*** DISCONNECTED: KB6IUX-1
```

The Console Operator's Point of View
Here is a transcription of the above example exactly as it would appear to you if you have MDMON *ON*.

```
WO6P*>KB6IUX [C]
*** CONNECTED to WO6P (Maildrop)
Type H for help.
You have mail.
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
L
Msg#    Size  To        From     @ BBS     Date        Time    Title
6       PN184 WO6P      KB6IUX              25-Nov-95   20:15   Gobble!
5       BY287 ALL       KB6IUX              21-Nov-95   18:42   Question
4       BY178 QST       KB6IUX              19-Nov-95   17:30   Mailbox
1        BY56 ALL       KB6IUX              23-Nov-95   10:22   APLINK
[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
R 6
Msg#    Size  To        From     @ BBS     Date        Time    Title
6       PN184 WO6P      KB6IUX   WF7A       25-Nov-95   20:15   Gobble!

Happy Thanksgiving, guy! Knowing that _you're_ cooking the big meal for
your family tonight, should I rush a case of Pepto-Bismol over to you
now?

73, Rich.

[AEA DSP232] 16508 free (A,B,H,J,K,L,R,S,V,?) >
K 6
*** Done.
[AEA DSP232] 16760 free (A,B,H,J,K,L,R,S,V,?) >
S
Subject:
Hey, wise guy...
Enter message, ^Z (CTRL-Z) or /EX to end

...will you be the only turkey at your table?

See you later, and all the best to you and Audrey.

[AEA DSP232] 16534 free (A,B,H,J,K,L,R,S,V,?) >
B
*** DISCONNECTED: WO6P
```

Message Numbers
Every message that's sent to the Maildrop is given a message number. Message numbers start at 1 and increment to 999; after 999, the next message will start at "1" again. If you need or want to, you can reset the message counter using the LASTMSG command—just enter LASTMSG *0*. The next message entered after this command will be numbered, "1." If you enter a different LASTMSG number other than zero, then the next message will be assigned

the number immediately following the value you entered. For example, if you enter: LASTMSG *100*, the next message entered into your Maildrop will be assigned number 101.

Forwarding and Reverse-Forwarding

Forwarding allows your local full-service Bulletin Board System (BBS) to automatically connect to your Maildrop to leave mail. Likewise, reverse-forwarding allows your community BBS to connect to your Maildrop to retrieve mail left at your station. These operations are done automatically if the correct commands are enabled in your DSP and the mail in your Maildrop is assigned the correct coding.

Forwarding and reverse-forwarding (or auto-forwarding) can be an advantage in a metropolitan area. The community BBS can be set to connect to your Maildrop at times when local traffic is low, such as late at night or very early in the morning when packet traffic is light.

Auto-forwarding requires the cooperation of both you and your community BBS "SYSOP" because not all large BBSs will forward mail to individual users. Some packet frequencies are so busy with BBSs forwarding mail to other BBSs that they can't forward mail to individuals. Contact the community BBS SYSOP to determine the guidelines in your area.

Settings for Auto-forwarding

For auto-forwarding to work:
1. Enter your MYCALL (and MYMAIL callsign if you want to use a separate callsign for your Maildrop.)
2. Make arrangements with your local BBS console operator to auto-forward mail to your Maildrop. Make sure you let him know the *Maildrop's* callsign you plan to use.
3. Enter the callsign of the community BBS in HOMEBBS.
4. Set MONITOR to *0* so the DSP's buffer will record only messages addressed—or passed through—to it and won't fill up with idle radio traffic.
5. Leave your DSP and radio on and set to the appropriate frequency so that your local BBS can connect to your Maildrop. If your packet station isn't on when the BBS tries to connect, mail won't be forwarded and its SYSOP will mutter unprintable things about you and your parentage.

Entering a Message for Reverse Forwarding

With reverse-forwarding, the local BBS can retrieve mail from your Maildrop—entered by you or left by other stations—automatically and send it on its way to its final destination. To create a messages that will be reverse-forwarded:
1. Enter MDCHECK to access your Maildrop from your terminal.
2. After entering the Send command and the recipient's callsign, use the "@" field to set the destination BBS where the recipient of the message will pick up his mail. For example, if you want to send a message to KB6IUX who you know uses KG6ZL's BBS, enter the following:
   S KB6IUX @ KG6ZL.CA.USA.NA

✎ **Note:** the call following the "@" sign doesn't need to be the same as the HOMEBBS callsign.

   The ".CA.USA.NA" is *optional* "hierarchical forwarding" information that, in this case, designates that KG6ZL is located in California in North America.
3. Enter the Subject and text of the message as you normally would. Don't forget to end your message with a (CTRL-Z) or "/EX" on its own separate line.
4. After you're finished, log off from your Maildrop by entering *B*.

To readdress a letter already in your Maildrop for reverse-forwarding:
1. Use the Edit command to set the forwarding flag for *each message* that will be reverse-forwarded to the callsign in HOMEBBS. For example, to mark message number 53 for reverse-forwarding, type:
   E 53 F
2. After you're finished, log off from your Maildrop using *B*.

✎ **Note**: If you want a message to be deleted from your Maildrop after it's been reverse-forwarded, leave KILONFWD *ON*; if you want to keep the message after its been forwarded, leave KILONFWD *OFF*.

With KILONFWD *OFF*, after the message has been forwarded the message's flag will change from "F" to "Y" to show that it has been read and sent.

Mode Specific Commands

Not all the modes share the same command structure and appearance when using the Maildrop. You've read about how to operate your Maildrop using packet. What follows is how to use the Maildrop in the other two Maildrop modes, AMTOR and PACTOR.

AMTOR MailDrop

The AMTOR Maildrop user interface is slightly different from the packet interface due to the differences between the two modes.

With CODE *0* and the ITA#2 alphabet used in AMTOR, only upper-case characters are sent. If you set CODE to *2* (enabling the Cyrillic extensions), both uppercase and lowercase characters can be sent and received. See CODE for information and limitations of this feature.

When a station links with your AMTOR Maildrop, your Maildrop first identifies you by sending your callsign and the amount of free Maildrop memory as shown in the example below:
```
DE WF7A (AEA DSP232) 17528 FREE.
```

The Maildrop then sends the user the MTEXT string if MMSG is *ON*. The default text is shown below:
```
WELCOME TO MY AEA DSP232 MAILDROP.
TYPE H FOR HELP.
```

Since AMTOR transmissions don't self-identify (like in packet), your Maildrop will force the user to identify in one of three possible ways: automatically, by request, and user input.

Automatic: Your Maildrop will send "STAND BY", then the WRU request to the user. Be sure you've entered an AAB message consisting of "QRA (MYCALL) (MYSELCALL) (MYIDENT)".

Request: AMTOR users who haven't entered an AAB response can't be automatically identified by your Maildrop. In this case, your Maildrop will ask the calling station to identify as follows:

After 10 seconds, your Maildrop will ask the calling station to identify by sending "QRZ? DE "(MYCALL) +?" to the calling station. The calling station then has three minutes to respond with its callsign. The ID must contain either "QRA" or "DE" and must end with "+?". So, if KG6ZL was calling he'd send the following:
QRA KG6ZL +?

If no satisfactory ID occurs within three minutes from the establishment of the link, the link will be automatically terminated.

User Input   Experienced AMTOR users may want to save time by simply sending QRA followed by their callsign immediately after establishing the link. For example, KB6IUX may simply enter the following entry immediately after establishing an ARQ link with you:
QRA KB6IUX +?

User Prompts
The command prompt that the Maildrop sends the user in AMTOR is slightly different from the one used in the packet mode:
```
WF7A DE KB6IUX GA+?
```

...and the default user command list is:

        A, B, H, J, K, L, R, S, V, ?

The user can end a command with either *+?* or a (RETURN).

TMPROMPT is the AMTOR Maildrop message prompt sent to a station by your Maildrop. The default prompt is:

        GA subj/GA msg, '/EX' to end.

Command Definitions for AMTOR

The AMTOR Maildrop has been designed with a "Watchdog" safety feature: if a remote station is linked with your AMTOR Maildrop and no traffic is passed for 5 minutes, the link will drop and your transmitter will be shut off by the DSP.

Most of the Maildrop commands listed earlier have the same effect in AMTOR as they do in packet—only the differences are listed below. The commands which have the same exact effect as mentioned earlier in this chapter are marked with "(Same as above.)"

A(bort)   The user must send the ACHG command first to reverse the direction of the link before he can issue the Abort command. The user also has the ability to abort a command that may have been mis-typed by typing three forward slashes (///) on the same line as the bad command.

B(ye)   Logs you—or the calling station—off the Maildrop. In AMTOR, the connecting station may gracefully shut down the link with the RECEIVE character (CTRL-D) or the CWID character (CTRL-F). (For other ways to shut down the link, see *Ending a QSO* in *Chapter 8: AMTOR Operation.*)

H(elp)   No different from Packet

J(log)   No different from Packet

K(ill)   No different from Packet

L(ist)   No different from Packet

R(ead) *n*   No different from Packet

S(end) *call* No different from Packet

S(end)   No different from Packet

V(ersion)   No different from Packet

?   No different from Packet

PACTOR MailDrop

Command Definitions for PACTOR

The PACTOR Maildrop user interface is slightly different from the packet interface due to the differences between the two modes. It has been designed with a "Watchdog" safety feature: if a remote station is linked with your PACTOR Maildrop and no traffic is passed for 5 minutes, the link will drop and your transmitter will be shut off by the DSP.

Before a PACTOR user can access your Maildrop, you must have your MYPTCALL or MYCALL set.

Turn TMAIL *ON* to allow remote stations to access your Maildrop in ARQ PACTOR. Turn TMAIL *OFF* to have normal ARQ QSOs with other stations in the PACTOR mode.

The Maildrop commands have the same effect as the ones listed earlier; only the differences from those are listed below when used in the PACTOR mode. The commands which have the same exact effect as mentioned earlier in this chapter are marked with "(Same as above.)"

A(bort)   Aborts the listing or reading of messages except that in PACTOR, the user must send the ACHG command first to reverse the direction of the link before he can issue the Abort command.

            The user also has the ability to abort a command that may have been mis-typed by typing three forward slashes (///) on the same line as the bad command.

B(ye)   . . . logs the user off the Maildrop. In PACTOR, the user may gracefully shut down the link with the RECEIVE character (CTRL-D) or the CWID character (CTRL-F).

H(elp)   No different from Packet

J(log)   No different from Packet

K(ill)   No different from Packet

L(ist)   No different from Packet

R(ead) *n* No different from Packet

S(end)   No different from Packet

V(ersion)   No different from Packet

?   No different from Packet

MailDrop Commands

3Rdparty *ON*/*OFF*   Default: OFF
Mode: Maildrop   Host: 3R

OFF   The Maildrop will only handle mail sent directly to, or from, you. (See MYCALL and MYMAIL.)
ON   The Maildrop will allow third party mail delivery and forwarding.

With 3RDPARTY *ON*, stations can leave messages in your mailbox addressed to you or someone else.

HOMebbs *call*   Default: (none)
Mode: packet/Maildrop   Host: HM

call   Callsign of your Home BBS with which you have made prior arrangements to auto-forward mail.

This is the callsign of your local or HOMEBBS that you'll use for reverse-forwarding messages. You must make special arrangements with the system operator of this BBS to set you up for reverse-forwarding. The SSID isn't compared when matching HOMEBBS to the source callsign of an incoming packet.

KILONFWD *ON|OFF*   Default: ON
Mode: packet/Maildrop   Host: KL

ON   The DSP deletes messages after they've been reverse-forwarded.
OFF   The DSP doesn't delete messages after reverse-forwarding.

KILONFWD controls the disposition of a message that has been reverse-forwarded to the station whose call is inputted in HOMEBBS. With KILONFWD *ON*, the message is deleted automatically after it has been forwarded to make room for other messages in your Maildrop. With KILONFWD *OFF*, the message's status is changed from "F" to "Y."

LAstmsg *n*   Immediate Command
Mode: packet Maildrop   Host: LA

"*n*"   0 to 999 specifies the message number of the last Maildrop message.

The number, 0-999, is the number assigned to the last message sent by a remote user (or the SYSOP) to the Maildrop. This command is handy for checking the last message sent to your Maildrop system. LASTMSG also allows the Maildrop message counter to be set to any value, or simply reset the counter to zero by entering LASTMSG *0*.

MAildrop *ON|OFF*   Default: OFF
Mode: packet   Host: MV

OFF   Turns off the Maildrop.
ON   The DSP operates as a personal packet station, BBS or Maildrop.

The Maildrop is a personal mailbox that uses a subset of the W0RLI/WA7MBL PBBS commands. With MAILDROP *ON*, other stations can connect to your DSP, leave messages for you or read messages from you. Third-party messages are not accepted unless 3RDPARTY is *ON*.

MDCheck   Immediate Command
Mode: Maildrop   Host: M1

MDCHECK is allows you to log on to your own Maildrop. After logging on, you can *EDIT*, *LIST*, *READ*, *SEND* or *KILL* Maildrop messages.

To use MDCHECK, your DSP mustn't be connected to or linked to any packet, AMTOR, or PACTOR stations. For monitoring purposes, local access of the Maildrop is considered a connection. Enter "*B*" (B)ye to exit the Maildrop.

MDMon *ON|OFF*   Default: OFF
Mode: AMTOR, PACTOR and packet/Maildrop   Host: Mm

OFF   You don't monitor a connected station's activity in your Maildrop.
ON   Lets you monitor a connected station's activity in your Maildrop.

MDMON permits you to monitor MailDrop activity on your AMTOR, PACTOR or packet Maildrop, showing you both sides of the QSO. (Packet headers aren't shown while a caller is connected.) When no one is connected to your Maildrop, channel activity is monitored according to the setting in MONITOR.

Note that Maildrop connect and link status messages will be displayed even with MDMON *OFF*. These status messages are important and allow you to see who is connected to your Maildrop. They can be disabled, however, with UBIT *13*. (See UBIT for more information).

MDPrompt *text*   Default: (see text)
Mode: packet/PACTOR Maildrop   Host: Mp

text   Any combination of characters and spaces of up to 80 characters.

MDPROMPT is the command line sent to a calling station by your packet or PACTOR
Maildrop in response to a Send message command. The default text is:

```
Subject:/Enter message, ^Z (CTRL-Z) or /EX to end
```

Text before the first slash is sent to the other station as the Subject prompt; text after the slash is sent as the message text prompt.

If there's no slash in the text, the subject prompt is "Subject:" and the text prompt message is `Enter message, ^Z (CTRL-Z) or /EX to end.`

MHeard   Immediate Command
Mode: packet/AMTOR Maildrop   Host: MH

MHEARD displays a list of the 18 most recently heard stations.

When DAYTIME has been set, entries in the Heard log are time stamped. With DAYSTAMP *ON* the date is also shown. An example of the MHEARD display is shown below:

DAYSTAMP *ON*   DAYSTAMP *OFF*
05-Nov-95 21:42:27 KG6ZL   21:42:27 KG6ZL
05-Nov-95 21:42:24 KB6IUX*   21:42:24 KB6IUX*

Previously, stations heard directly were displayed with an asterisk ("W1AW*") and digipeated stations were shown without ("W2SZ"). Digipeating isn't used as much as it used to be—most stations now use nodes so we've stopped using the asterisk. However, for those few cases in which a station is heard indirectly through a digipeater, that station's callsign is displayed with the message, "`via digi`".

In addition, I- and U-frame packets with PIDs of CF and CD are shown with the indicators "N/R" (for Net/ROM) and "IP" respectively. AMTOR and PACTOR stations accessing the Maildrop or the gateway are shown in the MHEARD list with an "AMTOR" or "PACTOR" indicator.

Clear the MHEARD list with a *%*, *&*, *N*, *N*O, *NONE* or *OFF* as arguments.

MMsg *ON\OFF*   Default: OFF
Mode: packet, AMTOR and PACTOR Maildrop   Host: MU

OFF   The MTEXT message isn't sent at all.
ON   The stored MTEXT message is sent as the first response after an AMTOR or PACTOR link or packet connect to the Maildrop is established.

MMSG enables or disables automatic transmission of the MTEXT message when your AMTOR, PACTOR or packet Maildrop links with another station.

MTExt *text*   Default: See sample
Mode: AMTOR, PACTOR and packet Maildrop   Host: Mt

text   Any printable message up to a maximum of 120 characters. (Spaces count as characters.)

MTEXT is the Maildrop's "answering machine message" similar to CTEXT. With MMSG *ON*, the MTEXT message is sent when a station links to your AMTOR or packet Maildrop.The default text is:

```
Welcome to my AEA DSP232MBX Maildrop.
Type H for help.
```

MTEXT can be reset with a *%*, *&,* *N*, *NO*, *NONE* or *OFF* as arguments.

MYAlias *call*[-*n*]   Default: none
Mode: packet   Host: MA

call   Alternate packet digipeater identity of your DSP
"*n*"   0 to 15, an optional SubStation ID (SSID)

MYALIAS specifies an alternate callsign (in addition to the callsign specified in MYCALL) for those households with two operators taking turns using the DSP—your TNC will accept connections to both your MYCALL and MYALIAS. Previously, MYALIAS had been reserved for stations digipeating through your station, only.

If MYMAIL isn't set, the Maildrop also accepts connections to either MYCALL or MYALIAS.

Outgoing connect attempts and Unproto frames use only MYCALL as the source callsign.

MYcall *call*[-*n*]   Default: DSP232
Mode: packet and PACTOR Maildrop   Host: ML

call   Your callsign
"*n*"   0-15, indicating an optional SubStation ID, (SSID)

Use the MYCALL command to load your callsign into your DSP. The DSP232 default callsign is present in your DSPs ROM when the system is manufactured. This "artificial call" *must be changed* for packet operation.

The SSID is usually added so the DSP can respond to two different tasks—as a "base" station and digipeater, a digipeater and Maildrop, or a base station and Maildrop. An example of using the SSID suffix is given in *Chapter 5: Packet Operation.*

Two or more stations can't use the same call and SSID on the air at the same time. Use a different SSID this is the case.

MYCALL must be entered for you to use the PACTOR Maildrop; the callsign is used for message routing and identification.

MYMail *call*[-*n*]   Default: none
Mode: packet/Maildrop   Host: Ma

call   The callsign you want to use for the Maildrop.
"*n*"   Numeral indicating an optional SubStation ID (SSID) or extension.

"*call*" may have an optional SSID, and must *not* be the same exact callsign and SSID as MYCALL. If you don't set
MYMAIL, the Maildrop will use the same callsign and SSID as you entered in MYCALL. For example, with
MYCALL WF7A, then MYMAIL may be *WF7A-1* through *WF7A-15*. You can use the CTEXT and MTEXT
messages to inform other stations about your MYCALL and MYMAIL callsigns when they connect to you.

REINIT   Immediate Command
Mode: All   Host: RI

This is an immediate command that you can use to get out of trouble caused by setting a lot of commands—
especially timing parameters—to strange values. REINIT can be thought of as being halfway between RESTART
and RESET. REINIT re-initializes most of the commands to their default setting, then does a RESTART, but the
contents of the Maildrop and the NAVTEX message history buffers are preserved. The commands that are
preserved are:

MYCALL	MYALIAS	MYMAIL	HOMEBBS	MYGATE	MYSELCAL
MYALTCAL	MYIDENT	MYPTCALL	UNPROTO	AWLEN	PARITY
TBAUD	BTEXT	CTEXT	AAB	MDPROMPT	TMPROMPT
CFROM	DFROM	MFROM	MTO	MBX	LASTMSG
MTEXT	NAVSTN	NAVMSG	HOST		

In Host mode, the REINIT command is acknowledged by a RESTART response (RT).

RESET   Immediate Command
Mode: Command   Host: RS

RESET resets all of the DSPs parameters to their default settings and reinitializes the unit. All personalized
parameters, monitor lists and Maildrop messages will be lost.

RESTART   Immediate Command
Mode: Command   Host: RT

RESTART reinitializes the DSP while retaining the settings you've changed or entered. The effect of RESTART is
the same as turning the DSP off, then on again. RESTART doesn't reset the values stored in its bbRAM.

See RESET.

TMail *ON|OFF*   Default: OFF
Mode: AMTOR and PACTOR   Host: TL

OFF   The DSP only operates as a normal AMTOR CCIR 476 or 625 or PACTOR controller.
ON   The DSP operates as a personal AMTOR or PACTOR BBS or Maildrop.

The DSPs Maildrop is a personal mailbox that uses a subset of the W0RLI/WA7MBL PBBS commands and is
similar to operation of APLINK stations. Turn TMAIL *ON* to allow other stations to access your Maildrop in ARQ
PACTOR; third-party messages aren't accepted by your AMTOR or PACTOR Maildrop unless 3RDPARTY is
ON.

TMPrompt *text*   Default: (see text)
Mode: AMTOR/Maildrop   Host: Tp

text   Any combination of characters and spaces up to a maximum of 80 bytes.

TMPROMPT is the command line sent to a calling station by your AMTOR Maildrop in response to a Send
message command. The default text is:

```
GA subj/GA msg,'/EX' to end.
```

Text before the first slash is sent to the user as the subject prompt; text after the slash is sent as the message text
prompt.

See the *Chapter 6: Maildrop Operation* for more information about TMPROMPT.

Chapter 8

ASCII and BAUDOT Operation

Overview

ASCII, the American Standard Code for Information Interchange (pronounced as-kee), has been around for nearly 30 years. ASCII is a 7-bit code and was designed to overcome the limitations of the Baudot character set by including both upper and lowercase letters, numbers, all punctuation characters as well as many computer control codes. However, by using a longer digital "word," the probability of receiving errors in ASCII is somewhat higher than Baudot because of the time element—noise has a greater chance of interfering with the longer word than a shorter one. For these reasons, ASCII is not used widely on the HF amateur bands as Baudot; some commercial and military HF stations use ASCII.

Baudot has been around for many years. The 5-bit Baudot/Murray code was the basis of the Western Union Telex service and Baudot RTTY (Radio TeleTYpe) is still widely used on the HF amateur bands. The Baudot character set contains the upper-case letters, the numbers 0-9, and some common punctuation characters. Because Baudot has only five bits, it's less prone to errors than 7-bit ASCII because of signal timing considerations. The DSP' provides Baudot RTTY at all the standard speeds in use today, including all commercial speeds up to 300 bauds; there's also the XBAUD command for use with non-standard baud rates.

Before proceeding with the rest of this chapter, review the following commands that are directly applicable to the Baudot and ASCII modes: AAB, ABAUD, ACRDISP, ACRTTY, ALFDISP, ALFRTTY, ATXRTTY, CODE, CRADD, CWID, DIDDLE, EAS, HEREIS, LOCK, MARSDISP, NUMS, RBAUD, RECEIVE, RCVE, RXREV, TXREV, USOS, WIDESHIFT, WORDOUT, WRU, XBAUD, and XMIT.

Operating ASCII and Baudot

ASCII and Baudot operation are virtually identical. Those commands which pertain just to Baudot will be noted in parenthesis.

Setting Up for ASCII

(If you're using an AEA program, follow the instructions in the program's manual to set up and use ASCII.)

To use the ASCII mode, simply enter ASCII (or AS) at the cmd: prompt. The DSP responds by displaying the previous mode it was in, then its new mode:

```
cmd: AS
Opmode    was (previous mode)
Opmode    now AScii
cmd:
```

Look at your DSP's front panel to verify that you're in the ASCII mode—an 'E' should be lit in the Mode display. You can choose the appropriate modem number at this point using the MODEM command. For a list of available modems use the DIR command.

The following parameters are the most common settings for HF ASCII operation. Check the parameters and make sure they are set as follows*:

```
ABAUD        110
RXREV        OFF
TXREV        OFF
WIDESHFT     OFF
```

   *These are default values.

Set your HF radio to LSB unless you connected your DSP to your radio's direct FSK keying lines. If you have, then you should select the FSK operating mode on your radio.

Some 2-Meter VHF Bulletin Boards and MSOs use ASCII at 110 and 300 bauds.

Setting Up for Baudot

(If you're using an AEA program, follow the instructions in the program's manual to set up and use Baudot.)

To use the Baudot mode, simply enter BAUDOT (or BA) at the cmd: prompt. The DSP responds by displaying the previous mode it was in, then its new mode:

```
cmd: BA
Opmode    was (previous mode)
Opmode    now BAudot
cmd:
```

Look at your DSP's front panel to verify that you're in the Baudot mode—the BAUDOT indicator symbol, 'b', should glow. You can choose the appropriate modem number at this point using the MODEM command. For a list of available modems use the DIR command.

The following parameters are the most common settings for HF Baudot operation. Check the parameters and make sure they are set as follows*:

```
RBAUD        45  (this is the most common amateur speed on HF)
RXREV        OFF
TXREV        OFF
WIDESHFT  OFF
```

   *These are default values.

Set your HF radio to LSB unless you connected your DSP' to your radio's direct FSK keying lines. If you have, then you should select the FSK or RTTY operating mode on your radio.

Receiving ASCII & Baudot

Most RTTY operation occurs on the 20-meter band between 14.08 and 14.10 MHz, though activity can be also found on the other HF amateur bands as well—it's located between 80 KHz and 100 KHz up from the bottom of the band as it is on 20 meters.

Since HF Baudot and RTTY stations use either 170 Hz or 200 Hz FSK to send data, tuning accuracy is very important. Follow the tuning procedure below:

1.   Put your HF receiver in either LSB or FSK/RTTY/PACKET, depending on your set-up.

2.   Turn any IF-shift and passband-tuning controls to their center or "off" position.

3.   Adjust the volume to a comfortable listening level.

4.   Tune your receiver between 14.08 and 14.10 MHz (or elsewhere where there's Baudot or ASCII activity).

5.   Slowly vary the tuning control on your receiver while glancing at the DSP's tuning indicator. Look for the LED pattern below and adjust the frequency control accordingly.

■□□□□□■■□□	■■□□□□□□■■	□□■■□□□□□■
Frequency too low	Tuned in!	Frequency too high

6.   When you find a station, adjust the threshold using either the THRESHLD or AUTOT commands (for an explaination of these commands refer to chapter 4). Adjust the threshold so the DCD light glows when a tuned Baudot or RTTY station is being received, but goes out when no signal is received.

With a good signal and your DSP properly tuned in, text should start to appear on your screen.

If the text you're receiving is garbled, you may be tuned to a transmission at a different baud rate. Either try tuning in a different station, or see *Chapter 11: SIAM, TDM, and NAVTEX Operation* about having the DSP determine the type of station you're listening to for you.

✎   **Note**: Many RTTY stations found outside of the Amateur bands don't transmit in plain text—they use a sophisticated encryption technique that makes receiving them almost impossible. There are a few stations, however, that use a relatively simple bit-inversion technique to make them hard to copy. For these stations, use BITINV to decode these simple forms of encoded RTTY stations.

Going on the Air

✎   **Note**: Make sure your DSP is adjusted for your SSB transmitter as described in *Chapter 3: Radio Installation*, under the heading *SSB Transceiver Final Adjustments*. These are critical adjustments. If your DSP's AFSK level and transmitter's mike gain aren't adjusted properly, other stations won't be able to copy your signals.

Finally, before you go ahead and transmit, here are some helpful hints:
- ♦ ***Don't*** use the VOX control—use the PTT line from your DSP.
- ♦ Turn off all compression or other transmitter audio processing.
- ♦ If you're using an AFSK audio input, keep the audio level to the microphone input circuit as low as possible to avoid overdriving the audio input stages.
- ♦ Adjust the transmitter's drive to prevent excessive ALC action; use more effective RF antenna loading to adjust output power levels.

Before you transmit, however, you have to decide if you're going to "call CQ" or answer someone's CQ call.

Calling CQ

As with most amateur operating modes, you can start a contact either by calling—or answering—(a) CQ. To call CQ:
1.   Enter *X* to key your transmitter.

2.   Type in your CQ message. For example:
CQ CQ CQ DE WF7A WF7A WF7A (RETURN)
CQ CQ CQ DE WF7A WF7A WF7A K (RETURN) (RETURN) (CTRL+D)

By entering a (CTRL-D) at the end of your CQ call, it puts both your radio and the DSP into the receive mode.

3.   After the DSP has sent your CQ, wait a bit for a response; if you don't get one, repeat the above procedure on the same—or another—frequency.

Answering a CQ

Let's assume you hear KG6ZL calling CQ. To answer him:

1. Enter *X* to key your transmitter.

2. Send a line of RYs as a tuning signal for the distant station, then a standard reply message:
    RYRYRYRYRYRYRYRYRYRY (RETURN)
    KG6ZL KG6ZL KG6ZL DE (YOURCALL) (YOURCALL) (YOURCALL) (RETURN)
    KG6ZL KG6ZL KG6ZL DE (YOURCALL) (YOURCALL) (YOURCALL) (RETURN)
    (RETURN) (CTRL-D)

✎ **Note**: As a courtesy, always add to the end of each transmission a blank line—it's a good operating habit that keeps things neat on your, and the other operator's, screen.

3. After you've sent your reply, wait a bit for a response; if you don't get one, repeat the above procedure. If the other operator doesn't respond after your second attempt to make contact, assume conditions are unfavorable to make contact and move on.

The QSO

After you make contact with the other station, what do you say or do? You might start of with something like this:
    DE (your call) Howdy! Name here is (you) and my QTH is (location). You're coming in (signal information) here. K (RETURN) (RETURN) (CTRL-D)

So it will go—each of you will take turns transmitting like you would using the CW mode. Finally, when you end the conversation, you'll type something like this:
    Thanks again, 73, and see ya later!   DE (your call) SK (CTRL-D)

✎ **Note:** Entering a (*CTRL-F)* will have the DSP send a Morse ID of your callsign first, then it'll shut off your transmitter and return you to the Command mode.

Entering a (*CTRL-C)* will return you to the Command mode immediately *without* turning off your transmitter. Entering an *R* after the (*CTRL-C)* will shut down your transmitter immediately, possibly leaving text in your transmit buffer. To clear that text, enter *TC* at the cmd: prompt.

Roundtable QSOs and Nets

With your DSP, it's possible to start or join in on a roundtable discussion where two or more hams get together on the same frequency to chat.

If you want to transmit:

1. Enter the letter, *X*; You're now in the Converse mode, so anything you type will be transmitted.

2. When you finished typing your message, enter (*CTRL-D)*. This will turn off your transmitter and return your DSP' into the Command mode after all the characters have been sent.

3. Repeat Step 1 when you want to transmit again.

Operating Tips and Options

ID'ing Yourself

The FCC requires station identification once every ten minutes while you're engaged in a QSO. It's sufficient to begin or end your transmission with *DE (your call)*, or you can enter (*CTRL-B)* to send your own Auto-AnswerBack (AAB) message.

WRU—(W)ho a(R)e yo(u)?—allows you to request the identity of the station you're conversing with by typing (CTRL+E). This causes the DSP to send a FIGS-D request to the other station. For this reason, you should set your own AAB message to *DE (your callsign)*. If you turn WRU *ON*, your station will automatically send your AAB message when another station requests your identity. With WRU *OFF*—or if AAB is empty—your station will ignore this request.

WORDOUT

Some Baudot/ASCII users like to have their words sent out only when they are complete, rather than individual letters sent as they're typed. Turning WORDOUT *ON* allows the word you're currently typing to be edited as long as you haven't pressed the (SPACE) bar or any punctuation and control characters.

Operating on the "Wrong" Sideband

By Amateur radio convention, BAUDOT is used while in LSB. If you find a station operating on USB, you can reverse your receive "sense" with RXREV to copy him. Likewise, if someone tells you that *you* are on the wrong sideband you can correct your transmit signal sense using TXREV, but ideally you should just switch to LSB and adjust your frequency accordingly.

Letters and Figures Case

In the old days, two keys were used on mechanical teletype machines to shift between punctuation and letters and numbers since 5-bit Baudot is limited to 32 different characters. The DSP takes care of sending "FIGS" and "LETTERS" automatically so no separate keystroke is required.

Unshift-On-Space—USOS—automatically changes the received Baudot/Murray code characters to the LETTERS or lowercase condition after any "space" character is received.

When operating Baudot RTTY under poor conditions, a received LETTERS-SHIFT character can be garbled, or another character can be wrongly interpreted as a FIGURES-SHIFT character. Turning USOS *ON* helps reduce reception errors under these conditions.

Some commercial, weather and utility RTTY services send groups of numbers separated by spaces. When receiving such non-amateur signals, USOS should be off to prevent displaying LETTERS-shifted characters when the originator may have intended the data to be FIGURES-shifted.

Function Keys

The following immediate commands and "Function Keys" are included for RTTY operating convenience:

K (or Converse)	Loads the transmit type-ahead buffer
L	Forces LETTERS case. (Baudot)
N	Forces FIGURES case. (Baudot)
R	Switches you to the receive mode and forces LETTERS case.
X	Switches you to the transmit (Converse) mode.

Control keys functions that you can embed in transmitted text:

(CTRL-B)	Sends your AAB string as a "HERE-IS" message
(CTRL-D)	Stops sending when the transmit buffer is empty
(CTRL-E)	Sends a "Who Are You?" (WRU) request to the other station
(CTRL-F)	Sends your callsign in Morse and shuts off your transmitter when the transmit buffer is empty
(CTRL-J)	Carriage Return
(CTRL-M)	Line Feed
(CTRL-N)	Sends FIGURES character (Baudot)
(CTRL-O)	Sends LETTERS character (Baudot)
(CTRL-T)	Sends the time if the DAYTIME has been set and the date if DAYSTAMP has been enabled.

Changing Speed

Assume you've been receiving at 45 bauds and want to increase the baud rate in steps. From the Command mode, enter: RB *U.* The DSP will respond with:

```
RBaud    was 45
RBaud    now 50
```

RBAUD sets the Baudot RTTY speed. The most common speed is 45 bauds on HF, but other speeds—including commercial speeds—are supported. See RBAUD for all the supported speeds.

Since Baudot RTTY at 45 baud is somewhat slow, some users like to know exactly when the characters are actually being sent. With EAS *ON,* characters will echo on your display as they're sent over the air.

For MARS Operators

MARS operators have some special requirements for RTTY operation and displaying text. To accommodate these requirements, use CRADD and MARSDISP and the control characters above.

WIDESHIFT

Most commercial stations operate with a wide FSK shift of either 425 or 850 Hz. To receive these stations, set WIDESHFT *ON.* With the proper license, you can also transmit to these stations, but remember to set WIDESHFT *ON.*

The CODE Command for International RTTY Compatibility

CODE enables the DSP to receive—and sometimes send—other RTTY character sets. Part 97.69 of the FCC rules specifies that the International Telegraph Alphabet Number 2 (ITA #2) must be used by U.S. stations when operating Baudot RTTY. This corresponds to the CODE *0* command (default), but you may want to see the CODE command for more information.

BAUDOT/ASCII COMMANDS

8Bitconv *ON*/*OFF*   Default: OFF
Mode: packet/ASCII   Host: 8B

OFF   The high-order bit is stripped in Converse Mode.
ON   The high-order bit *isn't* stripped in Converse Mode.

8BITCONV permits packet and ASCII transmission of 8-bit data in Converse mode. When 8BITCONV is *OFF,* the high-order bit (bit 7) of characters received from the terminal is set to 0 (zero) before the characters are transmitted.

AAb *text*   Default: empty
Mode: Baudot, ASCII, AMTOR, PACTOR   Host: AU

text   Any combination of charcters (maximum: 24).

Use AAB to enter *ack*nowledgment text for Baudot, ASCII, AMTOR and PACTOR. AAB sends automatic
confirmation in Baudot, ASCII, AMTOR and PACTOR in response to a distant station's WRU request—it's like an
answering machine message you've set up for incoming calls. Set WRU ON or CUSTOM to *$0200* to activate your
Auto-AnswerBack message.

To record your AAB message, enter "AAB (24-character text)". Example:

> cmd: AAB WF7A - VASHON ISLAND, WA

...and yes, spaces between words count as characters.

ABaud *n*   Default: 110 bauds
Mode: ASCII   Host: AB

"*n*"   Specifies the ASCII data rate—in bauds—from your DSP to your radio.

ABAUD sets the on-the-air baud rate only for the ASCII operating mode; it's the baud speed your DSP talks to your
radio and has no bearing at all with the speed your computer is set at to talk with the DSP.

The available "*n*" ASCII data rates in bauds are: 45, 50, 57, 75, 100, 110, 150, 200, 300, 400, 600, 1200, 2400,
4800 and 9600.

ACRRtty *n*   Default: 71 (69 in AMTOR)
Mode: Baudot/ASCII RTTY   Host: AT

"*n*"   0 - 255 specifies the number of characters on a line before a (RETURN) is automatically inserted in your
           transmitted text. Entering a zero disables the function.

When sending Baudot or ASCII RTTY, the ACRRTTY feature automatically sends a (RETURN) at the first space
following the "nth" character or column like the "autowrap" feature in a word processor—when you type and near
the right margin, the word processor automatically issues a (RETURN) to put you on a new line.

Use ACRRTY when you're sending and don't want to be bothered by watching the screen or worrying about line
length. You should *not* use this option when retransmitting text received from another station—ARRL Bulletins, for
example.

ACRRTTY is used in AMTOR, except that AMTOR is limited by international TELEX practices to a maximum of
69 characters per line. If ACRRTTY is set to 71, in AMTOR the automatic (RETURN) function operates after 69
characters.

ALFRtty *ON\OFF*   Default: ON
Mode: Baudot/ASCII RTTY   Host: AR

ON   An LF is sent after each RETURN.
OFF   An LF *isn't* sent after each RETURN.

If ALFRTTY is *ON* when transmitting in Baudot or ASCII RTTY, an LF character is added and sent automatically
after each (RETURN) character you type.

Use this option when you're typing into the transmit buffer and don't want to be bothered worrying about line length. You *shouldn't* use this option when retransmitting text received from another station; ARRL bulletins, for example.

ALFRTTY has no effect in AMTOR; an LF is automatically added after each (RETURN).

AScii   Immediate Command
Mode: Command   Host: AS

ASCII is an immediate command that switches your DSP into the ASCII mode.

ASCII is the proper mode to use if you want to use RTTY to transmit text, data or other information containing lowercase and special characters not present in the Baudot/Murray and ITA #2 alphabets or character sets. When 8BITCONV is *ON*, 8-bit ASCII data may also be sent and received.

Because the ASCII character set requires a minimum of seven bits to define each character, under worst-case conditions, ASCII is sometimes more subject to data errors and garbled text than Baudot/ITA#2 at the same data rate.

ATxrtty *n*   Default: 0
Mode: Morse, Baudot and ASCII   Host: At

"n"   0 to 250, signifying the length of time (in units of 100 mS) to delay before sending text.

ATXRTTY allows Morse, Baudot or ASCII characters to be transmitted automatically whenever they're typed and the TNC is in the Converse mode. When all the characters in the buffer have been sent, the DSP reverts to receive.

The number *n* represents the length of time from the last character typed to the dropping of PTT. This feature makes the repeated use of the commands RCVE and XMIT unnecessary.

AUdelay *n*   Default: 2 (20 msec.)
Mode: Baudot, ASCII, FEC, PTSEND, FAX and packet   Host: AQ

"*n*"   0 - 120 specifies in units of 10 mS intervals, the delay between PTT going active and the start of the
          transmit AFSK audio tones.

In some applications you may need to make a time delay from the moment the radio PTT line is keyed and the time that audio is produced from the DSP. Most notably, on HF when an amplifier is used, arcing of the amplifier's relay contacts may occur if drive to the amplifier is applied before the contacts have closed. If arcing occurs, increase AUDELAY slowly until the arcing stops.

In VHF or UHF FM operation, some synthesized transceivers may produce undesirable spurious emissions if audio and PTT are applied at the same time. These emissions may be reduced by setting AUDELAY to roughly half of TXDELAY.

Please note that AUDELAY must *always* be less than TXDELAY. It's advisable that AUDELAY be set lower than TXDELAY by a setting of 10. For example, you've determined that TXDELAY *20* works well for your transceiver. Subtracting 10 from 20 yields 10, which is the recommended setting for AUDELAY. If a setting of AUDELAY *10* is too short, then set *both* TXDELAY and AUDELAY higher.

BAudot   Immediate Command
Mode: Command   Host: BA

BAUDOT is an immediate command that switches the DSP into the Baudot mode.

Baudot RTTY operation is very common around the world and is the basis of the TELEX network and most radio press, weather and point-to-point message services. The Baudot/Murray and ITA #2 character sets don't contain lower-case or the special punctuation and control characters found in ASCII.

Because the Baudot/ITA #2 code requires only five information bits to define each character, it will generally suffer fewer errors than ASCII code at the same data rate.

BItinv *n*   Default: $00
Mode: RTTY   Host: BI

"*n*"   0 to $1F, (0 to 31 decimal) specifies a number to be exclusive-ORed with every received Baudot character. BITINV *0* is plain text.

Bit inversion is used to prevent listeners from reading some commercial Baudot transmissions. Usually either 2 or 3 bits of each character are inverted to give the appearance of an encrypted transmission. Try different settings of BITINV on a Baudot signal after the baud rate has been determined and experimenting with the **5BIT** command.

CODe *n*   Default: 0 (International)
Mode: Baudot RTTY, Morse, AMTOR   Host: C1

"*n*"   0 to 6 specifies a code from the list below. (RX = Receive; TX = Transmit)

CODE	Meaning	Morse	Baudot	AMTOR	PACKET
0	International	RX/TX	RX/TX	RX/TX	
1	US teleprinter		RX/TX	RX/TX	
2	Cyrillic	RX	RX/TX	RX/TX	
3	Transliterated Cyrillic	RX	RX	RX	
4	Katakana	RX/TX			
5	Transliterated Katakana	RX			
6	European	RX			RX

Not all the codes in the list above can be transmitted.

NOTE: FCC Part 97.69 and 97.131 calls for the use of (**CODE** *0*) "International Telegraph Alphabet Number 2" five unit teleprinter code. The Baudot characters "$", "#" and "&" are *not* permitted for use by US Amateurs.

CODE *0*: International

In Morse, this means the International Morse Code. For Baudot and AMTOR, this means the ITA #2 teleprinter code, which is internationally recommended for Baudot and 'TOR communications and shown below:

lowercase set	UPPERCASE SET
1 2 3 4 5 6 7 8 9 0 - =	? ? ? ? ? ? ? ? ( ) ? +
Q W E R T Y U I O P ? ?	Q W E R T Y U I O P ? ?
A S D F G H J K L ? '	A S D F G H J K L : ?
Z X C V B N M , . /	Z X C V B N M , . ?

The following special Morse characters are available as receive only and are used in non-English Morse alphabets.

Morse	RX
– – – –	ch
– . – . .	c
. – . . –	e
– – . . –	z
– – . – –	ñ

In response to requests from European customers, the "national" ITA#2 characters unassigned in the US have been made available for both transmission and reception. FIGS-F, FIGS-G and FIGS-H have been assigned characters according to standard use and are shown below. Note that some national alphabets use these characters for accented letters not appearing in English.

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-F	|	!
FIGS-G	{	&
FIGS-H	}	#
3rd-Q	q	

CODE 1: US Teleprinter
In Morse, this has no effect—the DSP will use the International Morse Code and *not* the American Morse code. In Baudot and AMTOR, the US teleprinter character set shown below is used. Users of CODE 1 should be aware of the following:

The US teleprinter code (CODE 1) makes the "!", "$", """ and "#" characters available in Baudot and AMTOR. The WRU character, "=", and the "+" characters are lost when set to CODE 1. Since there is no "+" character in the CODE 1 character set there should be no way to turn over the AMTOR link and change from ISS to the IRS. To avoid this problem, the DSP sends a FIGS-Z when the "+" key is pressed in AMTOR and responds to the reception of the "FIGS-Z" "?" sequence so the direction of traffic can be reversed.

US Teleprinter character set.

Lowercase set	UPPERCASE SET
1 2 3 4 5 6 7 8 9 0 -	! # $ & ( )
Q W E R T Y U I O P	Q W E R T Y U I O P
A S D F G H J K L ; '	A S D F G H J K L : '
Z X C V B N M , . /	Z X C V B N M , . ?

The differences between ITA #2 and US teleprinter codes are listed below:

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-D	WRU	$
FIGS-F	|	!
FIGS-G	{	&
FIGS-H	}	#
FIGS-J	BELL	'
FIGS-S	'	BELL
FIGS-V	=	;
FIGS-Z	+	"
3rd-Q	q	

Note that for U.S. Amateurs, the FCC regulations require that Baudot and AMTOR transmissions follow CCIR Recommendations which require the ITA#2 (CODE 0) be used. Technically, it's illegal to use CODE 1 on the U.S. Amateur bands. MARS operators and Amateurs outside the U.S. may find CODE 1 useful.

CODE 2: Cyrillic
This code causes a translation to an artificially extended ASCII so that all received characters are converted to single ASCII characters. The character set used prior to July 1991 was arbitrary, but we have now changed the character set to one which we believe is used in the former USSR.

The extensions used in Morse reception are shown below:

		English
Morse	ASCII	Pronunciation
.-.-	$71 - q	YA
---.	$7E - ~	CH (Morse only)
..--	$60 - '	YU
--.-	$7D -]	SHCH
----	$7B - {	SH

In Baudot and AMTOR, Russian transmitters use a third register to transmit Cyrillic characters in addition to the LTRS and FIGS. They use LTRS to transmit the Roman alphabet. As LTRS and FIGS characters are used to access the first and second registers, they use the BLK or NUL character (00) to access the third register. The DSP displays third-register characters as lowercase
alphabetic characters, and all FIGS characters as in CODE *0* with the following exceptions:

		English
Character	CODE *2*	Pronunciation
FIGS-F	$7C - |	E
FIGS-G	$7B - {	SH
FIGS-H	$7D - }	SHCH
FIGS-J	$60 - '	YU
3rd-Q	$71 - q	YA

If several words end in "OJ", "OW" or "OGO" the transmission is probably Russian.

There is no separate Baudot combination for the CH character. The Russians use a "4" because the Cyrillic character for CH resembles a "4."

It's safe to leave CODE set to *2* if you're not sure which alphabet the transmitting station is using. You'll be able to see the message in either alphabet with minimal garbling, then you can set CODE to either *0* or *3*.

Another interesting side effect of being able to send and receive in CODE *2* is that it's now possible to send and receive both upper and lowercase text in Baudot and AMTOR modes. To do this, both station must have CODE *2* enabled and both must be running 1991 or later firmware in their DSPs. Other users will see only uppercase characters and not be aware that anything unusual is happening as the feature merely inserts NULL characters at strategic times. A DSP using CODE *2* in a QSO with a unit in CODE *0* (or any other equipment) will exchange data in uppercase only, with no adverse effects.

This feature may be advantageous to users of the AMTOR Maildrop who want their messages to be forwarded to the packet network. The ability to send and receive upper and lowercase characters in AMTOR should improve message readability when it's translated to packet and vice versa.

CODE *3*: Transliterated Cyrillic
This code is similar to CODE *2*, except that some characters are transliterated into English phonetic equivalents for easier reading.

CODE *2*	CODE *3*
w	V
v	ZH
h	KH
c	TS
~	CH (Morse only)
{	SH
]	SHCH

x	,
|	E (RTTY only)
,	YU
q	YA

CODE *4*: Katakana

Katakana is the phonetic character set used in Japan for spelling out words of foreign (to Japan) origin. The Japanese also use Katakana for Morse and some computer communication. There are about 50 Katakana characters. CODE *4* translates the Katakana Morse code into an 8-bit extended version of ASCII. The characters displayed are generally in the range from $A0 to $DF, except for numerals and punctuation. If you're using CODE *4*, remember to set the DSP for AWLEN *8*, PARITY *0* and 8BITCONV *ON*.

CODE *5*: Transliterated Katakana

This is similar to CODE *4* except that the extended ASCII is transliterated into English equivalents for easier reading. The Morse characters are translated into 2- and 3-letter syllables.

CODE *6*: European

This is primarily for users with German language terminals. The differences in Morse coding are as follows:

Morse	CODE *0*	CODE *6*
.-.-	$5B	$5B
---.	$5C	$5C
..--	$5E	$5D
.--.-	$5D	

In addition, CODE *6* avoids the use of square brackets ($5B, $5D) in monitored packet headers and Maildrop prompts, using parentheses instead. US ASCII square bracket characters are used as extended alphabetic characters in most languages outside of English.

CODE *7*: TOR lowercase

Meaning	Morse	Baudot	AMTOR	Packet
TOR (lowercase)	—	—	RX/TX	—

CODE 7 applies to AMTOR operation only. It codes upper and lowercase letters using the NULL character as a shift while in LTRS case. This protocol is used by APLINK stations, European mailboxes, the AMT-3 and G4BMK software. The difference between CODE 7 and CODE 2 (Cyrillic) upper/lower case is that CODE 2 uses LTRS for upper case and NULL for lowercase, while CODE 7 uses the NULL to toggle between upper and lowercase. CODE 7 is invisible to stations using classic AMTOR (CODE 0). However, a CODE 7 station talking to a station using CODE 2 (AEA's already existing upper/lower case protocol) will result in upper/lowercase reversals or constant lower case text.

CODE *8*: Extended TOR lowercase

Meaning	Morse	Baudot	AMTOR	Packet
Extended Lower Case	—	—	—	—

CODE 8 also applies to AMTOR only. It includes the features of CODE 7 above, and additionally codes new punctuation characters using NULL as an escape while in FIGS case. Thus CODE 8 supports all 95 printable ASCII characters ($20-7E) plus CR, LF, space and ENQ while in AMTOR operating mode, but not BELL, backspace and TAB. At the moment, this protocol is used only on links between mailboxes forwarding messages. It could be used with the AEA AMTOR-to-Packet Gateway if all users had CODE 8. (CODE 8 isn't invisible to other users.)

CRAdd *ON*|*OFF*   Default: OFF
Mode: Baudot RTTY   Host: CR

OFF   Send (RETURN)+LF in Baudot RTTY (default).

ON   Send (RETURN)+(RETURN)+LF in Baudot RTTY.

The CRADD command permits you to set the DSPs "newline" sequence so that an additional (RETURN) is added automatically at the end of each typed line. The double (RETURN) is required in some RTTY services such as MARS. CRADD has no effect on received data.

CWid *n*   Default: $06 (CTRL-F)
Mode: Baudot/ASCII RTTY/AMTOR/PACTOR/FAX   Host: CW

The CWID command lets you change the "send CWID" control character typed at the end of your Baudot and ASCII RTTY dialogue.

When the DSP reads this character embedded in the text or keyboard input, it switches modes and sends your callsign in Morse code, at the keying speed set by MSPEED. As soon as your callsign has been sent in Morse, the DSP turns off your transmitter and returns to receive.

DIDdle: *ON|OFF*   Default: ON
Mode: Baudot, ASCII   Host: DD

ON   In Baudot, the DSP will send the LTRS character when idling. In ASCII, the DSP sends the NULL (00) character.
OFF   No characters are sent when idling in transmit.

In the RTTY modes, it may be desirable to continue sending some data while paused at the keyboard. With DIDDLE on, the DSP will send idle characters when waiting for keyboard entry.

EAS *ON/OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTORand MORSE   Host: EA

OFF   Echos characters when sent to the DSP by the computer.
ON   Echos characters actually sent on-the-air by the DSP.

The Echo-As-Sent (EAS) command functions in all modes *except* packet. EAS lets you to choose the way data is displayed on your monitor screen or printer. To display your text on your computer screen exactly as you're typing it in or while sending it from a disk file, leave EAS *OFF*. To see the actual data being sent from your DSP-232 to your radio and transmitted on the air, set EAS *ON*.

With EAS *ON* in Morse and Baudot RTTY, you'll see only uppercase characters on your screen and the data actually transmitted to the other station.

With EAS *ON* in AMTOR mode A and PACTOR (ARQ), you'll see characters echoed on your screen only *after* the distant station has validated *ack*ed your block of three characters. For packet, the MXMIT command should be used.

Nulls ($00) are not echoed, including the nulls produced by DIDDLE *ON* in ASCII.

HEReis *n*   Default: $02 (CTRL-B)
Mode: Baudot, ASCII, AMTOR and PACTOR   Host: HR

"*n*"   Is the hex representation ($01-$7F) of the character that causes the AAB string to be sent in the middle of transmitted text.

If you want to send your own AAB string for identification during a transmission, simply enter the HEREIS character.

Id   Immediate Command
Mode: AMTOR/ASCII/Baudot/Packet   Host: ID

In AMTOR, the ID command acts like the RCVE command only it adds a Morse ID before going back to receive. In ASCII and Baudot, the ID command causes a Morse ID to be sent much like an immediate version of the CWID character (CTRL-F). Because the ID command is immediate, the message "Transmit Data Remaining" will be displayed if any unsent data remains in the transmit buffer. To clear the data from the buffer, enter *TC* at the cmd: prompt.

In packet, ID is an immediate command that sends a special identification packet. The ID command allows you to send a final identification packet when you take your station off-the-air. (HID must also be set *ON*). The identification consists of a UI-frame, with its data field containing your MYALIAS (if it's entered), MYCALL, and the word "digipeater". The ID packet is sent only if your DSP has digipeated any transmissions since the last automatic identification.

Lock   Immediate Command
Mode: Morse/Baudot/AMTOR/FAX   Host: LO

AMTOR and Baudot: LOCK is used to force a LETTERS shift in the received data. This can be helpful if noise has garbled the LTRS character causing FIGURES to be displayed.

Morse: LOCK instructs the DSP to lock its timing circuits to the current measured speed of a received Morse signal; This may improve the DSPs ability to decode those signals in the presence of high noise levels. To "un-Lock" the Morse speed and allow the DSP to track the received signal automatically, enter an *R* or *MO* in the Command mode, followed by a (RETURN) .

MARsdisp *ON\OFF*   Default: OFF
Mode: Baudot and AMTOR, RTTY   Host: MW

OFF   The DSP operates normally in Baudot and AMTOR (default).
ON   The DSP translates received LTRS characters to a (CTRL-O), and FIGS characters to a (CTRL-N) then sends these to the terminal.

MARSDISP enables the Baudot and AMTOR operator to detect and display every character, including LTRS and FIGS sent by the other station. ACRDISP and ALFDISP may be turned off to prevent extraneous (RETURN)s and LFs from being sent to the display. If this data is retransmitted, ACRRTTY should be *0*, and ALFRTTY *OFF*. The (CTRL-O) and (CTRL-N) characters will send LTRS and FIGS, respectively.

MFilter *n1*[,*n2*[,*n3*[,*n4*]]]   Default: $80
Mode: Morse, Baudot ASCII, AMTOR, PACTOR and packet   Host: MI

"*n*"   0 to $80 (0 to 128 decimal) specifies an ASCII character code.
            (Up to four characters may be specified separated by commas.)

Use MFILTER to select up to 4 characters to be "filtered" or excluded from Morse, Baudot, ASCII, AMTOR, PACTOR and monitored packets with parameters *n1* - *n4*, the ASCII codes for the characters you want to filter. The special value of $80 (default) filters all characters above $7F and *all* control-characters except (RETURN) ($0D), LF ($0A), and (TAB) ($09).

MODem   Default: 12
                                                                         Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
1:  FSK   45   bps  2125/2295
2:  FSK   100  bps  2125/2295
3:  FSK   45   bps  1615/1785
4:  FSK   100  bps  1615/1785
5:  FSK   200  bps  2110/2310
6:  FSK   200  bps  1600/1800
7:  FSK   200  bps  2125/2550
8:  FSK   200  bps  1275/1700
9:  FSK   200  bps  2125/2975
10: FSK   200  bps  1275/2125
11: FSK   300  bps  2110/2310
12: FSK   300  bps  1600/1800
13: FSK   1200 bps  VHF
14: PACSAT 1200 bps BPSK
15:
16: FSK   9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

MWeight *n*   Default: 10
Mode: All except packet   Host: Mw

"*n*"   5 to 15, specifies roughly 10 times the ratio of one dot length to one inter-element space length in transmitted Morse code.

A value of 10 results in a 1:1 dot-space ratio. A setting of 5 results in a 0.5:1 ratio, while a setting of 15 (maximum) results in a 1.5:1 ratio. MWEIGHT applies only to the Morse transmit mode and the CW ID in all modes except packet. MWEIGHT doesn't affect the code output by the MID command.

Nums   Immediate Command
Mode: Baudot, AMTOR, TDM   Host: NX

In Baudot, AMTOR and TDM receive, the NUMS command will force the DSP into the FIGS case.

PASs *n*   Default: $16 (CTRL-V)
Mode: packet, ASCII and PACTOR   Host: PS

"*n*"   0 to $7F (0 to 127 decimal) specifies an ASCII character code that you can send to the TNC.

PASS selects the ASCII character "*n*" used for the "pass" input editing commands. The PASS character signals that the following character is to be included in a packet PACTOR or ASCII text string. For example, if you're typing in text and want to enter three RETURNs so you can put a line space between two paragraphs, you'd do this:

> *"...here's the end of the first paragraph."* (*CTRL-V*)+(RETURN)+(*CTRL-V*) (RETURN)+(*CTRL-V*)+(RETURN) .*"Now this line will appear after a line space."*

The line will appear at the other station like this:

> *"...here's the end of the first paragraph."*
>
> *"Now this line will appear after a line space."*

If you had just pressed (RETURN) at the end of the word, "paragraph," you would've forced a packet to be sent. Press (RETURN) again, and you would've forced an empty packet to be sent. Press (RETURN) yet again, and another empty packet would've been sent. This happens because when you press RETURN, it normally forces a packet to be sent. However, by inserting a (CTRL-V) before entering a (RETURN), you disable the function of (RETURN) in the Command mode and allow it to be used in your outgoing text to act as a "real" (RETURN). So, the PASS character "hides" the next character's function.

QRTTY *n*   Default:1 (Modem 1)
Mode: Baudot, ASCII, RTTY   Host: QR

n   Modem number to be selected when the ASCII or Baudot RTTY modes are entered.

QRTTY sets the DSP-232 modem that will automatically be selected when the Baudot or ASCII RTTY modes are
        entered.

See the BAUDOT, ASCII and MODEM commands for more information.

RBaud *n*   Default:45 bauds (60 wpm)
Mode: Baudot RTTY   Host: RB

"n"   Specifies the Baudot data rate, in bauds, from the DSP to the radio.

RBAUD sets the radio on-the-air baud rate *only* in the Baudot operating mode. This value has *no* relationship to
your computer or terminal program's baud rate. Available Baudot data rates include 45, 50, 57, 75, 100, 110, 150,
200 and 300 bauds (60, 66, 75, 100, 132, 145, 198, 264 and 396).

You can enter RBAUD *UP* to go to the next highest Baudot speed or RBAUD *DOWN* to go to the next lowest
Baudot speed.

Rcve   Immediate Command
Mode: Baudot/ASCII/AMTOR/PACTOR/FAX/Morse   Host: RC

RCVE is used in Morse, Baudot, ASCII, AMTOR, PACTOR and FAX modes to switch your DSP from transmit to
receive.

You *must* (RETURN) to the Command mode to use RCVE.

RECeive *n*   Default: $04 (CTRL-D)
Mode: Baudot/ASCII/Morse/AMTOR/PACTOR/FAX   Host: RE

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Parameter *"n"* is the numeric ASCII code for the character you'll use when you want the DSP to (RETURN) to
receive.

The RECEIVE command allows you to insert a character in your typed text that will cause the DSP to (RETURN) to receive after all the text has been transmitted.

RFRame *ON|OFF*   Default: OFF
Mode: Baudot and ASCII RTTY   Host: RG

OFF   Print received Baudot and ASCII characters regardless of errors.
ON   Check received Baudot and ASCII characters for framing errors.

With RFRAME *OFF*, Baudot and ASCII modes operate as always, that is, characters are copied based on the presence of the DCD signal.

With RFRAME *ON*, the DSP checks received Baudot and ASCII characters for framing errors. A framing error on a character in an asynchronous mode (such as Baudot and ASCII) occurs when the bit in the stop position is detected to be the wrong polarity (the polarity of the start bit is supposed to be "space" or 0, while the stop bit is supposed to be "mark" or 1.) The unit stops copying characters when 4 out of the last 12 characters have framing errors. Copy resumes when the most recent 12 characters are error-free. This significantly reduces the copying of "garbage" characters when no signals are present.

RXRev *ON|OFF*   Default: OFF
Mode: Baudot and ASCII RTTY/AMTOR   Host: RX

OFF   Received data polarity is normal.
ON   Received data polarity is reversed (mark-space reversal).

Use RXREV to invert the polarity of the data demodulated from the received mark and space tones. So, instead of "space" equalling zero, it'd be one; "mark" would equal zero instead of one.

In some cases, you may be trying to copy a station that's transmitting "upside down" although it's receiving your signals correctly. This is especially true when listening to signals in the shortwave bands. Set RXREV *ON* to reverse the data sense of received signals.

RXREV operates only at RBAUD and ABAUD speeds up to 150 baud.

TXdelay *n*   Default: 30 (300 mS)
Mode: packet, Baudot and ASCII   Host: TD

"n"   0 to 120 specifies 10 mS increments.

TXDELAY tells your DSP how long to wait before sending packet frame data after keying your transmitter's PTT line.

All transmitters experience a certain length of time from the instant the PTT line is keyed to when the signal is actually transmitted. The default value of 300 mS should work with almost all transceivers. In fact, many of the newer transceivers can use smaller TXDELAY values. (Crystal-controlled transceivers can often use smaller values as well.) On the other hand, tube-type transceivers and amplifiers can require a longer time to switch and may require TXDELAY to be increased. Experiment with the value to determine the shortest setting you can use in reliably in packet.

Baudot and ASCII use TXDELAY to set the timespan between PTT *ON* and the start of transmitted data.

TXRev *ON|OFF*   Default: OFF
Mode: Baudot/ASCII/AMTOR   Host: TX

OFF   Transmit data polarity is normal.
ON   Transmit data polarity is reversed (mark-space reversal).

Use TXREV to reverse the mark and space polarities in your transmitted AFSK and FSK signals.

In some cases, the station you're working may be receiving inverted data although it's transmitting in the correct polarity. Set TXREV *ON* to reverse the "sense" of your transmitted signals.

TXREV only works on ABAUD and RBAUD at speeds up to 150 baud.

USOs *ON|OFF*   Default: OFF
Mode: Baudot RTTY   Host: US

OFF   Letters (LTRS) isn't forced after receiving a space character.
ON   Letters (LTRS) case *is* forced after receiving a space character.

Use USOS (UnShift On Space) when you want your DSP to automatically change from FIGURES to LETTERS after receiving a space character.

When using Baudot RTTY in poor HF receiving conditions, a received character can be incorrectly interpreted as a FIGURES-SHIFT character, forcing the received data into the wrong case. Many otherwise good characters received after this will be interpreted as figures (numbers and punctuation), not as the letters sent by the distant station. USOS *ON* helps reduce these receiving errors.

WIdeshft *ON|OFF*   Default: OFF
Mode: Baudot/ASCII, RTTY, AMTOR, PACTOR   Host: WI

OFF   RTTY tones are shifted 200 Hz (emulates 170-Hz shift).
ON   RTTY tones are shifted 1000 Hz.

WIDESHFT permits the use of the DSP on VHF or HF with either wide (1000 Hz) or narrow (200 Hz) shifts. Many amateur radio VHF and HF RTTY operators use 170-shift. The DSPs 200 Hz shift is well within the filter tolerances of any RTTY demodulator in general service. MARS stations will find WIDESHFT generally compatible with MARS and Commercial 850 Hz shift RTTY operations.

WOrdout *ON|OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTOR and Morse   Host: WO

OFF   Inputted characters are sent directly to the transmitter.
ON   Inputted characters are held in the transmit buffer until a space, (RETURN), LF, (TAB), RECEIVE,
         CWID, ENQ or *+?* character(s) is typed.

Use WORDOUT to choose whether or not you can edit while entering text for transmission.

With WORDOUT *ON*, each character you type is held in a buffer until you enter a space, (RETURN), LF, ENQ character ($05 [CTRL-E]) or the *+?*. You can edit or delete words before the transmit buffer's contents are sent to the radio as long as you haven't entered pressed (SPACE), (RETURN) , LF, etc.

With WORDOUT *OFF*, each character you type is sent to the radio just as you typed it, without any delay. Also, the backspace character is transmitted in Baudot, ASCII, AMTOR and PACTOR modes. With WORDOUT *ON*, pressing the backspace key cancels out the preceding character and neither are transmitted.

In Baudot and AMTOR, the backspace character is transmitted as a "?" since there's no backspace in those modes.

In ASCII the backspace character is transmitted, but the destination station must be able to pass it. AEA products should have MFILTER set to zero to allow backspaces to print.

WRu *ON|OFF*   Default: OFF
Mode: Baudot, ASCII   Host: WR

OFF   Your Auto-AnswerBack isn't sent after another station sends WRU?
ON   Your Auto-AnswerBack *is* sent after another station sends WRU?

Use the WRU command in Baudot and ASCII to enable or disable your DSPs Automatic AnswerBack (AAB) feature.

With WRU *ON*, your DSP sends the AnswerBack on receipt of a distant station's WRU? request ["FIGS-D" or "$" in Baudot or a (CTRL-E) in ASCII]. Your DSP keys your transmitter, sends the text stored in the AAB field, then unkeys your transmitter and returns to receive.

The WRU function is defaulted to *ON* in AMTOR as per the CCIR recommendation. To allow for special applications where it may be helpful to disable the WRU function in AMTOR, UBIT *9*, or bit 9 of the CUSTOM command controls this feature.

XBaud *n*   Default: 0
Mode: ASCII/Baudot   Host: XB

"n"   Specifies an exact baud rate used in receiving ASCII and Baudot RTTY.

XBAUD enables hardware decoding of ASCII and Baudot signals using the DSPs 8530 Serial Communications Controller IC. This can allow the DSP to achieve better copy of these signals as well as allow non-standard data rates to be received. One disadvantage of XBAUD is that the software commands, RXREV and TXREV, can't be used to invert the data so the correct sideband must be used by both parties.

To use XBAUD, simply enter the data rate that you want in either ASCII or Baudot modes. For example, a 20-meter Baudot RTTY enthusiast may want to set XBAUD to *45* to improve copy of weaker signals on the band.

It's important to remember that XBAUD overrides both the RBAUD (in Baudot) and ABAUD (in ASCII) as well as the inverting commands, TXREV and RXREV. This means that if XBAUD has been set to *45* for Baudot operation, it should be reset to *0* before changing modes to ASCII. Otherwise, the DSP will attempt to receive ASCII at 45 bauds! To help reduce the chance of this error occurring, the DSP will disable XBAUD by setting it to *0* every time the SIAM mode is used and the command OK is entered.

Xmit   Immediate Command
Mode: Baudot/ASCII/Morse   Host: XM

XMIT keys your radio's PTT line and prepares the radio to receive outbound data and Morse characters from the DSP. This command can only be used while in the Command mode.

XMIT switches your DSP to either the Converse mode or the Transparent mode, depending on the setting of CONMODE. Typing the CWID or the RECEIVE character will (RETURN) you to receive. Typing RCVE from the Command mode will also (RETURN) to receive.

Chapter 9

AMTOR Operation

Overview

The DSP provides AMTOR operation in accordance with FCC Part 97.69 and CCIR Recommendations 476-2/476-3 and 625 for mode A (ARQ) and mode B (FEC) modes. AMTOR is an adaptation of the SITOR system used in high-seas ship telex, which provides error detection and correction.

AMTOR has two basic modes of operation, mode A (ARQ - Automatic ReQuest for reception) and mode B (FEC - Forward Error Correction).

♦ AMTOR mode A (ARQ) is a handshaking protocol that allows only two stations to communicate in a near error-free fashion. For years, this mode has been used by Amateurs as the best, error-free method of getting messages through on HF when conditions were poor.

♦ Unlike ARQ, FEC AMTOR is similar to Baudot RTTY and is used to call CQ or to carry on "roundtable" contacts. (No "link" is established between stations.)

In AMTOR, the transmitting station (ISS) "has the link" and requires a periodic *ack* signal from the receiving (IRS) station as part of its error-checking scheme. An analogy of this would be you reading off sequences of numbers to a friend and having him *ack* them back, then when you're finished you'd switch roles with him and he'd call off his set of numbers.

When you're reading off your set of numbers (transmitting) you have control of the link since you're the sending station. Your friend, the "receiver," answers back (*acks*) with either a quick "yes, I heard you okay" or a "no, I missed something." In the former case, you'll "send" the next sequence of numbers; in the latter, you'll repeat the previous number sequence. After you've read all the numbers on your list, you'd hand the link over to your friend and it'd be his turn to read numbers to you and for you to acknowledge them as "received okay" or "not received okay."

The *+?* character is a software changeover command that switches your system from being the ISS to the IRS. When you're linked, it switches the other system from being the IRS to the ISS. When the other operator sees the *+?*, he knows it's his turn to type and the link will be in his control.

Before proceeding with the rest of this section, review the following commands that are directly applicable to the AMTOR mode: AAB, ALIST, ARQ, ARQTMO, ARQTOL, ARXTOR, CBELL, CODE (2,7,8), EAS, FEC, GUSERS, MHEARD, MID, MYIDENT, MYSELCALL, OVER, RXREV, TXREV, TMAIL and WORDOUT. The AMTOR commands are listed and explained at the end of this chapter. Terminal commands can be found in Chapter 4.

Setting Up

(If you're using an AEA program, follow the instructions in the program's manual to set up and use AMTOR.)

AMTOR is a bit more complex than Baudot or ASCII operation. AMTOR operating modes require SELCALL (SELective CALL) codes to be entered before you can operate in this mode.

The SELCALL is a unique character sequence, consisting of four alphabetic characters, that's derived from your callsign; your DSP will convert your call for you using MYSELCALL. In the following example, we'll use KB6IUX to generate a SELCALL:

```
cmd:MYS KB6IUX
MYSelcall was none
MYSelcall now KIUX
cmd:
```

Because the same callsign sequences are assigned in ten districts, it's possible that your SELCALL could be used by another station. If that should happen, see MYSELCALL for information on how to change your SELCALL or use MYIDENT below.

Most of the AMTOR activity on the amateur bands uses a four-character SELCALL as described above. A seven-character SELCALL, using MYIDENT, is available to solve the problem of coincidental SELCALLs by providing many more possible combinations. To obtain your seven-character SELCALL, all you have to do is enter your amateur callsign as in the example below:

```
cmd:MYI KB6IUX
MYIdent was none
MYIdent now KBDIUXX
cmd:
```

We suggest you create both a 4- and 7-character SELCALL.

Now that you've entered your MYSELCAL and MYIDENT SELCALL codes, you're ready to enter the AMTOR mode by simply entering *AMTOR* or *AM* at the Command prompt. The DSP responds by displaying the previous mode it was in, then its new mode:

```
cmd:AM
Opmode   was (previous mode)
Opmode   now AMtor
cmd:
```

Look at your DSP's front panel to verify that you're in the AMTOR mode—the symbol 'A' will be shown in the Mode window.

Next, you can choose which modem you want to use using the MODEM command, followed by the specific modem number. For a list of modems available in the DSP, type DIRECT at the cmd:.

Once you have selected the mode, and modem the next step is to set your radio to LSB unless you've connected your DSP to your radio's direct FSK keying lines. If you have, then you should select the FSK operating mode on your radio.

Receiving AMTOR

Most AMTOR operation occurs on the 20-meter band between 14.065 and 14.085 MHz, though activity can also be found on the other HF amateur bands as well; it's often located between 65 KHz and 90 KHz up from the bottom of the band as it is on 20 meters.

Tuning in AMTOR stations properly is the key to successful operation. Since HF AMTOR stations use either 170 Hz or 200 Hz Frequency Shift Keying to send data, tuning accuracy is very important. Follow the procedure below for the best results.

1. Put your HF receiver in either LSB or FSK/RTTY/PACKET mode, depending on your set-up.
2. Turn any IF-shift and passband-tuning controls to their center or "off" position.
3. Adjust the volume to a comfortable listening level.
4. Tune your receiver between 14.065 and 14.085 MHz (or elsewhere where there's AMTOR activity) and listen for the *chirp chirp* of ARQ, or the steady data of, FEC stations.
5. When you find a station, use the THRESHLD command to adjust the threshold so that the DCD light glows when a tuned AMTOR station is being received, but goes out when no signal is received. Alternatively, you can use the AUTOTHR (automatic threshold) command to have the DSP-232 automatically adjust the threshold for you.
6. When in the AMTOR Standby mode (as you're in now), you won't be able to decode the chirping ARQ signals. To do so, you need to be in the AMTOR Listen (ALIST) mode. Use ALIST to monitor ARQ traffic flowing between two stations that are linked in an ARQ contact—your DSP will try to synchronize with whichever of the two stations is the ISS station at the moment. (ALIST, however, won't give you error detection or error correction abilities since you're not one of the two linked stations.) With poor links, you might see repeated characters on your screen because the ISS station is repeating blocks of information the IRS failed to catch the first time they were sent.

   If you want to listen in to CQs or on a roundtable QSO where stations *aren't* linked (FEC), enter *AM*. Again, no error correction will take place.
7. Slowly vary the tuning control on your receiver while glancing at the DSPs turning indicator. Look for the LED pattern below and adjust the frequency control accordingly.

■□□□□□■■□□   ■■□□□□□□■■   □□■■□□□□□■
Frequency too low   Tuned in!   Frequency too high

Your DSP will not print a block of data if the block contains the same information as the previous block. If the ISS repeats the same block, you won't receive it twice unless *you* receive an error. If the stations you're monitoring are sending error and RQ codes and repeating blocks of characters across their link, you may see some repeated character blocks. If they're having link problems, the data on your screen can look very strange indeed, although the two synchronized stations are enjoying error-free copy.

✎   **Note:** an alternative way of listening to AMTOR stations is by way of the SIAM mode; see Chapter 11 for more information.

Going On the Air

✎   **Note**: Make sure your DSP is adjusted for your SSB transmitter as described in *Chapter 3 - Radio Installation*, under the heading *SSB Transceiver Final Adjustments*. These are critical adjustments. If your DSPs AFSK level and transmitter's mike gain aren't adjusted properly, other stations won't be able to copy your signals.

Finally, before you go ahead and transmit, here are some helpful hints:
   ♦ ***Don't*** use the VOX control—use the PTT line from your DSP.
   ♦ Turn off the AGC circuit—use the RF gain control to prevent receiver blocking on stronger signals.
   ♦ Turn off all compression or other audio processing.
   ♦ If you're using an AFSK audio input, keep the audio level to the microphone input circuit as low as possible to avoid overdriving the audio input stages.
   ♦ Adjust the transmitter's drive to prevent excessive ALC action; use more effective RF antenna loading to adjust output power levels.
Before you transmit, however, you have to decide if you're going to "call CQ" or answer someone's CQ call.

Calling CQ
When you initiate a CQ call, you must do so in the FEC AMTOR mode.

1. Enter *FEC*. You're in the Converse mode and your transmitter is now keyed, so anything you type will be sent.
2. Type in your CQ message. Make sure you include your callsign, and four- and seven-character SELCALL. An example is shown below:

    CQ CQ CQ DE KB6IUX -- KIUX -- KBDIUXX +? (CTRL-D)

    By tacking on a *CTRL+D* at the end of your CQ (or other text), it puts your radio into `AMTOR STBY RCVE` mode after your CQ (or text) is sent; now it'll be ready to receive a connect from another station.

✎   **Note**: while in STBY RCVE mode you won't be able to monitor any text that the DSP hears—only in ALIST or AM mode can you monitor other linked and unlinked AMTOR stations.

3. After the DSP has sent your CQ, wait a bit for a response. If you don't get one, repeat Step 2 or listen on another frequency for other AMTOR stations.

Answering Another Station's CQ

Normally, when you see a station calling CQ in FEC AMTOR, you'll want to answer him using ARQ AMTOR.

Let's assume you hear KG6ZL calling CQ using either his four-character (KGZL) or seven-character (KCDZFFF) SELCALL . To answer him, enter one of the following:

> *ARQ KGZL*
> *or..*
> *ARQ KCDZFFF*

✎   **Note**: you'll get an error message if you try to connect to a station's callsign—*you have to connect to its SELCALL.*

If your station doesn't link within a period of time determined by ARQTMO, your station will "give up" and automatically stop transmitting.

Beginning a QSO

After you "connect" with the other station, what do you say or do? You might say something like:

> *DE (your call) Howdy! Name here is (you) and my QTH is (location). You're coming in (signal information) here. +?*

The *+?* at the end of your transmission changes control of the link back to the other station; when he's done with his transmission, he'll do the same...and this is how the conversation goes, changing control of the link back and forth until your QSO is finished.

Ending a QSO

The station that has control of the link is the one that normally ends the conversation. If you have control of the link, you might end it like this:

> *Thanks again, and see ya later! DE KB6IUX -- KIUX -- KBDIUXXSK (CTRL+D)*
> `*** DISCONNECTED: (callsign)`

Entering (*CTRL-D)* breaks the contact and puts you in back into `AMtor STBY RCVE` mode. From here, you can go ahead and initiate a contact with another station or wait for a station to connect to you. Remember, though, that you won't be able to monitor other stations' AMTOR transmissions unless you enter AM or ATL, for unlinked and linked stations, respectively.

Seizing the Link

If the other station has the link and is sending a message to you, but you have to interrupt to tell him something— like you might in Morse QSK (quick break-in.)—you can do that in AMTOR by entering *(CTRL-C) ACHG (RETURN) (text)*. The *(CTRL-C) ACHG (RETURN)* commands cause the link to come back under your control and puts the other station in receive. The text is optional; after you type it in, you can hand back control of the link to the other station by entering a *+?*.

Killing the Link

If, while the other station has control of the link, you have to end the conversation immediately, you can do so by entering *(CTRL-C) R (RETURN)*. This will put you into AMtor STBY RCVE mode. If there are characters left in the transmit buffer, they won't be sent. Enter *TC* to clear the buffer.

Bailing out like this isn't a recommended procedure since it leaves the other station "holding the bag"—he won't know that you left until his software timer "times out" waiting for an acknowledgement signal from you that will never come. A "graceful" way of performing the same function is *(CTRL-C) ACHG (CTRL-D)* or *(CTRL-C) ACHG (CTRL-C) D (RETURN)*.

Another alternative is to enter (*CTRL-F)* to break the link and send your Morse ID. Your DSP will switch to the Morse mode, send your callsign at the speed set by MSPEED, then will shut off your transmitter.

Roundtable QSOs

With your DSP, it's possible to start or join in on a roundtable discussion where two or more hams get together on the same frequency to chat. All you have to do to transmit is be in the FEC AMTOR mode.

If you want to listen in on a roundtable QSO where stations *aren't* linked (FEC), enter *AM*.

✎**Note**: Because you'll be in AMtor STBY RCVE mode, no error correction will take place.

If you want to transmit:

1. Enter *FEC* to key your transmitter; You're now in the Converse mode, so anything you type will be sent in FEC by your transmitter..
2. When you finished typing your message, enter (*CTRL-D*). This will put you in AMtor STBY RCVE mode, so you'll be able to copy the other station(s).
3. Repeat Step 1 when you want to transmit again.

"Hidden" QSOs

Say you want to send a message to a group of friends without other stations (initially) reading your message? By using SELFEC, you can do just that.

What you need to do is have you and your group use a common MYALTCALL like *GROU* (GROUp), for example. Once you've all entered MYALTCAL *GROU* and the others have entered the AMTOR mode, you'd enter:

> SELFEC *GROU* (RETURN)
> *Hi, everybody -- glad you all could make it tonight.* (CTRL-D)

It'll take a few moments, but the text will appear on everybody's else's screen at the same time; the PHASE and SELFEC lights in the DSPs Status Window on the front panel will glow as your message is sent—the IDLE light will glow when no text is sent. Since you all share the same MYALTCAL, you can all take turns transmitting apparently encrypted (to non-participants) text to each other.

The reason why your message won't be intially read by non-participants is because your mark and space tones' polarities are reversed using SELFEC. If an eavesdropping station figures out what you're up to, it can listen in by turning its RXREV command on.

This mode of operation works for both one-to-one QSOs and group chats.

Operating Tips and Options

ID'ing Yourself

The FCC requires station identification once every ten minutes while you're engaged in a QSO. It's sufficient to begin or end your transmission with *QRA* (*callsign*) before the *+?* changeover code, or you can enter (CTRL-B*)* to send your own Auto-AnswerBack (AAB) message.

AAB—Auto-AnswerBack—AMTOR allows you to request the identity of the station you're conversing with by entering (CTRL-E). This causes the DSP to send a FIGS-D request to the other station.

EAS—*E*cho *A*s *S*ent—is used in ARQ AMTOR. With EAS *ON*, you'll see characters echoed to your screen only *after* the other station has validated them; the characters appear on your screen three at a time. This allows you to observe the progress of your transmission. If progress is very slow or jerky—most likely due to deteriorating atmospheric conditions—then it's probably time to wrap up the contact.

For this reason, you should set your own AAB message to *DE (callsign) (MYSELCALL) (MYIDENT)*. If you turn WRU *ON*, your DSP will automatically send your AAB message when another station requests your identity.

Speed Change
In accordance with FCC Part 97.69 and international regulations, AMTOR is operated at 100 bauds. The DSP does not permit any other speed.

WORDOUT
Some AMTOR users like to have their words sent out only when they're complete, rather than individual letters sent as they're typed. Turning WORDOUT *ON* enables you to edit the word you're currently typing as long as you haven't pressed the (SPACE) bar or any punctuation.

Operating on the "Wrong" Sideband
By convention, AMTOR is used while in LSB. If you find a station operating on USB, you can reverse your receive "sense" with RXREV to copy him. Likewise, if someone tells you that *you* are on the wrong sideband you can correct your transmit signal sense using TXREV, but ideally you should just switch to LSB and adjust your frequency accordingly.

Letters and Figures Case
In the "old days" a key was used on mechanical teletype machines to differentiate between numbers, letters and punctuation since AMTOR is limited to 32 different characters. The DSP takes care of that automatically so no separate keybord stroke is required.

Function Keys
The following immediate commands and "Function Keys" are included for AMTOR operating convenience:

ARQ (SELCALL)	Starts mode A selective call and forces Converse.
FEC	Starts mode B transmission and forces Converse.
SELFEC (SELCALL)	Starts Selective mode B transmission.
R	Stops sending immediately, forces AMTOR Standby, clears the transmit buffer of all remaining data.
AM	Stops transmission, forces AMTOR Standby, clears the transmit buffer of all remaining data.
AL	Forces re-synchronization in ALIST (AMTOR mode A Listen).
L	Forces LETTERS case.
N	Forces FIGURES case.

Function Keys embedded in transmitted text:

(CTRL-B)	Sends your AAB string as a "HERE-IS" message
(CTRL-D)	Stops sending when the transmit buffer is empty
(CTRL-E)	Sends a "Who Are You? (WRU)" request to the other station
(CTRL-F)	Sends callsign in Morse and shuts off your transmitter
(CTRL-N)	Sends FIGURES character
(CTRL-O)	Sends LETTERS character
(CTRL-T)	Sends the time if the DAYTIME has been set; the date if DAYSTAMP has been set.

Switching Time Problem?
For operation in AMTOR ARQ, your transceiver or transmitter-receiver combination must be able to change between transmit and receive within 20 mS. Most modern solid state radios can easily meet this specification. Many older tube-type radios that use electromechanical relays also operate very well in AMTOR ARQ.

If the changeover time from transmit to receive in your radio set-up is too long, the ack signal from the distant station will arrive before your radio has switched back to receive. However, if the transmitting station is further away, the transmission time over the propagation path will delay the arrival of the signal until after your radio has switched to receive. For this reason, you may be able to link with stations across the world easier than across town.

If the receiving station's changeover from transmit to receive is too slow, the transmitting station delay between "PTT" and "data send" can be extended. See ADELAY to adjust the DSP's AMTOR timing characteristics to compensate for this.

If switching-time problems persist, you may have to make changes in the radio to eliminate excessive time delays:
- Remove large decoupling capacitors from the Push-To-Talk line to allow faster PTT (transmitter) activation;
- Improve power supply decoupling, especially in audio stages.
- *Don*'t use the squelch control.

Another solution is for either you, or the other station, to change the timing value in ADELAY.

In case you can't solve your radio's switching-time problems, call AEA for assistance.

Maildrop Operation

One of the unique features of the DSP-232 is that it allows AMTOR as well as Packet and PACTOR access to its MailDrop; messages can be dropped off and picked up in any combination of these modes as long as your mode (Packet, PACTOR, RTTY, etc.) matches the calling station's. Make sure that you understand *Chapter 7 - MailDrop Operation* and the basic AMTOR operation described earlier in this chapter before putting your AMTOR Maildrop on the air.

TMAIL controls other stations' access to your AMTOR and PACTOR MailDrop in the same way that the MAILDROP command controls Packet access. See TMAIL for more information about MailDrop accessibility.

The AMTOR Maildrop has been designed with a "Watchdog" safety feature so that it can operate independently with little attention. If a remote station is linked with your AMTOR Maildrop and no traffic is passed for 5 minutes, the link will drop and your transmitter will shut off.

At this writing however, unattended operation below 30 MHz isn't legal for US amateurs unless they hold a Special Temporary Authorization (STA) from the FCC for this purpose. This restriction may soon change, but until then US amateurs must be sure to always have control of their HF transmitters when any automatic device such as the DSP MailDrop is in operation.

With this in mind, we've designed the AMTOR Maildrop so that it can be turned on or off at any time during an ARQ link simply by turning TMAIL *ON* or *OFF*. This allows you to make your Maildrop available to any station you're linked with at a moment's notice. This could come in handy should you want to forward a message from an AMTOR station into the Packet or PACTOR network. See the CODE 2 command for upper and lowercase text in AMTOR.

LED Status and mode Indicators

The front panel LED display provides mode and status information at a glance. This is especially useful in AMTOR operation. See the following table for the light patterns you'll see when you operate your DSP in its different AMTOR modes.

Action	Keystroke	On-Screen Text	Front Panel LEDs
Enter AMTOR mode and to listen to FEC transmissions	*AM*	`Opmode was (old mode)` `Opmode now AMtor`	Amtor/FEC

Monitor AMTOR traffic while other stations are connected	*AList*	`Opmode was AMtor` `Opmode now AList`	Phase
Send CQ or a message	*FEC* *CQ CQ CQ,* *DE (yourcall 3X)...* (*CTRL-D*)	Enter your CQ text or send a message while not connected, then follow it by a (CTRL-D).	TX+traffic/FEC
Another station answers your CQ and connects to you			traffic/ARQ Idle/ARQ
The other station sends text...		`(text)`	Traffic/ARQ Idle/ARQ
...then he turns it over to you when it's your turn		`(text) +?`	TX+Idle/ARQ
You send text back to him	*(text)*	(text)	TX+Traffic/ARQ
...then you flip it over to him	*+?*		Over/ARQ Idle/ARQ
You end the QSO (while it's your turn to transmit)	(*CTRL-D*)		TX+Over/ARQ
To end a QSO while the other station has the link	(*CTRL-C*) *R*		
To grab the link away from the other station before he flips it over to you	(*CTRL-C*) *(text)* *ACHG* (*RETURN*)		TX+Idle/ARQ TX+Traffic/ARQ
To listen to an unlinked station, like in a roundtable	*AM*	`Opmode was (previous mode)` `Opmode now AMtor`	
To send out "unlinked" messages, like in a roundtable QSO	*FEC* *(text)*	`Opmode was AMtor` `Opmode now FEc`	Send+Idle/FEC
To connect to a station that's calling CQ	*ARQ callsign*		TX+Traffic/ARQ TX+Idle/ARQ

AMTOR COMMANDS

AAb *text*   Default: empty
Mode: Baudot, ASCII, AMTOR, PACTOR   Host: AU

text   Any combination of charcters (maximum: 24).

Use AAB to enter *ac*knowledgment text for Baudot, ASCII, AMTOR and PACTOR. AAB sends automatic confirmation in Baudot, ASCII, AMTOR and PACTOR in response to a distant station's WRU request—it's like an

answering machine message you've set up for incoming calls. Set WRU *ON* or CUSTOM to *$0200* to activate your Auto-AnswerBack message.

To record your AAB message, enter "AAB (24-character text)".
        Example: cmd: AAB WF7A - VASHON ISLAND, WA

...and yes, spaces between words count as characters.

AChg   Immediate Command
Mode: AMTOR, PACTOR   Host: AG

ACHG is an immediate command used in AMTOR or PACTOR by the receiving station to interrupt a sending station's transmissions.

As the receiving station, you usually rely on the transmitting station—your partner in the ARQ "handshake"—to send "+?" to make the changeover. However, in ARQ (Mode A), you can use the ACHG command to interrupt the sending station's transmission. Use the ACHG command only when it's really needed—it's akin to interrupting someone while they're talking.

ADelay *n*   Default: 4 (40 msec.)
Mode: AMTOR, PACTOR   Host: AD

"*n*"   1 to 9 specifies transmitter key-up delay in 10 mS increments.

ADELAY is the length of time, in tens of milliseconds, between the time the DSP activates the transmitter's PTT line and when the ARQ data actually begins to flow. The ADELAY command allows you to adjust a variable delay, from 10 to 90 mS, to handle the PTT delay of different transmitters.

In most cases, the default value of *4* (40 mS) is adequate for the majority of the popular HF transmitters. If the AMTOR or PACTOR signal strength is good and you observe periodic errors caused by the loss of phasing (shown by re-phase cycles in the middle of an ARQ contact) during contacts, it may be necessary to adjust the ADELAY value.
    ♦ Be sure that errors and rephasing effects are not caused by the other station before changing your ADELAY.
    ♦ If changing your ADELAY values doesn't improve link performance, reinstall your original value and ask the other station to try changing its ADELAY setting.

Because the ARQ AMTOR mode allows 170 mS for the signal to travel to the distant station and back, increasing ADELAY will reduce the maximum working distance. The maximum theoretical range of an ARQ contact is limited to about 16,000 miles (25,500 kilometers). Using some of that time as a transmit delay leaves less time for signal propagation, thus the maximum distance available is reduced.

Regardless of the setting of ADELAY, ARQ (mode A) AMTOR may not work well over very short distances like one or two miles. However, in very short distance work ARQ shouldn't be necessary to achieve error-free copy, anyway.

AList   Immediate Command
Mode: AMTOR   Host: AL

ALIST is an immediate command that switches your DSP into the ARQ Listen mode.

In AMTOR Listen (and PACTOR Listen) modes, monitored link attempts are displayed like this: >W1AW <C>

The callsigns are shown one per line and are meant to resemble the way the TNC monitors connect frames in packet. Since neither mode supports identification within the calling blocks, no source callsign can be shown.

You can usually monitor a contact between two linked stations using the ARQ Listen mode (also called Mode L). This mode may need a few seconds to phase or acquire synchronization with the master station, depending on operating conditions such as interference. Your monitor will display all the retries if the linked stations that you're monitoring are experiencing ARQ errors.

✎   **Note**: When the DSP "syncs" on the ISS station, it *won*'t automatically sync with the other station after the two stations switch control of the link; you'll have to reacquire and sync with the (now) ISS station after the changeover to copy what's being sent.

Type ALIST (or AL) repeatedly if you lose synchronization.

AMtor   Immediate Command
Mode: Command   Host: AM

AMTOR is an immediate command that switches your DSP into the AMTOR Mode—it's automatically placed in the ARQ Standby condition. Your station is then accessible by any AMTOR station that sends your SELCALL. The DSP can communicate using either the CCIR 476 (4-character SELCALL) or the CCIR 625 (7-character SELCALL) protocol. Your monitor will also display any inbound FEC (mode B) transmissions.

Use MYSELCAL and MYIDENT to enter your 4- and 7-character SELCALLs.

ARq *aaaa*[*aaa*]   Immediate Command
Mode: AMTOR   Host: AC

aaaa[*aaa*]   The distant station's 4-character or 7-character SELCALL code.

ARQ is an immediate command that initiates an AMTOR mode A (ARQ) SELCALL to another station. To begin the Mode A (ARQ) selective call, enter ARQ followed by the other station's SELCALL. Example:

cmd： ARQ WFFA (4-character SELCALL)
..or
cmd: ARQ MFTAAAA (7-character SELCALL)

As soon as (RETURN) is pressed, the DSP will begin keying your transmitter in the three-character AMTOR ARQ burst sequence. If the distant station receives and decodes a SELCALL successfully, the two AMTOR systems synchronize and begin the mode A (ARQ) AMTOR "handshaking" process.

See MYSELCAL and MYIDENT to enter your 4- and 7- character SELCALLs.

ARQTmo *n*   Default: 60
Mode: AMTOR, PACTOR   Host: AO

"*n*"   0 to 250 specifies the number of seconds to send an ARQ SELCALL before automatic transmitter shutdown.

ARQTMO sets the length of time during which your ARQ call will be sent, shutting down the transmitter automatically after exceeding its value. As a general rule, if you can't activate another AMTOR or PACTOR station in the default time of 60 seconds, you can probably assume that the other station can't hear your transmission.

ARQTOL *n*   Default: 3

Mode: AMTOR ARQ   Host: Ao

"*n*"   1 to 5, specifying a relative tolerance for bit boundary jitter.

ARQTOL controls the tolerance for received bit boundary jitter in the AMTOR ARQ mode. "*n*" is a number from 1 (tight tolerance) to 5 (loose tolerance). The number signifies how far away from the expected bit transition time the actual received transition may be, in tenths of a bit (mS). If the transition occurs further away than expected, the received block is counted as an error, even if all three characters in the block appear to be valid AMTOR characters. The default value of ARQTOL *3* is the equivalent of the fixed tolerance of previous firmware releases.

ARQTOL should be set to a low number (tighter tolerance) for applications that require nearly error-free communications. The tradeoff is that good received character blocks are counted as bad if the bit transitions are suspect, thereby causing retransmissions and lowering the effective character rate.

ARQTOL doesn't affect FEC, SELFEC or ARQ Listen modes.

ARXTor *ON|OFF*   Default: OFF
Mode: AMTOR, PACTOR   Host: Ar

OFF   Disables the automatic detection of non-selected operating modes.
ON   Enables automatic detection and switching between AMTOR and PACTOR modes.

ARXTOR allows the automatic switching from PACTOR Listen mode to AMTOR FEC receive and from PACTOR Standby to AMTOR ARQ. It also allows the automatic switching from AMTOR Listen to AMTOR FEC receive.

With ARXTOR *ON*, an AMTOR FEC signal is detected by ALIST and PTLIST modes as well as AMTOR Standby mode. AMTOR Standby, ALIST and PTLIST all use FEC idles to recognize FEC transmissions. In the AMTOR Standby mode, however, FEC text patterns are recognized as an additional quick recognition method which may speed locking onto a FEC signal.

ARXTOR *ON* enables PTLIST mode to monitor AMTOR ARQ transmissions. It also means an incoming AMTOR ARQ call is recognized in PACTOR Standby mode. Only a call for the selcall in MYSELCAL is recognized; PACTOR can't detect ARQ calls to MYALTCAL or MYIDENT.

When a PACTOR mode detects an AMTOR transmission, there is an added delay before the text is shown. Your TNC must switch from PACTOR to AMTOR, where the signal is again detected. For fastest detection of AMTOR FEC, your TNC should be in the AMTOR Standby mode. For fastest syncing on AMTOR ARQ signals, the TNC should be in ALIST mode.

At the end of the new mode (AMTOR ARQ or FEC), your TNC returns to the original monitoring mode (AMTOR, ALIST, PACTOR or PTLIST).

ARXTOR is defaulted *OFF* to accommodate old application programs that have no provision for handling a spontaneous change of modes from PACTOR to AMTOR.

Here's a summary of the AMTOR/PACTOR mode switching:

Original Operating Mode

Target mode detection	*AMTOR*	*ALIST*	*PACTOR*	*PTLIST*
AMTOR FEC	if RFEC	if ARXT		if ARXT
AMTOR ARQ (MYSELCAL)	always		if ARXT	
AMTOR ARQ (MYALTCAL)	always			
AMTOR ARQ (MYIDENT)	always			
Monitor AMTOR ARQ		always		if ARXT

SELFEC	always	if ARXT		if ARXT
Monitor SELFEC	if SRXALL	if ARXT & SRX		if ARXT & SRX
PTCONN			always	always
Monitor PACTOR				always

✎   **Note:** When automatically switching from PACTOR to AMTOR and back again, the modem isn't changed.

CBell *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR   Host: CU

OFF   "Bells" aren't sent with the CONNECTED or DISCONNECTED message.
ON   Three BELL characters (CTRL-G) are sent to your computer with the "***CONNECTED to" or
          "DISCONNECTED from (call)" message.

Set CBELL *ON* if you want to be notified when someone connects to, or disconnects from, your station in packet or upon establishing a link in AMTOR or PACTOR.

CDelay *n*   Default: 0

n   Can range from 1 to 4 with increments in 10 ms. 1 is 10 ms., 2 is 20 ms, and so on.

CDelay adds an additional delay to the response of a CS in AMTOR or PACTOR.

CODe *n*   Default: 0 (International)
Mode: Baudot RTTY, Morse, AMTOR   Host: C1

"*n*"   0 to 6 specifies a code from the list below. (RX = Receive; TX = Transmit)

CODE	*Meaning*	*Morse*	*Baudot*	*AMTOR*	*PACKET*
0	International	RX/TX	RX/TX	RX/TX	
1	US teleprinter		RX/TX	RX/TX	
2	Cyrillic	RX	RX/TX	RX/TX	
3	Transliterated Cyrillic	RX	RX	RX	
4	Katakana	RX/TX			
5	Transliterated Katakana	RX			
6	European	RX			RX

Not all the codes in the list above can be transmitted.

✎   **Note:** FCC Part 97.69 and 97.131 calls for the use of (CODE *0*) "International Telegraph Alphabet
      Number 2" five unit teleprinter code. The Baudot characters "$", "#" and "&" are *not* permitted for use by US Amateurs.

CODE *0*: International

In Morse, this means the International Morse Code. For Baudot and AMTOR, this means the ITA #2 teleprinter code, which is internationally recommended for Baudot and 'TOR communications and shown below:

lowercase set	*UPPERCASE SET*
1 2 3 4 5 6 7 8 9 0 - =	? ? ? ? ? ? ? ? ( ) ? +
Q W E R T Y U I O P ? ?	Q W E R T Y U I O P ? ?
A S D F G H J K L ? '	A S D F G H J K L : ?
Z X C V B N M , . /	Z X C V B N M , . ?

The following special Morse characters are available as receive only and are used in non-English Morse alphabets.

Morse	RX
– – – –	ch
– . – . .	c
. – . . –	e
– – . . –	z
– – . – –	ñ

In response to requests from European customers, the "national" ITA#2 characters unassigned in the US have been made available for both transmission and reception. FIGS-F, FIGS-G and FIGS-H have been assigned characters according to standard use and are shown below. Note that some national alphabets use these characters for accented letters not appearing in English.

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-F			!
FIGS-G	{	&
FIGS-H	}	#
3rd-Q	q	

CODE 1: US Teleprinter
In Morse, this has no effect—the DSP will use the International Morse Code and *not* the American Morse code. In Baudot and AMTOR, the US teleprinter character set shown below is used. Users of CODE 1 should be aware of the following:

The US teleprinter code (CODE 1) makes the "!", "$", "'" and "#" characters available in Baudot and AMTOR. The WRU character, "=", and the "+" characters are lost when set to CODE 1. Since there is no "+" character in the CODE 1 character set there should be no way to turn over the AMTOR link and change from ISS to the IRS. To avoid this problem, the DSP sends a FIGS-Z when the "+" key is pressed in AMTOR and responds to the reception of the "FIGS-Z" "?" sequence so the direction of traffic can be reversed.

US Teleprinter character set.

Lowercase set	UPPERCASE SET
1 2 3 4 5 6 7 8 9 0 -	! # $ & ( )
Q W E R T Y U I O P	Q W E R T Y U I O P
A S D F G H J K L ; '	A S D F G H J K L : '
Z X C V B N M , . /	Z X C V B N M , . ?

The differences between ITA #2 and US teleprinter codes are listed below:

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-D	WRU	$
FIGS-F			!
FIGS-G	{	&
FIGS-H	}	#
FIGS-J	BELL	'
FIGS-S	'	BELL
FIGS-V	=	;
FIGS-Z	+	"
3rd-Q	q	

✎ **Note:** for U.S. Amateurs, the FCC regulations require that Baudot and AMTOR transmissions follow CCIR Recommendations which require the ITA#2 (CODE 0) be used. Technically, it's illegal to use CODE 1 on the U.S. Amateur bands. MARS operators and Amateurs outside the U.S. may find CODE 1

useful.

CODE 2: Cyrillic
This code causes a translation to an artificially extended ASCII so that all received characters are converted to single ASCII characters. The character set used prior to July 1991 was arbitrary, but we have now changed the character set to one which we believe is used in the former USSR.

The extensions used in Morse reception are shown below:

Morse	_ASCII_	_English Pronunciation_
.-.-	$71 - q	YA
---.	$7E - ~	CH (Morse only)
..--	$60 - '	YU
--.-	$7D -]	SHCH
----	$7B - {	SH

In Baudot and AMTOR, Russian transmitters use a third register to transmit Cyrillic characters in addition to the LTRS and FIGS. They use LTRS to transmit the Roman alphabet. As LTRS and FIGS characters are used to access the first and second registers, they use the BLK or NUL character (00) to access the third register. The DSP displays third-register characters as lowercase
alphabetic characters, and all FIGS characters as in CODE *0* with the following exceptions:

Character	_CODE 2_	_English Pronunciation_
FIGS-F	$7C -		E
FIGS-G	$7B - {	SH
FIGS-H	$7D - }	SHCH
FIGS-J	$60 - '	YU
3rd-Q	$71 - q	YA

If several words end in "OJ", "OW" or "OGO" the transmission is probably Russian.

There is no separate Baudot combination for the CH character. The Russians use a "4" because the Cyrillic character for CH resembles a "4."

It's safe to leave CODE set to *2* if you're not sure which alphabet the transmitting station is using. You'll be able to see the message in either alphabet with minimal garbling, then you can set CODE to either *0* or *3*.

Another interesting side effect of being able to send and receive in CODE *2* is that it's now possible to send and receive both upper and lowercase text in Baudot and AMTOR modes. To do this, both station must have CODE *2* enabled and both must be running 1991 or later firmware in their DSPs. Other users will see only uppercase characters and not be aware that anything unusual is happening as the feature merely inserts NULL characters at strategic times. A DSP using CODE *2* in a QSO with a unit in CODE *0* (or any other equipment) will exchange data in uppercase only, with no adverse effects.

This feature may be advantageous to users of the AMTOR Maildrop who want their messages to be forwarded to the packet network. The ability to send and receive upper and lowercase characters in AMTOR should improve message readability when it's translated to packet and vice versa.

CODE 3: Transliterated Cyrillic
This code is similar to CODE *2*, except that some characters are transliterated into English phonetic equivalents for easier reading.

CODE 2	_CODE 3_

w	V
v	ZH
h	KH
c	TS
~	CH (Morse only)
{	SH
]	SHCH
x	'
|	E (RTTY only)
'	YU
q	YA

CODE *4*: Katakana
Katakana is the phonetic character set used in Japan for spelling out words of foreign (to Japan) origin. The Japanese also use Katakana for Morse and some computer communication. There are about 50 Katakana characters. CODE *4* translates the Katakana Morse code into an 8-bit extended version of ASCII. The characters displayed are generally in the range from $A0 to $DF, except for numerals and punctuation. If you're using CODE *4*, remember to set the DSP for AWLEN *8*, PARITY *0* and 8BITCONV *ON*.

CODE *5*: Transliterated Katakana
This is similar to CODE *4* except that the extended ASCII is transliterated into English equivalents for easier reading. The Morse characters are translated into 2- and 3-letter syllables.

CODE *6*: European
This is primarily for users with German language terminals. The differences in Morse coding are as follows:

Morse	*CODE 0*	*CODE 6*
.-.-	$5B	$5B
---.	$5C	$5C
..--	$5E	$5D
.--.-	$5D	

In addition, CODE *6* avoids the use of square brackets ($5B, $5D) in monitored packet headers and Maildrop prompts, using parentheses instead. US ASCII square bracket characters are used as extended alphabetic characters in most languages outside of English.

CODE *7*: TOR lowercase

Meaning	*Morse*	*Baudot*	*AMTOR*	*Packet*
TOR (lowercase)	—	—	RX/TX	—

CODE 7 applies to AMTOR operation only. It codes upper and lowercase letters using the NULL character as a shift while in LTRS case. This protocol is used by APLINK stations, European mailboxes, the AMT-3 and G4BMK software. The difference between CODE 7 and CODE 2 (Cyrillic) upper/lower case is that CODE 2 uses LTRS for upper case and NULL for lowercase, while CODE 7 uses the NULL to toggle between upper and lowercase. CODE 7 is invisible to stations using classic AMTOR (CODE 0). However, a CODE 7 station talking to a station using CODE 2 (AEA's already existing upper/lower case protocol) will result in upper/lowercase reversals or constant lower case text.

CODE *8*: Extended TOR lowercase

Meaning	*Morse*	*Baudot*	*AMTOR*	*Packet*
Extended Lower Case	—	—	—	—

CODE 8 also applies to AMTOR only. It includes the features of CODE 7 above, and additionally codes new punctuation characters using NULL as an escape while in FIGS case. Thus CODE 8 supports all 95 printable ASCII characters ($20-7E) plus CR, LF, space and ENQ while in AMTOR operating mode, but not BELL, backspace and

TAB. At the moment, this protocol is used only on links between mailboxes forwarding messages. It could be used with the AEA AMTOR-to-Packet Gateway if all users had CODE 8. (CODE 8 isn't invisible to other users.)

CWid *n*   Default: $06 (CTRL-F)
Mode: Baudot/ASCII RTTY/AMTOR/PACTOR/FAX   Host: CW

The CWID command lets you change the "send CWID" control character typed at the end of your Baudot and ASCII RTTY dialogue.

When the DSP reads this character embedded in the text or keyboard input, it switches modes and sends your callsign in Morse code, at the keying speed set by MSPEED. As soon as your callsign has been sent in Morse, the DSP turns off your transmitter and returns to receive.

DCdconn *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR, KISS and RAWHDLC   Host: DC

OFF   RS-232 cable Pin 8 is permanently set high (default).
ON   RS-232 cable Pin 8 follows the state of the CON (or DCD) LED.

DCDCONN defines how the DCD (Data Carrier Detect) signal affects pin 8 in the RS-232 interface to your computer or terminal. Some programs such as PBBS software require that DCDCONN be *ON*.

DCDCONN also works in the RAWHDLC and KISS modes. In RAWHDLC and KISS, no packet connections are known to the DSP. With DCDCONN *ON*, the state of the radio DCD is sent to the RS-232 DCD pin (pin-8). This may be necessary to some Host applications that need to know when the radio channel is busy.

EAS *ON*/*OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTORand MORSE   Host: EA

OFF   Echos characters when sent to the DSP by the computer.
ON   Echos characters actually sent on-the-air by the DSP.

The Echo-As-Sent (EAS) command functions in all modes *except* packet. EAS lets you to choose the way data is displayed on your monitor screen or printer. To display your text on your computer screen exactly as you're typing it in or while sending it from a disk file, leave EAS *OFF*. To see the actual data being sent from your DSP-232 to your radio and transmitted on the air, set EAS *ON*.

With EAS *ON* in Morse and Baudot RTTY, you'll see only uppercase characters on your screen and the data actually transmitted to the other station.

With EAS *ON* in AMTOR mode A and PACTOR (ARQ), you'll see characters echoed on your screen only *after* the distant station has validated *ack*ed your block of three characters. For packet, the MXMIT command should be used.

Nulls ($00) are not echoed, including the nulls produced by DIDDLE *ON* in ASCII.

ERrchar *n*   Default: $5F (_)
Mode: AMTOR, PACTOR, Morse, NAVTEX and TDM   Host: ER

"*n*"   A hexadecimal value from $00-$7F used to denote the error character used by the DSP for Morse, ARQ, FEC, PACTOR, NAVTEX, and TDM.

"*n*" is a hex value $00-7F, default $5F (underscore). This is the character that the DSP displays when it receives a corrupted or bad character in Morse, ARQ, FEC, PACTOR, NAVTEX or TDM. You may want to set this character to $2A (asterisk), $07 (bell), $20 (space) or $00 (null)—whichever works best for you. ERRCHAR *ON* or ER *Y* restores the default.

FEc   Immediate Command
Mode: AMTOR mode B   Host: FE

FEC starts an AMTOR FEC (mode B) transmission. Use FEC for CQ calls in AMTOR. Be sure to include your SELCALL and MYIDENT code in your CQ message so that the other station can call you back in ARQ.

FEC is necessary for all roundtable AMTOR contacts. When operating in FEC, let your DSP begin each transmission with 3-5 seconds of idling; the RTTY practice of transmitting a line of RYRYRY is unnecessary on FEC.

You can signal the end of your FEC transmission by typing the changeover sign "+?," recognized world over as the RTTY equivalent of "KKK." However, in FEC "+?" *isn't* a software command. You still have to unkey your transmitter (with the RECEIVE or CWID characters, or the RCVE command) as you would in RTTY.

GUSERS *n*   Default: 0
Mode: packet, AMTOR, PACTOR   Host: GU

"*n*"   0 to 3 specifies the maximum number of users allowed to use your node.

GUSERS allows up to *n* number of stations to connect to your MYGATE call. The argument "*n*" may be 0-3, with zero meaning no station can use your node. Alternatively, *n* can be thought of as the maximum number of *pairs* of stations which may be connected through your Gateway.

Your must have your MYGATE call entered and GUSERS set to a number greater than 0 to enable the DSPs node function.

HEReis *n*   Default: $02 (CTRL-B)
Mode: Baudot, ASCII, AMTOR and PACTOR   Host: HR

"*n*"   Is the hex representation ($01-$7F) of the character that causes the AAB string to be sent in the middle of transmitted text.

If you want to send your own AAB string for identification during a transmission, simply enter the HEREIS character.

Id   Immediate Command
Mode: AMTOR/ASCII/Baudot/Packet   Host: ID

In AMTOR, the ID command acts like the RCVE command only it adds a Morse ID before going back to receive. In ASCII and Baudot, the ID command causes a Morse ID to be sent much like an immediate version of the CWID character (CTRL-F). Because the ID command is immediate, the message "Transmit Data Remaining" will be displayed if any unsent data remains in the transmit buffer. To clear the data from the buffer, enter *TC* at the cmd: prompt.

In packet, ID is an immediate command that sends a special identification packet. The ID command allows you to send a final identification packet when you take your station off-the-air. (HID must also be set *ON*). The identification consists of a UI-frame, with its data field containing your MYALIAS (if it's entered), MYCALL, and the word "digipeater". The ID packet is sent only if your DSP has digipeated any transmissions since the last automatic identification.

Lock   Immediate Command
Mode: Morse/Baudot/AMTOR   Host: LO

AMTOR and Baudot: LOCK is used to force a LETTERS shift in the received data. This can be helpful if noise has
        garbled the LTRS character causing FIGURES to be displayed.

Morse: LOCK instructs the DSP to lock its timing circuits to the current measured speed of a received Morse
        signal; This may improve the DSPs ability to decode those signals in the presence of high noise levels. To
        "un-Lock" the Morse speed and allow the DSP to track the received signal automatically, enter an *R* or
        MO in the Command mode, followed by a (RETURN) .

MARsdisp *ON\OFF*   Default: OFF
Mode: Baudot and AMTOR, RTTY   Host: MW

OFF   The DSP operates normally in Baudot and AMTOR (default).
ON   The DSP translates received LTRS characters to a (CTRL-O), and FIGS characters to a (CTRL-N) then
        sends these to the terminal.

MARSDISP enables the Baudot and AMTOR operator to detect and display every character, including LTRS and
FIGS sent by the other station. ACRDISP and ALFDISP may be turned off to prevent extraneous (RETURN)s and
LFs from being sent to the display. If this data is retransmitted, ACRRTTY should be *0*, and ALFRTTY *OFF*. The
(CTRL-O) and (CTRL-N) characters will send LTRS and FIGS, respectively.

MDMon *ON\OFF*   Default: OFF
Mode: AMTOR, PACTOR and packet/Maildrop   Host: Mm

OFF   You don't monitor a connected station's activity in your Maildrop.
ON   Lets you monitor a connected station's activity in your Maildrop.

MDMON permits you to monitor activity on your AMTOR, PACTOR or packet Maildrop, showing you both sides
of the QSO. (Packet headers aren't shown while a caller is connected.) When no one is connected to your Maildrop,
channel activity is monitored according to the setting in MONITOR.

Note that Maildrop connect and link status messages will be displayed even with MDMON *OFF*. These status
messages are important and allow you to see who is connected to your Maildrop. They can be disabled, however,
with UBIT *13*. (See UBIT for more information).

MFilter *n1*[,*n2*[,*n3*[,*n4*]]]   Default: $80
Mode: Morse, Baudot ASCII, AMTOR, PACTOR and packet   Host: MI

"*n*"   0 to $80 (0 to 128 decimal) specifies an ASCII character code.
        (Up to four characters may be specified separated by commas.)

Use MFILTER to select up to 4 characters to be "filtered" or excluded from Morse, Baudot, ASCII, AMTOR,
PACTOR and monitored packets with parameters *n1 - n4*, the ASCII codes for the characters you want to filter. The
special value of $80 (default) filters all characters above $7F and *all* control-characters except (RETURN) ($0D),
LF ($0A), and (TAB) ($09).

MHeard   Immediate Command
Mode: packet/AMTOR Maildrop   Host: MH

MHEARD displays a list of the 18 most recently heard stations.

When DAYTIME has been set, entries in the Heard log are time stamped. With DAYSTAMP *ON* the date is also shown. An example of the MHEARD display is shown below:

DAYSTAMP ON	*DAYSTAMP OFF*
05-Nov-95 21:42:27 KG6ZL	21:42:27 KG6ZL
05-Nov-95 21:42:24 KB6IUX*	21:42:24 KB6IUX*

Previously, stations heard directly were displayed with an asterisk ("W1AW*") and digipeated stations were shown without ("W2SZ"). Digipeating isn't used as much as it used to be—most stations now use nodes so we've stopped using the asterisk. However, for those few cases in which a station is heard indirectly through a digipeater, that station's callsign is displayed with the message, "`via digi`".

In addition, I- and U-frame packets with PIDs of CF and CD are shown with the indicators "N/R" (for Net/ROM) and "IP" respectively. AMTOR and PACTOR stations accessing the Maildrop or the gateway are shown in the MHEARD list with an "AMTOR" or "PACTOR" indicator.

Clear the MHEARD list with a *%*, *&*, *N*, *N*O, *NONE* or *OFF* as arguments.

MId *n*   Default: 0 (00 sec.)
Mode: packet, AMTOR, PACTOR   Host: Mi

"*n*"   0 - 250 specifies the Morse ID timing in units of 10-second increments.
0   Zero disables this function.

If "*n*" is set to a value between 1 and 250, the DSP will periodically issue a 20 wpm Morse ID. For example, a MID of *177* would cause a Morse ID to be sent every 1,770 seconds (29.5 minutes). A Morse ID will be transmitted only if a packet was sent since the last Morse ID. The Morse ID uses TXDELAY, PPERSIST and DCD.

If MID is set to a value other than *0*, ID will force a Morse ID immediately. If both HID and MID are active, the Morse ID will be sent first.

MID normally sends a Morse ID using on/off keying of the low tone. If FSK keying of both tones is desired to prevent stations from transmitting over your Morse ID, see the UBIT *12* command.

Morse ID now works in AMTOR and PACTOR modes on both ARQ and broadcast transmissions. Because of the nature of these operating modes, the destination station will go into an error state when your TNC sends a Morse ID, but should recover data synchronization immediately afterwards.

MMsg *ON|OFF*   Default: OFF
Mode: packet, AMTOR and PACTOR Maildrop   Host: MU

OFF   The MTEXT message isn't sent at all.
ON   The stored MTEXT message is sent as the first response after an AMTOR or PACTOR link or packet connect to the Maildrop is established.

MMSG enables or disables automatic transmission of the MTEXT message when your AMTOR, PACTOR or packet Maildrop links with another station.

MODem *n*   Default: 12
                                                                              Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
1:  FSK    45   bps  2125/2295
2:  FSK    100  bps  2125/2295
3:  FSK    45   bps  1615/1785
4:  FSK    100  bps  1615/1785
5:  FSK    200  bps  2110/2310
6:  FSK    200  bps  1600/1800
7:  FSK    200  bps  2125/2550
8:  FSK    200  bps  1275/1700
9:  FSK    200  bps  2125/2975
10: FSK    200  bps  1275/2125
11: FSK    300  bps  2110/2310
12: FSK    300  bps  1600/1800
13: FSK    1200 bps  VHF
14: PACSAT 1200 bps BPSK
15:
16: FSK   9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

MTExt *text*   Default: See sample
Mode: AMTOR, PACTOR and packet Maildrop   Host: Mt

text   Any printable message up to a maximum of 120 characters. (Spaces count as characters.)

MTEXT is the Maildrop's "answering machine message" similar to CTEXT. With MMSG *ON*, the MTEXT message is sent when a station links to your AMTOR or packet Maildrop.The default text is:

```
Welcome to my AEA DSP232 Maildrop.
Type H for help.
```

MTEXT can be reset with a *%*, *&, N*, *NO*, *NONE* or *OFF* as arguments.

MWeight *n*   Default: 10
Mode: All except packet   Host: Mw

"*n*"   5 to 15, specifies roughly 10 times the ratio of one dot length to one inter-element space length in transmitted Morse code.

A value of 10 results in a 1:1 dot-space ratio. A setting of 5 results in a 0.5:1 ratio, while a setting of 15 (maximum) results in a 1.5:1 ratio. MWEIGHT applies only to the Morse transmit mode and the CW ID in all modes except packet. MWEIGHT doesn't affect the code output by the MID command.

MYALTcal *aaaa*   Default: none
Mode: AMTOR   Host: MK

aaaa   Your alternate SELective CALling code (SELCALL)

Use the MYALTCAL command to specify your alternate SELCALL which, under certain conditions, may be
convenient or necessary. (You can enter an additional SELCALL code not related to your callsign.) The alternate
SELCALL can be any four alphabetical characters, or can be numeric strings of either four or five numbers.
MYALTCAL is generally used for special applications such as receiving network or group broadcasts in AMTOR
mode B Selective (Bs or SELFEC).

MYSelcal *aaaa*   Default: none
Mode: AMTOR   Host: MG

aaaa   Specifies your SELective CALling code (SELCALL)

Use MYSELCAL to enter the SELCALL (SELective CALLing) code required in AMTOR ARQ (mode A) and
SELFEC operating modes. MYSELCAL is a unique character string which must contain four alphabetic characters
and is normally derived from your callsign.

Amateurs may simply enter their callsign in MYSELCAL and the DSP will automatically translate it into a 4-
character SELCALL using the grouping table below:

GROUP	CALL	SELCALL
1 by 2	W1XY	WWXY
1 by 3	W1XYZ	WXYZ
2 by 1	AB1X	AABX
2 by 2	AB1XY	ABXY
2 by 3	KA1XYZ	KXYZ

Although the convention is to form the SELCALL from the callsign, your DSP can include any AMTOR character
in the SELCALL. In accordance with CCIR Recommendation 491, 4- or 5-digit numbers may be entered; the DSP
automatically translates the numeric entry to your 4-letter alpha SELCALL. For example:

```
cmd: MYSELCAL KG6ZL
MYSelcal   was none
MYSelcal   now KGZL
cmd:
```

Nums   Immediate Command
Mode: Baudot, AMTOR, TDM   Host: NX

In Baudot, AMTOR and TDM receive, the NUMS command will force the DSP into the FIGS case.

OVer   Immediate Command
Mode: AMTOR, PACTOR   Host: OV

An immediate command that reverses the link direction from ISS to IRS; this can be considered the opposite of the
function of ACHG. The changeover happens as soon as possible—the DSP doesn't wait for all the characters in its
buffer to be sent.

OVER should be thought of as analogous to RCVE—as neither command waits for the buffer to empty—the same
way the PTOVER character is analogous to the RECEIVE character (both *wait* for empty). Host applications can
use ZSTATUS to detect when all characters have been sent.

In PTCONN, this command accomplishes the same thing as sending the PTOVER character. OVER is useful in Host mode when sending transparent data (CONMODE *TRANS*). To change from ISS to IRS, you'd normally send the PTOVER character, but in Transparent mode, the character would be sent as data and would not change the link direction. OVER changes the direction without the need to change CONMODE to CONV first.

In AMTOR ARQ, this command inserts "+?" into the data stream being sent. With EAS *ON*, the "+?" is echoed to the terminal.

QTor   Default: 1 (Modem 1)
Mode: AMTOR   Host: QT

n   Modem number to be selected when the AMTOR mode is entered.

QTOR sets the DSP-232 modem that will automatically be selected when the AMTOR mode is entered.
See the AMTOR (in this chapter) and MODEM (in Chapter 4) Terminal Interfacing for more information.

Rcve   Immediate Command
Mode: Baudot/ASCII/AMTOR/PACTOR/Morse   Host: RC

RCVE is used in Morse, Baudot, ASCII, AMTOR, and PACTOR modes to switch your DSP from transmit to receive.

You *must* (RETURN) to the Command mode to use RCVE.

RECeive *n*   Default: $04 (CTRL-D)
Mode: Baudot/ASCII/Morse/AMTOR/PACTOR   Host: RE

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Parameter *"n"* is the numeric ASCII code for the character you'll use when you want the DSP to (RETURN) to receive.

The RECEIVE command allows you to insert a character in your typed text that will cause the DSP to (RETURN) to receive after all the text has been transmitted.

RFec *ON|OFF*   Default: *ON*
Mode: AMTOR   Host: RF

O*N*   Mode B (FEC) signals are displayed in AMTOR Standby (default).
OFF   Mode B (FEC) signals aren't displayed in AMTOR Standby.

Turn RFEC *OFF* to prevent the reception and display of all FEC signals received while in AMTOR Stand-by.

RXRev *ON|OFF*   Default: OFF
Mode: Baudot and ASCII RTTY/AMTOR   Host: RX

OFF   Received data polarity is normal.
ON   Received data polarity is reversed (mark-space reversal).

Use RXREV to invert the polarity of the data demodulated from the received mark and space tones. So, instead of "space" equalling zero, it'd be one; "mark" would equal zero instead of one.

In some cases, you may be trying to copy a station that's transmitting "upside down" although it's receiving your signals correctly. This is especially true when listening to signals in the shortwave bands. Set RXREV *ON* to reverse the data sense of received signals.

RXREV operates only at RBAUD and ABAUD speeds up to 150 baud.

SELfec *aaaa*[*aaa*]   Immediate Command
Mode: AMTOR FEC   Host: SE

aaaa   Specifies the distant station's SELCALL.

SELFEC starts a SELective FEC (mode Bs) transmission to a specific station when you enter that station's
SELCALL (SELective CALLing) code. The SELFEC command must be accompanied by a unique character
sequence (*aaaa*) that contains 4 or 7 alphabetic characters. You don't have to type the SELCALL a second time if
you intend to call the same station again right away.

See MYSELCAL and MYIDENT to enter your 4- and 7-character SELCALLs.

SRXall *ON*|*OFF*   Default: OFF
Mode: AMTOR   Host: SR

OFF   Receive only SELCALL-addressed SELFEC transmissions.
ON   Receive *all* SELFEC transmissions.

SRXALL permits the reception of selectively coded inverse FEC signals normally not available for decoding. Set
SRXALL *ON* to activate this feature.

TMail *ON*|*OFF*   Default: OFF
Mode: AMTOR and PACTOR   Host: TL

OFF   The DSP only operates as a normal AMTOR CCIR 476 or 625 or PACTOR controller.
ON   The DSP operates as a personal AMTOR or PACTOR BBS or Maildrop.

The DSPs Maildrop is a personal mailbox that uses a subset of the W0RLI/WA7MBL PBBS commands and is
similar to operation of APLINK stations. Turn TMAIL *ON* to allow other stations to access your Maildrop in ARQ
PACTOR; third-party messages aren't accepted by your AMTOR or PACTOR Maildrop unless 3RDPARTY is
ON.

TMPrompt *text*   Default: (see text)
Mode: AMTOR/Maildrop   Host: Tp

text   Any combination of characters and spaces up to a maximum of 80 bytes.

TMPROMPT is the command line sent to a calling station by your AMTOR Maildrop in response to a Send
message command. The default text is:

```
GA subj/GA msg,'/EX' to end.
```

Text before the first slash is sent to the user as the subject prompt; text after the slash is sent as the message text
prompt.

See the *Chapter 7: Maildrop Operation* for more information about TMPROMPT.

TRACe *ON|OFF*   Default: OFF
Mode: packet/Baudot/AMTOR/PACTOR   Host: TR

OFF   Trace function is disabled.
ON   Trace function is activated.

Packet: TRACE activates the AX.25 protocol display. With TRACE *ON*, all received frames are displayed in their entirety, including all header information. The TRACE display is shown as it appears on an 80-column display. The following monitored frame is a sample:

```
KB6IUX*>TESTER <UI>:
This is a test message packet.
```

Byte		*Hex*			*Shifted ASCII*	*ASCII*
000:	A88AA6A8	8AA460AE	6494AAA0	406103F0	TESTER0KB6IUX0.x	......`.d...@a..
010:	54686973	20697320	61207465	7374206D	*449.49.0.:29:.6	This is a test m
020:	65737361	67652070	61636B65	742E0D	299032.80152:..	essage packet...

The byte column shows the offset into the packet of the first byte of the line. The hex display column shows the next 16 bytes of the packet, exactly as received, in standard hex format. The Shifted ASCII column decodes the high-order seven bits of each byte as an ASCII character code. The ASCII column decodes the low-order seven bits of each byte as an ASCII character code.

Interspersed command prompts and even the L and R commands would have no effect on the final data, and it could be translated back to binary data with a computer program.

TXRev *ON|OFF*   Default: OFF
Mode: Baudot/ASCII/AMTOR   Host: TX

OFF   Transmit data polarity is normal.
ON   Transmit data polarity is reversed (mark-space reversal).

Use TXREV to reverse the mark and space polarities in your transmitted AFSK and FSK signals.

In some cases, the station you're working may be receiving inverted data although it's transmitting in the correct polarity. Set TXREV *ON* to reverse the "sense" of your transmitted signals.

TXREV only works on ABAUD and RBAUD at speeds up to 150 baud.

WIdeshft *ON|OFF*   Default: OFF
Mode: Baudot/ASCII, RTTY, AMTOR, PACTOR   Host: WI

OFF   RTTY tones are shifted 200 Hz (emulates 170-Hz shift).
ON   RTTY tones are shifted 1000 Hz.

WIDESHFT permits the use of the DSP on VHF or HF with either wide (1000 Hz) or narrow (200 Hz) shifts. Many amateur radio VHF and HF RTTY operators use 170-shift. The DSPs 200 Hz shift is well within the filter tolerances of any RTTY demodulator in general service. MARS stations will find WIDESHFT generally compatible with MARS and Commercial 850 Hz shift RTTY operations.

WOrdout *ON|OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTOR and Morse   Host: WO

OFF   Inputted characters are sent directly to the transmitter.
ON   Inputted characters are held in the transmit buffer until a space, (RETURN), LF, (TAB), RECEIVE, CWID, ENQ or *+?* character(s) is typed.

Use WORDOUT to choose whether or not you can edit while entering text for transmission.

With WORDOUT *ON*, each character you type is held in a buffer until you enter a space, (RETURN), LF, ENQ character ($05 [CTRL-E]) or the *+?*. You can edit or delete words before the transmit buffer's contents are sent to the radio as long as you haven't entered pressed (SPACE), (RETURN) , LF, etc.

With WORDOUT *OFF*, each character you type is sent to the radio just as you typed it, without any delay. Also, the backspace character is transmitted in Baudot, ASCII, AMTOR and PACTOR modes. With WORDOUT *ON*, pressing the backspace key cancels out the preceding character and neither are transmitted.

In Baudot and AMTOR, the backspace character is transmitted as a "?" since there's no backspace in those modes.

In ASCII the backspace character is transmitted, but the destination station must be able to pass it. AEA products should have MFILTER set to zero to allow backspaces to print.

Chapter 10

Morse Operation

Overview

The DSP will both send and receive International Morse code at much higher speeds than hand-sent code. As a rule, though, no computer can "copy" code as well as the human ear and the DSP is no exception. A strong signal and a good "fist" are *both* required for the DSP to do a reasonable job of copying code. Don't expect your DSP to perform miracles and produce good copy from incredibly weak signals and bad fists!

Before proceeding with the rest of this chapter, review the following commands that are directly applicable to the Morse mode: ACRDISP, ATXRTTY, CODE, CONVERSE (K), CUSTOM (bits 7 & 8), EAS, LOCK, MOPTT, MORSE, MSPEED, RCVE, TCLEAR, XMIT, XMITOK, and WORDOUT. Morse commands are listed and explained at the end of this chapter. Terminal commands are listed and explained in Chapter 4.

Special Morse Characters

The DSP supports special keystrokes that you can use to send "prosigns" while in the Morse mode. These special "reserved" keys are:

Morse	*Keyboard Keystroke*	*Abbreviation*	*Meaning*
• • • – • –	* or <	SK	End of QSO
• – • • •	&	AS	Wait
• – • – •	-	AR	End of message
– • – – •	(	KN	Go only
– • • • –	=	BT	Break or pause
– • – • –	> or %	KA	Attention
• • • – •	!	SN	Understand
• – • –	[	AA	New line
– – – •	\	ö	Umlaut O
• • – –	^	ü	Umlaut U
• – – • –	]	å	Swedish A
• • – • •	@	é	Swedish E

Setting up

(If you're using an AEA program, follow the instructions in the program's manual to set up and use the Morse mode.)

To enter the Morse mode, simply enter *MORSE* or *MO* at the Command prompt. The DSP responds by displaying the previous mode it was in, then its new mode:

```
cmd:MO
Opmode   was (previous mode)
```

```
Opmode    now MOrse
cmd:
```

Look at your DSPs front panel to verify that you're in the Morse mode—the 'C' (for CW) symbol will glow in the Mode window.

Next, you can choose which modem you want to use using the MODEM command, followed by the specific modem number. For a list of modems available in the DSP, type DIRECT at the cmd:.

Tuning in Morse Stations

Tuning in Morse stations properly is critical to successful copying. Follow this procedure:

1. Select RADIO 1 or 2 using the RADIO command to switch the DSP to the port that's associated with your radio.
2. Put your HF receiver or transceiver in the CW mode.
3. Adjust the volume to a comfortable listening level.
4. Turn any IF-shift and passband-tuning controls to their center or "off" position.
5. Tune your receiver for Morse signals. Until you hear some, the DSP's tuning indicator's two, center LEDs will glow constantly. When you find a signal, *slowly* vary the tuning control on your receiver while keeping an eye on the DSP's tuning indicator. If you're tuned to a strong signal, the two indicator LEDs should "swing" out from the center toward the left and blink with each received dit and dah.

✎   **Note**: The strength of the received signal is proportional to how far to left the LEDs will swing from the center. Also, the DSP's filtering is such that it can only interpret Morse signals heard at a frequency of 800 Hz—a pseudo frequency standard for HF CW.

6. Using either the THRESHLD or AUTOTHR command, adjust the Threshold so the DCD light goes out when no station is being received. That way, you'll prevent "garbage" characters from printing on your screen.

With a solid signal, a good fist, and the other station tuned in properly, you should see "real time" copy; characters will appear on your screen as each one is received.

Going On-the-Air

1. Follow steps 1 through 3 in *Tuning in Morse Stations* above.
2. Press the letter, *X*—this will key your transmitter and will automatically enter the DSP into the Converse mode.
3. Start typing! Your message will be sent at the default rate of 20 wpm. (To change the default speed, see MSPEED. If you want to see the characters you've typed as they're being sent, turn EAS *ON*.)

✎   **Note**: The (RETURN) key won't force a line-feed while in the Morse mode.

4. When your entire message has been typed, enter (CTRL-D) to tell the DSP when to turn off the transmitter. The DSP will then return to the Command mode.

If you need to stop sending, enter (CTRL-C) to return to the Command mode, *R*, then a (RETURN) to shut down your transmitter. If you have any remaining text that wasn't sent, you'll receive the error message: ***
Transmit data remaining. To clear the rest of the message so it won't be automatically sent when you transmit again, enter *TC*; *TC* clears the transmit buffer.

Calling CQ

As with the other modes, you can initiate a contact either by "calling CQ" or by answering a "CQ" made by another station.

To call CQ, you must first tell your DSP to start transmitting.

1. Type *X* to key your transmitter.
2. Type in your CQ message like the one below, using your callsign:
    CQ CQ CQ DE YOURCALL YOURCALL YOURCALL K (CTRL-D)

3.   Wait a few seconds to see if you get a response. If not, repeat the above procedure.

Operating Tips
Type Ahead Buffer

Sometimes it's convenient, or easier for you, to type a response to the other operator's message while you're receiving it. Then when it's your turn to reply, all you have to do is enter a keystroke or two and your message is ready to go. You can use the type-ahead buffer in the DSP for just this purpose. To use it:

1.   Enter the letter *K* or (*CONV*) to enter the Converse mode. Press (RETURN).
2.   Type the message you want to send to the other operator. When you're done with the entire message, enter a (CTRL-D) to return to receive.
3.   When it's your turn to send, enter a (CTRL-C), *X*, (RETURN).

Your message will now be sent. By tacking on the (CTRL-D) at the end of your message, the DSP will automatically turn off the transmitter after your message has been sent.

If, while entering a message into the buffer, it's your turn to transmit and you don't want to keep the other operator waiting while you finish typing your message, enter a (CTRL-C), *X*, (RETURN). The DSP will send the contents of the buffer, starting at its beginning. As it's being sent, you can continue typing the rest of your message, ending it with a (CTRL-D). As soon as the DSP finishes sending the buffer's contents, it'll automatically send your post-buffer message.

Operating QSK

QSK (Full Break-in) is a feature found on some transceivers that allows you to hear the other operator's signals in between the dits and dahs you send out. To operate QSK:

1.   Set up your radio for QSK keying per your radio's instruction manual.
2.   Put the DSP into the Morse mode. (cmd:*MO*)
3.   Enter: XMITOK *OFF*
4.   Enter: *X*
5.   Type your message and disengage from transmit as described earlier in this chapter.

✎   **Note**: If you're using the DSP to copy code, enter a (CTRL-D) to force the DSP into receive when you hear the other operator break in.

Morse Code Practice

Use your computer with your DSP to develop and improve your manual CW sending and receiving skills.

♦ Set your DSP for Morse receive operation and operate the hand-key attached to your radio.
♦ In most installations, your hand keying will be sent to the DSP and displayed on your monitor if your radio has an audio "input monitor" or "sidetone" output and you've turned on those monitor functions.
♦ Send test words for a few minutes to acquaint yourself with the relationship between your hand-keying and the Morse appearing on your screen.
♦ Practice keying at various speeds; observe how the system decodes your "fist." You may be a bit unhappy or surprised at the quality of your keying but after a few sessions you'll notice an improvement.

Dits & Bits

If you enter a (CTRL-T) in your text, the DSP will send the current time if DAYTIME has been set and the date if DAYSTAMP is *ON*.

The DSP will automatically track the speed of the received signal. However, if the sending station's speed is relatively constant, you can lock onto it—using LOCK—to increase the accuracy of the copy.

Use the "Slow AGC" control on your radio, if it has one. When used in the CW mode, it can improve the signal-to-noise ratio during reception, hence improving the DSPs ability to copy.

MORSE COMMANDS

ATxrtty *n*   Default: 0
Mode: Morse, Baudot and ASCII   Host: At

"n"   0 to 250, signifying the length of time (in units of 100 mS) to delay before sending text.

ATXRTTY allows Morse, Baudot or ASCII characters to be transmitted automatically whenever they're typed and the TNC is in the Converse mode. When all the characters in the buffer have been sent, the DSP reverts to receive.

The number *n* represents the length of time from the last character typed to the dropping of PTT. This feature makes the repeated use of the commands RCVE and XMIT unnecessary.

CODe *n*   Default: 0 (International)
Mode: Baudot RTTY, Morse, AMTOR   Host: C1

"*n*"   0 to 6 specifies a code from the list below. (RX = Receive; TX = Transmit)

CODE	*Meaning*	*Morse*	*Baudot*	*AMTOR*	*PACKET*
0	International	RX/TX	RX/TX	RX/TX	
1	US teleprinter		RX/TX	RX/TX	
2	Cyrillic	RX	RX/TX	RX/TX	
3	Transliterated Cyrillic	RX	RX	RX	
4	Katakana	RX/TX			
5	Transliterated Katakana	RX			
6	European	RX			RX

Not all the codes in the list above can be transmitted.

✎   **Note:** FCC Part 97.69 and 97.131 calls for the use of (CODE *0*) "International Telegraph Alphabet Number 2" five unit teleprinter code. The Baudot characters "$", "#" and "&" are *not* permitted for use by US Amateurs.

CODE *0*: International

In Morse, this means the International Morse Code. For Baudot and AMTOR, this means the ITA #2 teleprinter code, which is internationally recommended for Baudot and 'TOR communications and shown below:

lowercase set	*UPPERCASE SET*
1 2 3 4 5 6 7 8 9 0 - =	? ? ? ? ? ? ? ? ( ) ? +
Q W E R T Y U I O P ? ?	Q W E R T Y U I O P ? ?
A S D F G H J K L ? '	A S D F G H J K L : ?
Z X C V B N M , . /	Z X C V B N M , . ?

The following special Morse characters are available as receive only and are used in non-English Morse alphabets.

Morse	*RX*
– – – –	ch
– . – . .	c
. – . . –	e
– – . . –	z
– – . – –	ñ

In response to requests from European customers, the "national" ITA#2 characters unassigned in the US have been made available for both transmission and reception. FIGS-F, FIGS-G and FIGS-H have been assigned characters according to standard use and are shown below. Note that some national alphabets use these characters for accented letters not appearing in English.

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-F	|	!
FIGS-G	{	&
FIGS-H	}	#
3rd-Q	q	

CODE *1*: US Teleprinter

In Morse, this has no effect—the DSP will use the International Morse Code and *not* the American Morse code. In Baudot and AMTOR, the US teleprinter character set shown below is used. Users of CODE *1* should be aware of the following:

The US teleprinter code (CODE *1*) makes the "!", "$", "'" and "#" characters available in Baudot and AMTOR. The WRU character, "=", and the "+" characters are lost when set to CODE *1*. Since there is no "+" character in the CODE *1* character set there should be no way to turn over the AMTOR link and change from ISS to the IRS. To avoid this problem, the DSP sends a FIGS-Z when the "+" key is pressed in AMTOR and responds to the reception of the "FIGS-Z" "?" sequence so the direction of traffic can be reversed.

US Teleprinter character set.

Lowercase set	UPPERCASE SET
1 2 3 4 5 6 7 8 9 0 -	! # $ & ( )
Q W E R T Y U I O P	Q W E R T Y U I O P
A S D F G H J K L ; '	A S D F G H J K L : '
Z X C V B N M , . /	Z X C V B N M , . ?

The differences between ITA #2 and US teleprinter codes are listed below:

Baudot Character	ITA #2 CODE 0	U.S. CODE 1
FIGS-D	WRU	$
FIGS-F	|	!
FIGS-G	{	&
FIGS-H	}	#
FIGS-J	BELL	'
FIGS-S	'	BELL
FIGS-V	=	;
FIGS-Z	+	"
3rd-Q	q	

✎ **Note:** for U.S. Amateurs, the FCC regulations require that Baudot and AMTOR transmissions follow CCIR Recommendations which require the ITA#2 (CODE *0*) be used. Technically, it's illegal to use CODE *1* on the U.S. Amateur bands. MARS operators and Amateurs outside the U.S. may find CODE *1* useful.

CODE *2*: Cyrillic

This code causes a translation to an artificially extended ASCII so that all received characters are converted to single ASCII characters. The character set used prior to July 1991 was arbitrary, but we have now changed the character set to one which we believe is used in the former USSR.

The extensions used in Morse reception are shown below:

Morse	ASCII	English Pronunciation
.-.-	$71 - q	YA
---.	$7E - ~	CH (Morse only)
..--	$60 - '	YU
--.-	$7D -]	SHCH
----	$7B - {	SH

In Baudot and AMTOR, Russian transmitters use a third register to transmit Cyrillic characters in addition to the LTRS and FIGS. They use LTRS to transmit the Roman alphabet. As LTRS and FIGS characters are used to access the first and second registers, they use the BLK or NUL character (00) to access the third register. The DSP displays third-register characters as lowercase alphabetic characters, and all FIGS characters as in CODE *0* with the following exceptions:

Character	CODE *2*	English Pronunciation
FIGS-F	$7C - |	E
FIGS-G	$7B - {	SH
FIGS-H	$7D - }	SHCH
FIGS-J	$60 - '	YU
3rd-Q	$71 - q	YA

If several words end in "OJ", "OW" or "OGO" the transmission is probably Russian.

There is no separate Baudot combination for the CH character. The Russians use a "4" because the Cyrillic character for CH resembles a "4."

It's safe to leave CODE set to *2* if you're not sure which alphabet the transmitting station is using. You'll be able to see the message in either alphabet with minimal garbling, then you can set CODE to either *0* or *3*.

Another interesting side effect of being able to send and receive in CODE *2* is that it's now possible to send and receive both upper and lowercase text in Baudot and AMTOR modes. To do this, both station must have CODE *2* enabled and both must be running 1991 or later firmware in their DSPs. Other users will see only uppercase characters and not be aware that anything unusual is happening as the feature merely inserts NULL characters at strategic times. A DSP using CODE *2* in a QSO with a unit in CODE *0* (or any other equipment) will exchange data in uppercase only, with no adverse effects.

This feature may be advantageous to users of the AMTOR Maildrop who want their messages to be forwarded to the packet network. The ability to send and receive upper and lowercase characters in AMTOR should improve message readability when it's translated to packet and vice versa.

CODE *3*: Transliterated Cyrillic
This code is similar to CODE *2*, except that some characters are transliterated into English phonetic equivalents for easier reading.

CODE 2	CODE 3
w	V
v	ZH
h	KH
c	TS

~	CH (Morse only)
{	SH
]	SHCH
x	'
|	E (RTTY only)
'	YU
q	YA

CODE *4*: Katakana
Katakana is the phonetic character set used in Japan for spelling out words of foreign (to Japan) origin. The Japanese also use Katakana for Morse and some computer communication. There are about 50 Katakana characters. CODE *4* translates the Katakana Morse code into an 8-bit extended version of ASCII. The characters displayed are generally in the range from $A0 to $DF, except for numerals and punctuation. If you're using CODE *4*, remember to set the DSP for AWLEN *8*, PARITY *0* and 8BITCONV *ON*.

CODE *5*: Transliterated Katakana
This is similar to CODE *4* except that the extended ASCII is transliterated into English equivalents for easier reading. The Morse characters are translated into 2- and 3-letter syllables.

CODE *6*: European
This is primarily for users with German language terminals. The differences in Morse coding are as follows:

Morse	*CODE 0*	*CODE 6*
.-.-	$5B	$5B
---.	$5C	$5C
..--	$5E	$5D
.--.-	$5D	

In addition, CODE *6* avoids the use of square brackets ($5B, $5D) in monitored packet headers and Maildrop prompts, using parentheses instead. US ASCII square bracket characters are used as extended alphabetic characters in most languages outside of English.

CODE *7*: TOR lowercase

Meaning	*Morse*	*Baudot*	*AMTOR*	*Packet*
TOR (lowercase)	—	—	RX/TX	—

CODE 7 applies to AMTOR operation only. It codes upper and lowercase letters using the NULL character as a shift while in LTRS case. This protocol is used by APLINK stations, European mailboxes, the AMT-3 and G4BMK software. The difference between CODE 7 and CODE 2 (Cyrillic) upper/lower case is that CODE 2 uses LTRS for upper case and NULL for lowercase, while CODE 7 uses the NULL to toggle between upper and lowercase. CODE 7 is invisible to stations using classic AMTOR (CODE 0). However, a CODE 7 station talking to a station using CODE 2 (AEA's already existing upper/lower case protocol) will result in upper/lowercase reversals or constant lower case text.

CODE *8*: Extended TOR lowercase

Meaning	*Morse*	*Baudot*	*AMTOR*	*Packet*
Extended Lower Case	—	—	—	—

CODE 8 also applies to AMTOR only. It includes the features of CODE 7 above, and additionally codes new punctuation characters using NULL as an escape while in FIGS case. Thus CODE 8 supports all 95 printable ASCII characters ($20-7E) plus CR, LF, space and ENQ while in AMTOR operating mode, but not BELL, backspace and TAB. At the moment, this protocol is used only on links between mailboxes forwarding messages. It could be used with the AEA AMTOR-to-Packet Gateway if all users had CODE 8. (CODE 8 isn't invisible to other users.)

EAS *ON*/*OFF*   Default: OFF

Mode: Baudot, ASCII, AMTOR, PACTORand MORSE   Host: EA

OFF   Echos characters when sent to the DSP by the computer.
ON   Echos characters actually sent on-the-air by the DSP.

The Echo-As-Sent (EAS) command functions in all modes *except* packet. EAS lets you to choose the way data is displayed on your monitor screen or printer. To display your text on your computer screen exactly as you're typing it in or while sending it from a disk file, leave EAS *OFF*. To see the actual data being sent from your DSP-232 to your radio and transmitted on the air, set EAS *ON*.

With EAS *ON* in Morse and Baudot RTTY, you'll see only uppercase characters on your screen and the data actually transmitted to the other station.

With EAS *ON* in AMTOR mode A and PACTOR (ARQ), you'll see characters echoed on your screen only *after* the distant station has validated *ack*ed your block of three characters. For packet, the MXMIT command should be used.

Nulls ($00) are not echoed, including the nulls produced by DIDDLE *ON* in ASCII.

ERrchar *n*   Default: $5F (_)
Mode: AMTOR, PACTOR, Morse, NAVTEX and TDM   Host: ER

"*n*"   A hexadecimal value from $00-$7F used to denote the error character used by the DSP for Morse, ARQ, FEC, PACTOR, NAVTEX, and TDM.

"*n*" is a hex value $00-7F, default $5F (underscore). This is the character that the DSP displays when it receives a corrupted or bad character in Morse, ARQ, FEC, PACTOR, NAVTEX or TDM. You may want to set this character to $2A (asterisk), $07 (bell), $20 (space) or $00 (null)—whichever works best for you. ERRCHAR *ON* or ER *Y* restores the default.

Lock   Immediate Command
Mode: Morse/Baudot/AMTOR   Host: LO

AMTOR and Baudot: LOCK is used to force a LETTERS shift in the received data. This can be helpful if noise has garbled the LTRS character causing FIGURES to be displayed.

Morse: LOCK instructs the DSP to lock its timing circuits to the current measured speed of a received Morse signal; This may improve the DSPs ability to decode those signals in the presence of high noise levels. To "un-Lock" the Morse speed and allow the DSP to track the received signal automatically, enter an *R* or *MO* in the Command mode, followed by a (RETURN).

MFilter *n1*[,*n2*[,*n3*[,*n4*]]]   Default: $80
Mode: Morse, Baudot ASCII, AMTOR, PACTOR and packet   Host: MI

"*n*"   0 to $80 (0 to 128 decimal) specifies an ASCII character code.
        (Up to four characters may be specified separated by commas.)

Use MFILTER to select up to 4 characters to be "filtered" or excluded from Morse, Baudot, ASCII, AMTOR, PACTOR and monitored packets with parameters *n1 - n4*, the ASCII codes for the characters you want to filter. The special value of $80 (default) filters all characters above $7F and *all* control-characters except (RETURN) ($0D), LF ($0A), and (TAB) ($09).

MODem   Default: 12
                                                                                     Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
1:  FSK    45  bps  2125/2295
2:  FSK   100  bps  2125/2295
3:  FSK    45  bps  1615/1785
4:  FSK   100  bps  1615/1785
5:  FSK   200  bps  2110/2310
6:  FSK   200  bps  1600/1800
7:  FSK   200  bps  2125/2550
8:  FSK   200  bps  1275/1700
9:  FSK   200  bps  2125/2975
10: FSK   200  bps  1275/2125
11: FSK   300  bps  2110/2310
12: FSK   300  bps  1600/1800
13: FSK  1200 bps  VHF
14: PACSAT 1200 bps BPSK
15:
16: FSK   9600 bps  K9NG/G3RUH
17: Analog FAX HF 1450/2500 FM
18: Analog FAX APT 2400 Hz AM
19: Zero-Crossing FAX 1300/2100
20: Morse 750  Hz.
21: OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

MOPtt *ON|OFF*   Default: ON
Mode: Morse   Host: Mo

ON   Enables PTT in Morse transmit mode.
OFF   Disables PTT in Morse transmit mode.

MOPTT controls the PTT output in Morse mode only. To enable PTT for Morse transmissions, both XMITOK and MOPTT must be ON. XMITOK *OFF* still disables PTT for all operating modes.

The most probable use of MOPTT is to disable PTT in Morse to allow full break-in operation but enable PTT in all the other modes. Setting XMITOK *ON* and MOPTT *OFF* accomplishes this.

MOPTT doesn't affect the Morse IDs generated by MID (in Packet mode) and by the CWID character (in other digital operating modes); ATXRTTY may also be helpful.

MOrse   Immediate Command
Mode: Command   Host: MO

MORSE switches your DSP into the Morse mode.

Unless you change MSPEED, your DSP uses the default Morse transmit speed value of 20 WPM.

MSPeed *n*   Default: 20 wpm
Mode: Morse   Host: MP

"*n*"   5 to 99 signifies your DSPs Morse transmit speed.

The MSPEED command sets the Morse code keying (transmit) speed for your DSP. The slowest available Morse code speed is 5 WPM. When using Morse speeds between 5 and 14 wpm, the transmitted code is sent with Farnsworth spacing at a character speed of 15 wpm. (With Farnsworth spacing, characters are sent at 15 WPM rate, but the spacing between each character is "lengthened" to give an overall speed of *n* wpm.)

QMorse   Default: 40 (Modem40)
Mode: Morse   Host: QO

n   Modem number to be selected when the MORSE mode is entered.

QMORSE sets the DSP-232 modem that will automatically ne selected when the Morse mode is entered.

See the MORSE (this chapter) and MODEM (Chapter 4) commands for more information.

Rcve   Immediate Command
Mode: Baudot/ASCII/AMTOR/PACTOR/Morse   Host: RC

RCVE is used in Morse, Baudot, ASCII, AMTOR, PACTOR and FAX modes to switch your DSP from transmit to receive.

You *must* (RETURN) to the Command mode to use RCVE.

RECeive *n*   Default: $04 (CTRL-D)
Mode: Baudot/ASCII/Morse/AMTOR/PACTOR   Host: RE

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Parameter *"n"* is the numeric ASCII code for the character you'll use when you want the DSP to (RETURN) to receive.

The RECEIVE command allows you to insert a character in your typed text that will cause the DSP to (RETURN) to receive after all the text has been transmitted.

WOrdout *ON|OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTOR and Morse   Host: WO

OFF   Inputted characters are sent directly to the transmitter.
ON   Inputted characters are held in the transmit buffer until a space, (RETURN), LF, (TAB), RECEIVE,
            CWID, ENQ or *+?* character(s) is typed.

Use WORDOUT to choose whether or not you can edit while entering text for transmission.

With WORDOUT *ON*, each character you type is held in a buffer until you enter a space, (RETURN), LF, ENQ character ($05 [CTRL-E]) or the *+?*. You can edit or delete words before the transmit buffer's contents are sent to the radio as long as you haven't entered pressed (SPACE), (RETURN) , LF, etc.

With WORDOUT *OFF*, each character you type is sent to the radio just as you typed it, without any delay. Also, the backspace character is transmitted in Baudot, ASCII, AMTOR and PACTOR modes. With WORDOUT *ON*, pressing the backspace key cancels out the preceding character and neither are transmitted.

In Baudot and AMTOR, the backspace character is transmitted as a "?" since there's no backspace in those modes.

In ASCII the backspace character is transmitted, but the destination station must be able to pass it. AEA products should have MFILTER set to zero to allow backspaces to print.

Xmit   Immediate Command
Mode: Baudot/ASCII/Morse   Host: XM

XMIT keys your radio's PTT line and prepares the radio to receive outbound data and Morse characters from the DSP. This command can only be used while in the Command mode.

XMIT switches your DSP to either the Converse mode or the Transparent mode, depending on the setting of CONMODE. Typing the CWID or the RECEIVE character will (RETURN) you to receive. Typing RCVE from the Command mode will also (RETURN) to receive.

Chapter 11

SIAM and NAVTEX Operation

NOTE: The SIAM function is not operatioal in the DSP-232!

Overview

As you tune across the HF bands you'll find an ever increasing number of digital signals. These signals range from the simple Murray Baudot code, to ASCII, and even packetized data. With the large number of speeds, formats, and shifts now in use, it's sometimes difficult to determine what kind of signal you're listening to. Even with a knowledge of digital communications, it's still time consuming to set the communication parameters correctly by trial-and-error methods.

Signal Identification and Acquisition Mode (SIAM™) was developed by AEA to allow a wide variety of digital signals to be automatically analyzed by the DSP. SIAM will listen to a signal for a few seconds then will display the type of signal it is and its speed. You can then decide whether or not to copy the signal, or move off to find another. To have copy come up on the screen, type *OK*, then press (RETURN).

One of the aspects of a transmission that SIAM looks for are its start and stop pulses. With the *asynchronous* signals used by amateur radio operators, the start and stop pulses act as delimiters at the beginning and end of each character; SIAM looks for these pulses. In the commercial bands, mostly *synchronous* signals are used. If you're tuned to a synchronous signal, SIAM won't find the start and stop pulses (or other recurring data patterns) it needs and will be unable to decode any text.

SIAM can identify and copy ASCII, ARQ and FEC AMTOR, SITOR, and Baudot signals. (At this writing, SIAM can't decode Packet, PacTOR and Morse code signals.) Once copy has been identified, you can read it by entering *OK* after the analysis has been completed.

Before proceeding with the rest of this section, review the following commands that are directly applicable to the SIAM mode: ARQE, CODE (see Chapter 4), RXREV, SAMPLE, SIAM, TXREV, and WIDESHIFT. SIAM commands are listed and explained at the end of this chapter. Terminal Interfacing can be found in Chapter 4.

Setting Up for SIAM

(If you're using an AEA program, follow the instructions in the program's manual to setup and use the SIAM mode.)

To enter the SIAM mode, simply enter *SIAM* or *SI* at the Command prompt. The DSP responds by displaying the previous mode and it was in, then its new mode:

```
cmd:SI
Opmode   was (previous mode)
Opmode   now SIgnal
cmd:
```

Look at your DSPs front panel to verify that you're in the SIAM mode—the 'S' will glow in the mode window.

Next, you can choose which modem you want to use using the MODEM command, followed by the specific modem number. For a list of modems available in the DSP, type DIRECT at the cmd:.

Reception

When preparing to decode a digital signal, the only decision you need to make before using SIAM is whether the signal is narrow or wide shift. Inside the Amateur bands, most digital signals are at 170 or 200 Hz shift so set WIDESHFT *OFF*. Outside the Amateur bands, most stations use a frequency shift greater than 200 Hz, so set WIDESHIFT *ON*. (Commercial SITOR is an exception—set WIDESHIFT *OFF*.)

Tuning in an FSK signal properly is critical to successful SIAM operation. Follow the tuning procedure below:

1. Select RADIO 1 or 2 using the RADIO command to switch the DSP to the port that's associated with your radio.
2. Put your HF receiver is either the LSB or FSK/RTTY mode.
3. Turn any IF-shift and passband-tuning controls to their center or "off" position.
4. Adjust the volume to a comfortable listening level.
5. Set WIDESHIFT *ON* for commercial "bands" or leave it *OFF* for the Amateur bands, including MARS and SITOR.
6. Listen for the distinctive two-tone warble of an FSK signal. When you find a station, slowly vary your receiver's tuning control so the DSPs tuning indicator's light pattern looks like this:

■□□□□□■■□□   ■■□□□□□□■■   □□■■□□□□□■
Frequency too low   Tuned in!   Frequency too high

7. Using either the THRESHLD or AUTOTHR command, adjust the Threshold so the DCD light goes on when a tuned RTTY station is being received. After about 10 seconds, the DSP should respond with a baud rate indication and confidence factor similar to the one shown below.
    ```
    0.47: 50 Baud
    ```

About 15 seconds later, the DSP will display one of the following signal classes and tell you whether or not the signal is reversed by giving the status of RXREV:

```
ASCII       ALIST       Unknown      6-bit
AMTOR       Baudot      noise TDM
```

The complete signal analysis will look something like the following:
```
0.47  50 Baud, Baudot,  RXREV OFF
```

This means that the DSP has determined the signal to be a 50-Baud Baudot signal that isn't inverted (since RXREV is *OFF*). The 0.47 means that the DSP is only 47% sure that this analysis is correct. (You'll receive a higher percentage when either the signal is louder or clearer, or tuned in better.)

If the DSP determined the signal to be Unknown, 6-bit, or noise (which it can't decode), typing *OK* will get you this response:
```
?bad
```

The signal analysis routine will run repeatedly until the operating mode is changed by either typing *OK* or by changing to another mode. If you decide to tune to a different signal during an analysis, simply type SIGNAL again to immediately restart the analysis routine, or wait for the next analysis cycle.

✎   **Note**: Adjust the THRESHOLD so the DCD light goes out when no station is being received. That way, you'll prevent "garbage" characters from printing on your screen.

Copying Encoded RTTY Transmissions

Many RTTY stations can be found on the HF bands that aren't transmitting in plain text. Most of these stations use sophisticated encryption techniques that make decoding them almost impossible. There are a few stations, however, that use a relatively simple bit-inversion technique; for these stations, there's the BITINV command.

If the text you're receiving isn't plain but appears to be encoded, you can try different settings of BITINV; it will Exclusive-OR a number from $00 to $1F with the received character of a Baudot signal, thus inverting specific bits.

By varying BITINV from 0 through 31, you'll test all the different bit-inversion possibilities that may be used to encode a Baudot signal.

If only simple bit-inversion is being used, one of the settings of BITINV should cause the transmission to print in plain text. If none of the 32 possibilities reveal plain text, then the transmitting station is likely using a more sophisticated encryption technique.

About NAVTEX
NAVTEX (NAVigational TELEX)—a form of FEC AMTOR broadcasted in mode-B AMTOR (SITOR) on a frequency of 518 KHz—is an international, direct printing service designed to broadcast navigational and meteorological warnings and other urgent information to ships at sea. NAVTEX broadcasts are sporadic, so you'll see only information of timely interest and may never see the same message twice.

Recently, the ARRL has also adopted this format for transmitting bulletins. In amateur radio this same format is starting to be referred to as AMTEX; its transmissions can be found on the ARRL's bulletin frequencies.

Before proceeding with the rest of this section, review the following commands that are directly applicable to NAVTEX : NAVMSG, and NAVSTN. Commands are listed and explained at the end of this chapter.

Setting Up for NAVTEX
(If you're using an AEA program, follow the instructions in the program's manual to set up and use NAVTEX.)

To enter the NAVTEX mode, simply enter NA at the command prompt. The DSP responds by displaying the previous mode it was in, then its new mode:
```
cmd:NA
Opmode was (old mode)
Opmode now NAvtex
cmd:
```

Look at your DSPs front panel to verify that you're in the NAVTEX mode—the left-hand STBY light should be lit.

Next, you can choose which modem you want to use using the MODEM command, followed by the specific modem number. For a list of modems available in the DSP, type DIRECT at the cmd:.

Set your radio to LSB, WIDESHIFT *OFF*.

Receiving NAVTEX Signals
NAVTEX/AMTEX messages are prefaced by the characters "ZCZC", then a four-character Preamble shown below:
```
ZCZC AA49
```

Serial Number 2nd Digit
Serial Number 1st Digit
Message Classification (A to Z)
NAVTEX Station Identification (A to Z)

The first character of the Preamble is a letter that identifies the NAVTEX transmitter, which can be any letter from A to Z. (This limits the number of NAVTEX stations in an area to 26.) NAVSTN can be used to selectively monitor or reject monitored NAVTEX transmitters.

The second character of the Preamble is the Message Classification. The classifications are:
   A)   Navigational Warnings
   B)   Meteorological Warnings (Storm Warnings)
   C)   Ice Reports
   D)   Search and Rescue Information
   E)   Weather Forecasts

F)   Pilot Service Messages
G)   DECCA System Information
H)   LORAN-C System Information
I)   Omega Systems Messages
J)   SATNAV System Messages
K-Z)   Reserved for future use

NAVMSG is used to selectively monitor or reject any of the NAVTEX message classes shown above. The exception to this is that message classes A, B and D can't be excluded and will always be copied if the transmitting station is enabled by NAVSTN.

The last two numbers form a message counter (from 00 through 99) that's assigned as a reference number to each message.

The DSP remembers the Preamble of the 200 most recent messages and won't reprint a message that has the same Preamble if it has already been received without many errors.

SIAM and NAVTEX COMMANDS

ARQE   Immediate Command
Mode: Command   Host: AE

ARQE is an immediate command that switches the DSP into the ARQ-E receiving mode.

ARQ-E is similar to 1-channel TDM except that the 7-bit code is different. Like TDM, most ARQ-E stations send idle signals for long periods of time. The DSP can only phase on ARQ-E signals that are idling so this isn't a problem.

The SIAM mode will identify ARQ-E signals for the user. They are identified as `TDM ARQ-E:4` or `TDM ARQ-E:8`, referring to 4- and 8- character repetition cycles used in this mode.

ERrchar *n*   Default: $5F (_)
Mode: AMTOR, PACTOR, Morse, NAVTEX and TDM   Host: ER

"*n*"   A hexadecimal value from $00-$7F used to denote the error character used by the DSP for Morse, ARQ, FEC, PACTOR, NAVTEX, and TDM.

"*n*" is a hex value $00-7F, default $5F (underscore). This is the character that the DSP displays when it receives a corrupted or bad character in Morse, ARQ, FEC, PACTOR, NAVTEX or TDM. You may want to set this character to $2A (asterisk), $07 (bell), $20 (space) or $00 (null)—whichever works best for you. ERRCHAR *ON* or ER *Y* restores the default.

MWeight *n*   Default: 10
Mode: All except packet   Host: Mw

"*n*"   5 to 15, specifies roughly 10 times the ratio of one dot length to one inter-element space length in transmitted Morse code.

A value of 10 results in a 1:1 dot-space ratio. A setting of 5 results in a 0.5:1 ratio, while a setting of 15 (maximum) results in a 1.5:1 ratio. MWEIGHT applies only to the Morse transmit mode and the CW ID in all modes except packet. MWEIGHT doesn't affect the code output by the MID command.

NAVMsg *ALL*, *NONE*, *YES*/*NO letters*   Default: All
Mode: NAVTEX   Host: NM

letters   ALL, *NONE*, *YES LIST*, *NO LIST*   (List = up to 13 letters which may or may not be separated by spaces, commas or tabs.)

NAVMSG uses Letter arguments to determine which NAVTEX messages your DSP will print. NAVTEX messages are grouped into classes by the second letter in the Preamble. The NAVMSG Command allows *ALL, NONE* or a list of up to 13 letters representing message types to be Monitored or Rejected.

NAVMSG may be cleared with *%*, *&*, or *OFF* as arguments.

NAVStn *ALL*, *NONE*, *YES|NO letters*   Default: All
Mode: NAVTEX   Host: NS

letters   ALL, *NONE*, *YES LIST*, *NO LIST*   (List = up to 13 letters which may or may not be separated by spaces, commas or tabs.)

The NAVSTN command uses letter arguments to determine which NAVTEX transmitting stations the DSP will print. NAVTEX transmitters are identified by the 26 letters of the alphabet. The NAVSTN Command allows *ALL*, *NONE* or a list of up to 13 letters representing NAVTEX transmitting stations to be monitored or rejected.

NAVSTN may be cleared by using *%*, *&*, or *OFF* as arguments.

NAvtex   Immediate Command
Mode: All   Host: NA

NAVTEX switches your DSP into the NAVTEX receive mode. The DSP can accept or reject certain message classes and transmitting stations with the NAVMSG and NAVSTN commands.

For logging purposes, NAVTEX uses the setting of DAYTIME to print the date and/or time in front of the preamble if MSTAMP and DAYSTAMP are both *ON*.

Nums   Immediate Command
Mode: Baudot, AMTOR, TDM   Host: NX

In Baudot, AMTOR and TDM receive, the NUMS command will force the DSP into the FIGS case.

OK   Immediate Command
Mode: SIGNAL   Host: OK

OK normally follows the SIGNAL command after it has determined the class and speed of the station you're listening to. Typing OK will change the commands RXREV, RBAUD or ABAUD and OPMODE to their proper value.

If the SIGNAL command doesn't reveal any useful information, typing OK will produce the ?bad error message.

QSignal   Default: 1 (Modem 1)
Mode: Signal   Host: QS

n   Modem number to be selected when the SIGNAL mode is entered.

QSIGNAL sets the DSP-232 modem that will automatically be selected when the SIGNAL Identification mode is entered.

See the SIGNAL (this chapter) and MODEM (Chapter 4) commands for more infromation.

SAmple *n*   Immediate Command
Mode: Command   Host: SA

"n"   20 to 255 specifies the sampling rate in baud.

This operating mode is for advanced users interested in decoding unknown synchronous data transmissions. SAMPLE is similar to the 5BIT and 6BIT modes, but operates on synchronous data.

SAMPLE syncs up on any regularly-paced data transmission and samples the data once per bit, packaging the data in groups and sending the groups to the you for further analysis. You can use SAMPLE to capture data bits from synchronous transmission modes such as FEC, TDM or an "unknown mode" not identified by the SIGNAL command. (The transmission is actually sampled several times per data bit.) The DSP does a majority vote on the last few samples to represent the value of the data bit.

One use for the SAMPLE command is to record the output to a disk file, then write a program to analyze the results for synchronous/asynchronous, bit sync patterns, data decoding, etc.

SAMPLE data is captured in 6-bit units; the order of bit reception is MSB first, LSB last. The TNC sends the data unit to you with a constant of hex 30 added to each unit, the same as the 6BIT command. The 6-bit unit is a compromise between hex and 8-bit binary output. The 6-bit unit yields shorter disk files than 4-bit hexadecimal characters, but encounters no interference from terminal communications programs and the TNC's Converse and Command modes. The 6-bit unit's range of $30-6F falls within the printable ASCII range, allowing the TNC to insert end-of-line carriage returns that can be ignored by your analysis software.

To use SAMPLE, set ACRDISP to a non-zero value such as 77. This will break up the recorded disk file into lines. Tune in the signal, set WIDESHFT *ON* or *OFF* as needed, and get the transmission rate from the SIGNAL command. Now type SAMPLE (*rate*). As an example, SIGNAL may identify a transmission as 96 baud TDM; in this case, enter the following:

> SAMPLE *96*

Now begin the "capture to a disk" file command with your terminal program. At the end of the session, edit the disk file and remove any TNC commands that were echoed before or after the received data.

Occasionally, SIGNAL will identify a Baudot transmission at a rate that SAMPLE can't sync with. This will happen if the Baudot signal has a stop bit duration 1.5 times the data bit duration. In this case, SAMPLE at twice the baud rate and compensate for the doubled data bits in the analysis software. Note that it might be more useful to let the TNC do the start/stop bit work by using the 5BIT command rather than SAMPLE. 5BIT uses RBAUD, and adds a constant of hex $40 to each 5-bit character received.

Note: RXREV affects the sense of the SAMPLE data; it shouldn't be changed while capturing data.

SIgnal   Immediate Command
Mode: All   Host: SI

SIGNAL causes the DSP to enter the Signal Identification and Acquisition mode (SIAM). The DSP will respond with:

```
Opmode  was (mode)
Opmode  now SIgnal
```

After a few seconds the DSP will show the signal's baud rate. A few seconds after that it'll try to identify the signal type. SIAM *can't* identify packet, AMTOR or PACTOR signals.

WIdeshft *ON|OFF*   Default: OFF
Mode: Baudot/ASCII, RTTY, AMTOR, PACTOR   Host: WI

OFF   RTTY tones are shifted 200 Hz (emulates 170-Hz shift).
ON   RTTY tones are shifted 1000 Hz.

WIDESHFT permits the use of the DSP on VHF or HF with either wide (1000 Hz) or narrow (200 Hz) shifts. Many amateur radio VHF and HF RTTY operators use 170-shift. The PK's 200 Hz shift is well within the filter tolerances of any RTTY demodulator in general service. MARS stations will find WIDESHFT generally compatible with MARS and Commercial 850 Hz shift RTTY operations.

Chapter 12

PACTOR Operation

Overview

PACTOR is a relatively new amateur data communications mode; it was developed in Germany by Hans-Peter Helfert, DL6MAA, and Ulrich Strate, DF4KV. PACTOR combines some of the best features of both AMTOR and Packet as well as providing a few new features which we'll cover later in this chapter. PACTOR operates at 100 bps or 200 bps, depending on atmospheric conditions and the quality of the received signal. PACTOR also provides near error-free throughput and can also selectively use a data compression scheme (Huffman encoding) to increase throughput when transmitting text. Since PACTOR uses 8-bit words, you can use the full ASCII character set.

Another advantage of PACTOR is when data blocks are repeated in the case of an error in reception, the DSP can often combine the bad blocks of data into a good ones without the need of receiving a perfect block in the first place. This scheme is called "memory ARQ"(Automatic ReQuest for reception). Like AMTOR and Packet, PACTOR has two basic modes of operation: an ARQ (linked) mode and a non-linked mode used for CQ calls and roundtable operation.

When listening to an ARQ PACTOR conversation, you'll hear a 960 mS burst of data from the sending station followed by a short burst from the receiving station—back to the transmitting station—to acknowledge (ack) or non-acknowledge (nack) reception of the sent data. The nack signal is sent by the receiving station when the error-checking scheme (CRC) detects an error in the received data block. Like packet, PACTOR is mark-space polarity independent—the PACTOR protocol purposely alternates the data polarity with every transmission as a means of reducing the effects of interference.

In PACTOR, the transmitting station (ISS) "has the link" and requires a periodic "ack" signal from the receiving (IRS) station as part of its error-checking scheme. An analogy of this would be you reading off sequences of numbers to a friend and having him acknowledge them back, then when you're finished you'd switch roles with him and he'd call off his set of numbers.

When you're reading off your set of numbers (transmitting) you have control of the link since you're the sending station. Your friend, the "receiver," answers back (acknowledges) with either a quick "yes, I heard you okay" or a "no, I missed something." In the former case, you'll "send" the next sequence of numbers; in the latter, you'll repeat the previous number sequence. After you've read all the numbers on your list, you'd hand the link over to your friend and it'd be his turn to read numbers to you and for you to acknowledge them as "received okay" or "not received okay."

The unproto(col) mode of PACTOR operation is a non-linked type of operation. It's used for roundtable operation or for calling CQ. The unproto mode repeats the data blocks "*n*" times and can use either 100 or 200 bps. (It also uses the CRC error-check scheme.)

Before proceeding with the rest of this section, review the following commands that are directly applicable to the PACTOR mode: AAB, ACHG, ARQTMO, ARXTOR, CBELL, CONSTAMP, EAS, GUSERS, MHEARD, MID, MYCALL, MYPTCALL, OVER, PT200, PTCONN, PTHUFF, PTLIST, PTOVER, PTROUND, PTSEND, TMAIL, UCMD, UNPROTO, and WORDOUT. PACTOR commands are listed and explained at the end of this chapter. Terminal Interfacing commands can be found in Chapter 4.

Setting up

(If you're using an AEA program, follow the instructions in the program's manual to set up and use PACTOR.)

PACTOR operation requires you to have MYPTCALL or MYCALL entered before you can transmit. If you don't enter your MYPTCALL, the call in MYCALL will be used as the default callsign. (PACTOR stations can't use the SubStation IDentification number [SSID] in MYCALL.) It's preferred that you enter both a MYCALL and MYPTCALL, even if the call is the same.

When you enter your callsign in MYPTCALL, the DSP will respond with:
```
MYPTCALL  was  DSP232
MYPTCALL  now  (your callsign)
```

Unlike MYCALL, which doesn't allow punctuation other than the dash (–), MYPTCALL *does* allow punctuation in the callsign field. This allows you to properly identify when operating portable, for example: *ZL2/KB6IUX*.

To enter the PACTOR mode, simply enter *PACTOR* or *PT* at the Command prompt. The DSP responds by displaying the previous mode it was in, then its new mode:
```
cmd:PT
Opmode   was (previous mode)
Opmode   now PACTor
cmd:
```

Look at your DSP's front panel to verify that you're in the PACTOR mode—both STBY indicator lights should be lit.

Next, you can choose which modem you want to use using the MODEM command, followed by the specific modem number. For a list of modems available in the DSP, type DIRECT at the cmd:.

The next step is to set your HF receiver (or transceiver) to LSB unless the DSP is connected to your radio's direct FSK keying lines. If you're using a transceiver that has a RTTY or FSK mode and you have the DSP connected for direct FSK, keep in mind that PACTOR uses 200 Hz shift; if your radio has a 200 Hz shift selector, use it. If it has only 170 Hz shift, don't worry about it—in the "real" world, other stations won't see the 30 Hz difference so you shouldn't have any problems.

Receiving PACTOR

Before you can operate PACTOR, you have to find out where the activity is—usually it's in the 20-meter band between 14.065 and 14.085 MHz. PACTOR activity can be found on the other HF amateur bands as well and is most often located between 65 and 90 KHz up from the bottom of the band as it is on 20 meters; on 80 meters, most PACTOR activity can be found between 3.66 and 3.69 MHz.

Tuning in PACTOR stations properly is the key to successful operation. Since HF PACTOR stations use 200 Hz Frequency Shift Keying (FSK) to send data, tuning accuracy is very important. Follow the procedure below for the best results.

✎   **Note**: In some radios, the FSK circuits are set for a 170 Hz shift. Don't worry about it; PACTOR will work just fine.

1. Put your HF receiver in either LSB or FSK/RTTY/PACKET, depending on your set-up. (PACTOR isn't sensitive to the sideband used, but by convention LSB is generally used.)

2. Turn any IF-shift and passband-tuning controls to their center or "off" position.
3. Adjust the volume to a comfortable listening level.
4. Enter the command *PTLIST* to monitor both linked and unlinked (unproto) PACTOR transmissions. The PHASE and MODE L lights on the DSPs front panel should glow; you can verify you're in the PTLIST mode by entering *OP*—the DSP will respond with: Opmode   PTList   PHAS RCVE.
5. Tune your receiver carefully between 14.065 and 14.085 MHz (or elsewhere where there's PACTOR activity) and listen for the 960 mS data burst of ARQ PACTOR or the steady data of the unproto mode stations. It sounds similar to an AMTOR "cricket chirp," but longer.
6. When you find a station, Using either the THRESHLD or AUTOTHR command, adjust the Threshold so the DCD light goes on when a PACTOR station is being received, but goes out when no signal is received.
7. Slowly vary the tuning control on your receiver while glancing at the DSPs turning indicator. Look for the LED pattern below and adjust the frequency control accordingly.

■□□□■■□□□□   □■■□□□□□■■□   □□□■■□□□□□■
Frequency too low   Tuned in!   Frequency too high

With a good signal and your radio properly tuned in, within seconds you should start seeing text on your screen. While receiving text, the TFC and RQ lights will blink back and forth while the MODE L light remains lit. Every few seconds, the IDLE light will quickly blink, too. When the other station sends a CTRL+D at the end of its message, this will "drop" the link and the PHASE and MODE L lights will be the only ones glowing; if he remains "idle"—his transmitter is on but nothing is being sent—the RQ and MODE L lights will remain on, accompanied by an occasional blink from the IDLE light.

Use PTL to monitor ARQ traffic flowing between two stations linked in a PACTOR ARQ contact. Your DSP will try to synchronize with whichever of the two linked stations has the link.

Monitoring two linked PACTOR ARQ stations doesn't provide the error correction enjoyed by the linked stations. Since your DSP is not part of the "handshake," you can't generate the request for repeat, but it will check for the correct CRC and won't display messages with errors. Missing blocks will be designated with four error symbols— the default error symbol is the underline (_). (See ERCHAR if you want to change it.)

Also, you can only read copy from the ISS station that you originally synced on—you won't be able to hear both sides of the PACTOR QSO unless you re-sync with the ISS after each changeover.

The DSP won't print a block of data if that block contains the same sequence number as the previous block. If the transmitting station (ISS) repeats the same block, the DSP won't print it twice.

Going On The Air
Note: Make sure your DSP is adjusted for your SSB transmitter as described in Chapter 3: Radio Installation under the heading **SSB Transceiver Final Adjustments**. These are very critical adjustments. If your DSPs AFSK level and transmitter's mike gain aren't adjusted properly, other stations won't be able to copy your signals.

Finally, before you go ahead and transmit, here are some helpful hints:
  ♦ ***Don't*** use the VOX control—use the PTT line from your DSP.
  ♦ Turn off the AGC circuit—use the RF gain control to prevent receiver blocking on stronger signals.
  ♦ Turn off all compression or other audio processing.
  ♦ If you're using an AFSK audio input, keep the audio level to the microphone input circuit as low as possible to avoid overdriving the audio input stages.
  ♦ Adjust the transmitter's drive to prevent excessive ALC action; use more effective RF antenna loading to adjust output power levels.

Make sure your transmitter and antenna are tuned and adjusted for the band and frequency you want to use. Before you transmit, however, you have to decide if you're going to "call CQ" or answer someone's CQ call.

Roundtable QSOs

With your DSP, it's possible to listen to, or join, a roundtable discussion where two or more hams get together on the same frequency to chat. To listen to stations that aren't linked, enter PTL.

✎   **Note**: Because PACTOR-Listen mode doesn't provide for error-correction, you may miss copying some frames.

If you want to transmit as part of a roundtable, all you have to do to participate is:
1. Turn PTROUND *ON*.
2. Enter *PTSEND* to key your transmitter; You're now in the CONVERSE mode, so anything you type will be broadcast by your transmitter.
3. When you've finished typing in your message, enter (CTRL-D). Because PTROUND is *ON*, this will put you back into the PTLIST RCVE mode, so you'll be able to copy the other station(s).
4. Go to Step 2 when you want to transmit again.

Calling CQ
When you call CQ, you must do so in the unproto PACTOR mode. Follow these steps to put your DSP and transceiver into the transmit mode.

1. Enter PTSEND: you're now transmitting in the CONVERSE mode, so anything you type will now will be sent "unproto."
2. Type in your CQ message. (Make sure you include your callsign) or text. An example is shown below:
    CQ CQ CQ DE WF7A WF7A WF7A K (*CTRL+D)*

    By tacking on a (CTRL-D) at the end of your CQ (or other text), it puts your radio into PACTOR STBY RCVE mode after your CQ (or text) is sent; now it'll be ready to receive a connect from another station.

✎   **Note**: while in STBY RCVE mode you won't be able to monitor other packets that the DSP hears; Only in PTL mode can you monitor other PACTOR stations.
3. After the DSP has sent your CQ, wait a bit for a response. If you don't get one, repeat Step 2 or listen on another frequency for other PACTOR stations.
4. If you do get a response, you'll get a CONNECTED to (callsign) message. You're now linked!

Answering Another Station's CQ
While in PTL, if you want to answer another station's CQ enter: *PTC call*. If you successfully link, you'll get the *** CONNECTED to (callsign) message and you'll have control of the link. You might send something to acknowledge this, like:
        (Other station's callsign) DE (your callsign). I'm (your name) and I'm
        in (your location). You're coming in (signal report).>

If your station doesn't link within a period of time determined by ARQTMO, your station will "give up" and automatically stop transmitting.

Beginning a QSO
The station that connected to you above now has the link and might send a message like:
        DE KB6IUX Howdy! Name here is Monroe and my QTH is Bisbee, AZ. You're
        coming in gangbusters here! K

Your contact typed a his marker—the "K"— to let you know he's finished this transmission and is turning control of the link over to you. (You'll know when he's done so by looking at the DSPs indicator lights: the SEND, IDLE, and ARQ lights will glow.) Now go ahead and type a reply:
        DE WF7A. Great, Monroe--you're 5x5 here, too. I'm Richard and I live on Vashon Island, WA.
        You're my first PACTOR contact!> (CTRL+Z)*

        *(CTRL+Z) is similar in function as +? in AMTOR.

After you type your response, enter a *CTRL+Z*. This command changes control of the link back to the other station...and this is how the conversation goes, changing control of the link back and forth until your conversation is finished.

Ending a QSO
The station that has control of the link is the one that normally ends the conversation. If you have control of the link, you might end it like this:
> *Thanks again, Monroe---see ya later! DE KB6IUX   SK (CTRL+D)*
> `*** DISCONNECTED: (callsign)`

Entering *CTRL+D* breaks the contact and puts you in back into STBY RCVE mode. From here, you can go ahead and initiate a contact with another station or wait for a station to connect to you. Remember, though, that you won't be able to monitor other stations' PACTOR transmissions unless you enter PTL.

Seizing the Link
If the other station has the link and is sending a message to you, but you have to interrupt to tell him something—like you might in Morse QSK (quick break-in.)—you can do that in PACTOR by entering *(CTRL+C) ACHG (RETURN) (text)*. The *(CTRL+C) ACHG (RETURN)* commands cause the link to come back under your control and puts the other station in receive. The text is optional; after you type it in, you can hand back control of the link to the other station by entering a *(CTRL+Z)*.

Killing the Link
If, while the other station has control of the link, you have to end the conversation immediately, you can do so by entering *(CTRL+C) R (RETURN)*. This will put you into STBY RCVE mode. If there are characters left in the transmit buffer, they won't be sent.

Bailing out like this isn't a recommended procedure since it leaves the other station "holding the bag"—he won't know that you left until his software timer "times out" waiting for an acknowledgement signal from you that will never come. A "graceful" way of performing the same function is *(CTRL+C) ACHG (CTRL+D)* or *(CTRL+C) ACHG (CTRL+C) D (RETURN)*.

LED Status and mode Indicators
The front panel LED display provides mode and status information at a glance. This is especially useful in PACTOR operation. The following describe typical STATUS indications you will see.

See Table 1 for the light patterns you'll see when you operate your DSP in its different PACTOR modes.

File Transfers
To send or receive ASCII, text and binary files with your program, set 8BITCONV to *ON*, AFILTER to *OFF*, and MFILTER *$00* (this allows all the control and graphics characters to be monitored/sent.). Consult your program's operating manual for the commands or keystrokes to send or receive files.

MailDrop Operation
One of the unique features of the DSP-232 is that it allows PACTOR as well as Packet and AMTOR access to its MailDrop; messages can be dropped off and picked up in any combination of these modes as long as your mode (Pactor, PACTOR, RTTY, etc.) matches the calling station's. Make sure that you understand Chapter 7: MailDrop Operation and the basic PACTOR operation described earlier in this chapter before putting your PACTOR MailDrop on the air.

The TMAIL command controls other stations' access to your PACTOR and AMTOR MailDrop in the same way that the MAILDROP command controls Packet access. See TMAIL for more information about MailDrop accessibility.

Special Operating Considerations

The PACTOR MailDrop has been designed with a "Watchdog" safety feature so that it can operate independently with little attention. If a remote station is linked with your PACTOR MailDrop and no traffic is passed for 5 minutes, the link will drop and your transmitter will shut off.

At this writing however, unattended operation below 30 MHz is not legal for US amateurs unless they hold a Special Temporary Authorization (STA) from the FCC for this purpose. This restriction may soon change, but until then US amateurs must be sure to always have control of their HF transmitters when any automatic device such as the DSP MailDrop is in operation.

Operating Tips and Options

ID'ing Yourself

The FCC requires station identification once every ten minutes while you're engaged in a QSO. It's sufficient to begin with *DE mycall* or end your transmission with *DE mycall* before the CTRL+Z changeover, but an easier way to ID yourself is to use CTRL+B to send the text stored in your own Auto-AnswerBack message. (See AAB.) ✎

> **Note**: If you want to see your AAB message on your screen as it's sent to the linked station, turn EAS *ON* (while in the Command mode.)

EAS—*E*cho *A*s *S*ent—operates the same as in ARQ AMTOR. With EAS *ON*, you'll see characters echoed to your screen only the first time the DSP sends them and *only* once, even if the data isn't acknowledged by the receiving station. This allows you to observe the progress of your transmission. If progress is very slow, most likely due to deteriorating atmospheric conditions, then it's probably time to wrap up the contact.

Long Path Contacts

If the station you're going to QSO with is more than halfway around the earth (long path), precede the station's callsign with an exclamation point. This will change PACTOR's timing to allow for the extended radio propagation delay.

♦ If data scrolls across your monitor at an even rate, you can assume that you have a good ARQ link.
♦ If the data hesitates or scrolls in a jerky, intermittent fashion, that's generally a sign that the radio link isn't very good.
♦ If the characters stop appearing on your monitor during receive, the link is failing or has failed. The STATUS display will tell you this by showing ERROR or REQUEST nearly continuously.

WORDOUT

Some PACTOR users like to have their words sent out only when they are complete, rather than individual letters sent as they're typed. WORDOUT allows the word you're currently typing to be edited as long as you haven't pressed the Space Bar or any punctuation. Turning WORDOUT *ON* activates this feature.

Operating on the "Wrong" Sideband

PACTOR, like packet, is mark-space polarity independent—although the reason for this is somewhat different. Specific header blocks define the mark-space sense for each PACTOR information block and during linked operation, the mark-space sense is alternated. For this reason, there is no "wrong" sideband. You may operate on either LSB or USB. If you're going to change to other modes—for example AMTOR—then LSB is used by convention. Using LSB keeps mode changes simple as well as keeping the radio dial frequency reading consistent with other users. If you don't have a "narrow" filter, switching sidebands and retuning may allow you to reduce adjacent channel interference during PACTOR operation.

Switching Time Problem?

For operation in PACTOR ARQ, your transceiver or transmitter-receiver combination must be able to change between transmit and receive within 130 mS. Most modern solid state radios can easily meet this specification. Many older tube-type radios that use electromechanical relays also operate very well in PACTOR ARQ; any radio capable of AMTOR ARQ will operate PACTOR ARQ.

If the changeover time from transmit to receive in your radio set-up is too long, the ack signal from the distant station will arrive before your radio has switched back to receive. However, if the transmitting station is further away, the transmission time over the propagation path will delay the arrival of the signal until after your radio has switched to receive. For this reason, you may be able to link with stations across the world easier than across town.

If switching-time problems persist, you may have to make changes in the radio to eliminate excessive time delays:
- Remove large decoupling capacitors from the Push-To-Talk line to allow faster PTT (transmitter) activation;
- Improve power supply decoupling, especially in audio stages.
- *Don*'t use the squelch control.

Another solution is for either you or the other station to change the timing value in ADELAY.

In case you can't solve your radio's switching-time problems, call AEA for assistance.

Control Key Summary:
CTRL+B   Sends your AAB message.
CTRL+C   Takes you out of the Converse mode and into the Command mode.
CTRL+D   Stops your radio from transmitting when the transmit buffer is empty.
CTRL+E   Sends a "Who Are You" (WRU?) request to the other station. This causes the other station to send its callsign. (...and serial number of the PACTOR chips if it's a DSP232MBX.)
CTRL+F   Unkeys the transmitter after the transmit buffer is empty, sends your callsign in Morse, then returns the DSP to PACTOR Standby in the Command mode.
CTRL+T   Sends the time if DAYTIME and (or) date if DAYSTAMP is *ON*.
CTRL+Z   Changes your DSP from send (ISS) to receive (IRS).

Action	Keystroke	On-Screen Text	Front Panel LEDs
Enter PACTOR mode	*PT*	`Opmode was (previous mode)` `Opmode now PACTOr`	Pactor
Monitor PACTOR traffic while unconnected	*PTL*	`Opmode was (previous mode)` `Opmode now PTList`	Phase
Put DSP in unproto mode	*PTS*	`Opmode was (previous mode)` `Opmode now PTSend`	TX+Idle/FEC
Send CQ or a message	*CQ CQ CQ, DE (yourcall 3X)... (CTRL+D)*	(enter your CQ text or send a message while not connected, then follow it by a CTRL+D.) `cmd:`	
Another station answers your CQ and connects to you		`*** CONNECTED to (callsign)`	CONnected/ARQ Idle/ARQ
The other station sends text...		`(text)`	Traffic/ARQ Idle/ARQ
...then he turns it over to you when it's your turn		`K, BTU, > (your choice)`	TX+Idle/ARQ
You send text back to him	*(text)*	(text)	TX+Traffic/ARQ
...then you flip it over to him	*K, BTU, > ... (CTRL+Z)*		Over/ARQ Idle/ARQ
You end the QSO (while it's your turn to transmit)	*(CTRL+D)*	`*** DISCONNECTED: (callsign)`	TX+Over/ARQ

To end a QSO while the other station has the link	(CTRL+C) ACHG (CTRL+D) or (CTRL+C) ACHG (CTRL+C) D (RETURN)	`*** DISCONNECTED: (callsign)`	
To grab the link away from the other station (and interject text) before he flips it over to you	(CTRL+C) ACHG RETURN (text)		TX+Idle/ARQ
To connect to a station that's calling CQ	PTC callsign	`*** CONNECTED to (callsign)`	TX/ARQ Phase/ARQ Idle/ARQ

Table 1

PACTOR COMMANDS

AAb *text*   Default: empty
Mode: Baudot, ASCII, AMTOR, PACTOR   Host: AU

text   Any combination of charcters (maximum: 24).

Use AAB to enter *ack*nowledgment text for Baudot, ASCII, AMTOR and PACTOR. AAB sends automatic confirmation in Baudot, ASCII, AMTOR and PACTOR in response to a distant station's WRU request—it's like an answering machine message you've set up for incoming calls. Set WRU *ON* or CUSTOM to *$0200* to activate your Auto-AnswerBack message.

To record your AAB message, enter "AAB (24-character text)". Example:

> cmd: AAB WF7A - VASHON ISLAND, WA

...and yes, spaces between words count as characters.

AChg   Immediate Command
Mode: AMTOR, PACTOR   Host: AG

ACHG is an immediate command used in AMTOR or PACTOR by the receiving station to interrupt a sending station's transmissions.

As the receiving station, you usually rely on the transmitting station—your partner in the ARQ "handshake"—to send "+?" to make the changeover. However, in ARQ (Mode A), you can use the ACHG command to interrupt the sending station's transmission. Use the ACHG command only when it's really needed—it's akin to interrupting someone while they're talking.

ADelay *n*   Default: 4 (40 msec.)
Mode: AMTOR, PACTOR   Host: AD

"*n*"   1 to 9 specifies transmitter key-up delay in 10 mS increments.

ADELAY is the length of time, in tens of milliseconds, between the time the DSP activates the transmitter's PTT line and when the ARQ data actually begins to flow. The ADELAY command allows you to adjust a variable delay, from 10 to 90 mS, to handle the PTT delay of different transmitters.

In most cases, the default value of *4* (40 mS) is adequate for the majority of the popular HF transmitters. If the AMTOR or PACTOR signal strength is good and you observe periodic errors caused by the loss of phasing (shown by re-phase cycles in the middle of an ARQ contact) during contacts, it may be necessary to adjust the ADELAY value.

- ♦ Be sure that errors and rephasing effects are not caused by the other station before changing your ADELAY.
- ♦ If changing your ADELAY values doesn't improve link performance, reinstall your original value and ask the other station to try changing its ADELAY setting.

Because the ARQ AMTOR mode allows 170 mS for the signal to travel to the distant station and back, increasing ADELAY will reduce the maximum working distance. The maximum theoretical range of an ARQ contact is limited to about 16,000 miles (25,500 kilometers). Using some of that time as a transmit delay leaves less time for signal propagation, thus the maximum distance available is reduced.

Regardless of the setting of ADELAY, ARQ (mode A) AMTOR may not work well over very short distances like one or two miles. However, in very short distance work ARQ shouldn't be necessary to achieve error-free copy, anyway.

ARQTmo *n*   Default: 60
Mode: AMTOR, PACTOR   Host: AO

"*n*"   0 to 250 specifies the number of seconds to send an ARQ SELCALL before automatic transmitter shutdown.

ARQTMO sets the length of time during which your ARQ call will be sent, shutting down the transmitter automatically after exceeding its value. As a general rule, if you can't activate another AMTOR or PACTOR station in the default time of 60 seconds, you can probably assume that the other station can't hear your transmission.

ARXTor *ON|OFF*   Default: OFF
Mode: AMTOR, PACTOR   Host: Ar

OFF   Disables the automatic detection of non-selected operating modes.
ON   Enables automatic detection and switching between AMTOR and PACTOR modes.

ARXTOR allows the automatic switching from PACTOR Listen mode to AMTOR FEC receive and from PACTOR Standby to AMTOR ARQ. It also allows the automatic switching from AMTOR Listen to AMTOR FEC receive.

With ARXTOR *ON*, an AMTOR FEC signal is detected by ALIST and PTLIST modes as well as AMTOR Standby mode. AMTOR Standby, ALIST and PTLIST all use FEC idles to recognize FEC transmissions. In the AMTOR Standby mode, however, FEC text patterns are recognized as an additional quick recognition method which may speed locking onto a FEC signal.

ARXTOR *ON* enables PTLIST mode to monitor AMTOR ARQ transmissions. It also means an incoming AMTOR ARQ call is recognized in PACTOR Standby mode. Only a call for the selcall in MYSELCAL is recognized; PACTOR can't detect ARQ calls to MYALTCAL or MYIDENT.

When a PACTOR mode detects an AMTOR transmission, there is an added delay before the text is shown. Your TNC must switch from PACTOR to AMTOR, where the signal is again detected. For fastest detection of AMTOR FEC, your TNC should be in the AMTOR Standby mode. For fastest syncing on AMTOR ARQ signals, the TNC should be in ALIST mode.

At the end of the new mode (AMTOR ARQ or FEC), your TNC returns to the original monitoring mode (AMTOR, ALIST, PACTOR or PTLIST).

ARXTOR is defaulted *OFF* to accommodate old application programs that have no provision for handling a spontaneous change of modes from PACTOR to AMTOR.

Here's a summary of the AMTOR/PACTOR mode switching:

Original Operating Mode

Target mode detection	*AMTOR*	*ALIST*	*PACTOR*	*PTLIST*
AMTOR FEC	if RFEC	if ARXT		if ARXT
AMTOR ARQ (MYSELCAL)	always		if ARXT	
AMTOR ARQ (MYALTCAL)	always			
AMTOR ARQ (MYIDENT)	always			
Monitor AMTOR ARQ		always		if ARXT
SELFEC	always	if ARXT		if ARXT
Monitor SELFEC	if SRXALL	if ARXT & SRX		if ARXT & SRX
PTCONN			always	always
Monitor PACTOR				always

✎   **Note:** When automatically switching from PACTOR to AMTOR and back again, the modem isn't changed.

BBSmsgs *ON|OFF*   Default: OFF
Mode: packet, PACTOR   Host: BB

OFF   The DSPs status messages work as before (default).
ON   Makes the DSP status messages look like the TAPR-style output.

With BBSMSGS *ON*, some of the status messages change or are suppressed which may improve operation of the DSP with some BBS software. The following status messages are suppressed or changed with BBSMSGS *ON*:

    No: (parm) was (value)
           (parm) now (value)

           (Connect messages:) ; v2; 1 unACKed

           xxx in progress: (dest) via (digis)

           Sends carriage (RETURN) before all other "***"

           (callsign) busy message

CBell *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR   Host: CU

OFF   "Bells" aren't sent with the CONNECTED or DISCONNECTED message.
ON   Three BELL characters (CTRL-G) are sent to your computer with the "***CONNECTED to" or
         "DISCONNECTED from (call)" message.

Set CBELL *ON* if you want to be notified when someone connects to, or disconnects from, your station in packet or upon establishing a link in AMTOR or PACTOR.

CDelay *n*   Default: 0

n   Can range from 1 to 4 with increments in 10 ms. 1 is 10 ms., 2 is 20 ms, and so on.

CDelay adds an additional delay to the response of a CS in AMTOR or PACTOR.

CONmode *CONVERSE|TRANS*   Default: CONVERSE
Mode: packet, PACTOR   Host: CE

CONVERSE   Your DSP enters the Converse mode when a connection is established.
TRANS   Your DSP enters the Transparent mode when a connection is established.

CONMODE selects the mode your DSP enters after entering the "connected" state. For general operation, use the default setting.

CONStamp *ON|OFF*   Default: OFF
Mode: packet, PACTOR   Host: CG

OFF   Connect status messages aren't time stamped.
ON   Connect status messages *are* time stamped.

CONSTAMP activates time stamping of *** CONNECTED status messages. If CONSTAMP is *ON* and DAYTIME (the DSPs internal clock) is set, the time is sent with CONNECT and DISCONNECT messages. For example, if the clock is set and CONSTAMP is *ON*, a connect and disconnect sequence would appear like this:

```
cmd:10:55:23*** CONNECTED to KB6IUX
cmd:10:55:59*** DISCONNECTED: KB6IUX
```

CWid *n*   Default: $06 (CTRL-F)
Mode: Baudot/ASCII RTTY/AMTOR/PACTOR   Host: CW

The CWID command lets you change the "send CWID" control character typed at the end of your Baudot and
ASCII RTTY dialogue.

When the DSP reads this character embedded in the text or keyboard input, it switches modes and sends your
callsign in Morse code, at the keying speed set by MSPEED. As soon as your callsign has been sent in Morse, the
DSP turns off your transmitter and returns to receive.

DCdconn *ON|OFF*   Default: OFF
Mode: packet, AMTOR, PACTOR, KISS and RAWHDLC   Host: DC

OFF   RS-232 cable Pin 8 is permanently set high (default).
ON   RS-232 cable Pin 8 follows the state of the CON (or DCD) LED.

DCDCONN defines how the DCD (Data Carrier Detect) signal affects pin 8 in the RS-232 interface to your
computer or terminal. Some programs such as PBBS software require that DCDCONN be *ON*.

DCDCONN also works in the RAWHDLC and KISS modes. In RAWHDLC and KISS, no packet connections are
known to the DSP. With DCDCONN *ON*, the state of the radio DCD is sent to the RS-232 DCD pin (pin-8). This
may be necessary to some Host applications that need to know when the radio channel is busy.

EAS *ON*/*OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTOR and MORSE   Host: EA

OFF   Echos characters when sent to the DSP by the computer.
ON   Echos characters actually sent on-the-air by the DSP.

The Echo-As-Sent (EAS) command functions in all modes *except* packet. EAS lets you to choose the way data is
displayed on your monitor screen or printer. To display your text on your computer screen exactly as you're typing
it in or while sending it from a disk file, leave EAS *OFF*. To see the actual data being sent from your DSP-232 to
your radio and transmitted on the air, set EAS *ON*.

With EAS *ON* in Morse and Baudot RTTY, you'll see only uppercase characters on your screen and the data
actually transmitted to the other station.

With EAS *ON* in AMTOR mode A and PACTOR (ARQ), you'll see characters echoed on your screen only *after*
the distant station has validated *ack*ed your block of three characters. For packet, the MXMIT command should be
used.

Nulls ($00) are not echoed, including the nulls produced by DIDDLE *ON* in ASCII.

ERrchar *n*   Default: $5F (_)
Mode: AMTOR, PACTOR, and Morse   Host: ER

"*n*"   A hexadecimal value from $00-$7F used to denote the error character used by the DSP for Morse, ARQ,
           FEC, PACTOR, NAVTEX, and TDM.

"*n*" is a hex value $00-7F, default $5F (underscore). This is the character that the DSP displays when it receives a
corrupted or bad character in Morse, ARQ, FEC, PACTOR, NAVTEX or TDM. You may want to set this character

to $2A (asterisk), $07 (bell), $20 (space) or $00 (null)—whichever works best for you. ERRCHAR *ON* or ER *Y* restores the default.

GUSERS *n*   Default: 0
Mode: packet, AMTOR, PACTOR   Host: GU

"*n*"   0 to 3 specifies the maximum number of users allowed to use your node.

GUSERS allows up to *n* number of stations to connect to your MYGATE call. The argument "*n*" may be 0-3, with zero meaning no station can use your node. Alternatively, *n* can be thought of as the maximum number of *pairs* of stations which may be connected through your Gateway.

Your must have your MYGATE call entered and GUSERS set to a number greater than 0 to enable the DSPs node function.

HEReis *n*   Default: $02 (CTRL-B)
Mode: Baudot, ASCII, AMTOR and PACTOR   Host: HR

"*n*"   Is the hex representation ($01-$7F) of the character that causes the AAB string to be sent in the middle of transmitted text.

If you want to send your own AAB string for identification during a transmission, simply enter the HEREIS character.

MDMon *ON|OFF*   Default: OFF
Mode: AMTOR, PACTOR and packet/Maildrop   Host: Mm

OFF   You don't monitor a connected station's activity in your Maildrop.
ON   Lets you monitor a connected station's activity in your Maildrop.

MDMON permits you to monitor activity on your AMTOR, PACTOR or packet Maildrop, showing you both sides of the QSO. (Packet headers aren't shown while a caller is connected.) When no one is connected to your Maildrop, channel activity is monitored according to the setting in MONITOR.

Note that Maildrop connect and link status messages will be displayed even with MDMON *OFF*. These status messages are important and allow you to see who is connected to your Maildrop. They can be disabled, however, with UBIT *13*. (See UBIT for more information).

MDPrompt *text*   Default: (see text)
Mode: packet/PACTOR Maildrop   Host: Mp

text   Any combination of characters and spaces of up to 80 characters.

MDPROMPT is the command line sent to a calling station by your packet or PACTOR
Maildrop in response to a Send message command. The default text is:

```
Subject:/Enter message, ^Z (CTRL-Z) or /EX to end
```

Text before the first slash is sent to the other station as the Subject prompt; text after the slash is sent as the message text prompt.

If there's no slash in the text, the subject prompt is "Subject:" and the text prompt message is `Enter message,` `^Z (CTRL-Z) or /EX to end.`

MFilter *n1*[,*n2*[,*n3*[,*n4*]]]   Default: $80
Mode: Morse, Baudot ASCII, AMTOR, PACTOR and packet   Host: MI

"*n*"   0 to $80 (0 to 128 decimal) specifies an ASCII character code.
            (Up to four characters may be specified separated by commas.)

Use MFILTER to select up to 4 characters to be "filtered" or excluded from Morse, Baudot, ASCII, AMTOR, PACTOR and monitored packets with parameters *n1 - n4*, the ASCII codes for the characters you want to filter. The special value of $80 (default) filters all characters above $7F and *all* control-characters except (RETURN) ($0D), LF ($0A), and (TAB) ($09).

MId *n*   Default: 0 (00 sec.)
Mode: packet, AMTOR, PACTOR   Host: Mi

"*n*"   0 - 250 specifies the Morse ID timing in units of 10-second increments.
0   Zero disables this function.

If "*n*" is set to a value between 1 and 250, the DSP will periodically issue a 20 wpm Morse ID. For example, a MID of *177* would cause a Morse ID to be sent every 1,770 seconds (29.5 minutes). A Morse ID will be transmitted only if a packet was sent since the last Morse ID. The Morse ID uses TXDELAY, PPERSIST and DCD.

If MID is set to a value other than *0*, ID will force a Morse ID immediately. If both HID and MID are active, the Morse ID will be sent first.

MID normally sends a Morse ID using on/off keying of the low tone. If FSK keying of both tones is desired to prevent stations from transmitting over your Morse ID, see the UBIT *12* command.

Morse ID now works in AMTOR and PACTOR modes on both ARQ and broadcast transmissions. Because of the nature of these operating modes, the destination station will go into an error state when your TNC sends a Morse ID, but should recover data synchronization immediately afterwards.

MMsg *ON|OFF*   Default: OFF
Mode: packet, AMTOR and PACTOR Maildrop   Host: MU

OFF   The MTEXT message isn't sent at all.
ON   The stored MTEXT message is sent as the first response after an AMTOR or PACTOR link or packet
            connect to the Maildrop is established.

MMSG enables or disables automatic transmission of the MTEXT message when your AMTOR, PACTOR or packet Maildrop links with another station.

MODem   Default: 12
                                                                                                                                                     Host: Mg

n   0 to 21 signifies a modem number from the list below.

The MODEM command determines what DSP Modem is selected for the DSP-232. The Modems available in EPROM are listed below.

The DSP modems included in the DSP-232 can be shown with the DIRECT(ory) command and are listed below.

```
 1:  FSK    45  bps  2125/2295
 2:  FSK   100  bps  2125/2295
 3:  FSK    45  bps  1615/1785
 4:  FSK   100  bps  1615/1785
 5:  FSK   200  bps  2110/2310
 6:  FSK   200  bps  1600/1800
 7:  FSK   200  bps  2125/2550
 8:  FSK   200  bps  1275/1700
 9:  FSK   200  bps  2125/2975
10:  FSK   200  bps  1275/2125
11:  FSK   300  bps  2110/2310
12:  FSK   300  bps  1600/1800
13:  FSK  1200 bps  VHF
14:  PACSAT 1200 bps BPSK
15:
16:  FSK   9600 bps  K9NG/G3RUH
17:  Analog FAX HF 1450/2500 FM
18:  Analog FAX APT 2400 Hz AM
19:  Zero-Crossing FAX 1300/2100
20:  Morse 750  Hz.
21:  OSCAR-13 Telemetry 400 bps BPSK
cmd:
```

MTExt *text*   Default: See sample
Mode: AMTOR, PACTOR and packet Maildrop   Host: Mt

text   Any printable message up to a maximum of 120 characters. (Spaces count as characters.)

MTEXT is the Maildrop's "answering machine message" similar to CTEXT. With MMSG *ON*, the MTEXT message is sent when a station links to your AMTOR or packet Maildrop.The default text is:

```
Welcome to my AEA DSP232 Maildrop.
Type H for help.
```

MTEXT can be reset with a *%*, *&*, *N*, *NO*, *NONE* or *OFF* as arguments.

MYcall *call*[*-n*]   Default: DSP232
Mode: packet and PACTOR Maildrop   Host: ML

call   Your callsign
"*n*"   0-15, indicating an optional SubStation ID, (SSID)

Use the MYCALL command to load your callsign into your DSP. The DSP232 default callsign is present in your DSPs ROM when the system is manufactured. This "artificial call" *must be changed* for packet operation.

The SSID is usually added so the DSP can respond to two different tasks—as a "base" station and digipeater, a digipeater and Maildrop, or a base station and Maildrop. An example of using the SSID suffix is given in *Chapter 5: Packet Operation*.

Two or more stations can't use the same call and SSID on the air at the same time. Use a different SSID this is the case.

MYCALL must be entered for you to use the PACTOR Maildrop; the callsign is used for message routing and identification.

MYcall *call*[-*n*]   Default: DSP232
Mode: packet and PACTOR Maildrop   Host: ML

call   Your callsign
"*n*"   0-15, indicating an optional SubStation ID, (SSID)

Use the MYCALL command to load your callsign into your DSP. The `DSP232` default callsign is present in your DSPs ROM when the system is manufactured. This "artificial call" *must be changed* for packet operation.

The SSID is usually added so the DSP can respond to two different tasks—as a "base" station and digipeater, a digipeater and Maildrop, or a base station and Maildrop. An example of using the SSID suffix is given in *Chapter 5: Packet Operation.*

Two or more stations can't use the same call and SSID on the air at the same time. Use a different SSID this is the case.

MYCALL must be entered for you to use the PACTOR Maildrop; the callsign is used for message routing and identification.

MYPTcall *call*   Default: none
Mode: PACTOR   Host:Mf

Use the MYPTCALL comand to load your PACTOR call into your DSP. (Limit: 10 characters.)

If you haven't loaded your callsign into the DSP with MYPTCALL, the callsign loaded in MYCALL will be used. The difference between MYCALL and MYPTCALL is that MYCALL allows only the dash (-) to be used while MYPTCALL will allow any punctuation with the call. Example: MYPTCALL *KB6IUX/AE.*

If calls have not been loaded into either MYCALL or MYPTCALL, the DSP won't allow PACTOR transmission—an error message of `Need MYCALL` will be displayed if transmission is attempted.

OVer   Immediate Command
Mode: AMTOR, PACTOR   Host: OV

An immediate command that reverses the link direction from ISS to IRS; this can be considered the opposite of the function of ACHG. The changeover happens as soon as possible—the DSP doesn't wait for all the characters in its buffer to be sent.

OVER should be thought of as analogous to RCVE—as neither command waits for the buffer to empty—the same way the PTOVER character is analogous to the RECEIVE character (both *wait* for empty). Host applications can use ZSTATUS to detect when all characters have been sent.

In PTCONN, this command accomplishes the same thing as sending the PTOVER character. OVER is useful in Host mode when sending transparent data (CONMODE *TRANS*). To change from ISS to IRS, you'd normally send the PTOVER character, but in Transparent mode, the character would be sent as data and would not change the link direction. OVER changes the direction without the need to change CONMODE to CONV first.

In AMTOR ARQ, this command inserts "+?" into the data stream being sent. With EAS *ON*, the "+?" is echoed to the terminal.

PACTor   Immediate Command
Mode: PACTOR   Host: Pt

PACTOR is an immediate command that switches the DSP into the PACTOR mode of operation.

PACTOR is a mode of data communication that combines some of the features of both AMTOR and packet. The abbreviated command is PT. It has both a linked mode called ARQ and a non-linked mode called unproto.

PASs *n*   Default: $16 (CTRL-V)
Mode: packet, ASCII and PACTOR   Host: PS

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code that you can .

PASS selects the ASCII character *"n"* used for the "pass" input editing commands. The PASS character signals that the following character is to be included in a packet PACTOR or ASCII text string. For example, if you're typing in text and want to enter three RETURNs so you can put a line space between two paragraphs, you'd do this:

> *"...here's the end of the first paragraph."* (*CTRL-V*)+(RETURN)+(*CTRL-V*) (RETURN)+(*CTRL-V*)+(RETURN) . *"Now this line will appear after a line space."*

The line will appear at the other station like this:

> *"...here's the end of the first paragraph."*

> *"Now this line will appear after a line space."*

If you had just pressed (RETURN) at the end of the word, "paragraph," you would've forced a packet to be sent. Press (RETURN) again, and you would've forced an empty packet to be sent. Press (RETURN) yet again, and another empty packet would've been sent. This happens because when you press RETURN, it normally forces a packet to be sent. However, by inserting a (CTRL-V) before entering a (RETURN), you disable the function of (RETURN) in the Command mode and allow it to be used in your outgoing text to act as a "real" (RETURN). So, the PASS character "hides" the next character's function.

PT200 *ON|OFF*   Default: ON
Mode: PACTOR   Host: PB

ON   Automatically increases the data transmission to 200 baud if HF conditions allow it..
OFF   You disable the automatic shift function to 200 baud is disabled.

The normal operating speed for PACTOR is 100 baud. If conditions are good, its speed automatically increases to 200 baud. If—because of deteriorating HF conditions—the error rate becomes too high at 200 baud, the data speed will automatically revert back to 100 baud.

There can be conditions where the data rate is frequently shifting because of rapidly changing conditions or fading; this can cause data loss of information or lock-up during reception.

PTConn [*!*]*aaaa*(*aa*)   Immediate Command
Mode: PACTOR   Host:PG

aaaa(*aa*)   The callsign of the PACTOR station to be called.

PTCONN starts the PACTOR connect protocol. To start a PACTOR connect, type PTC followed by the other station's callsign. Example:

cmd: PTC *WF7A*

As soon as (RETURN) is pressed, the DSP will key your transmitter on and off with the PACTOR connect sequence. If you're connecting with a station by long path (more than halfway around the world), use an exclamation mark before the callsign:

PTC *!WF7A*

This changes the PACTOR timing to allow for the extended radio propagation time.

PTHUFF *n*   Default: 0
Mode: PACTOR   Host:PH

"n"   0 to 3, specifying a type of compression that may be used in PACTOR.

To enhance the effective data rate in PACTOR, a data compression scheme (called Huffman) may be automatically enabled.
- *0*   No compression (default)
- *1*   Huffman encoding.
- *2, 3*   Presently not implemented but reserved for future use.

Instead of using the normal 8-bit ASCII representation of a character, Huffman encoding assigns each character a code that may be as few as 2 bits—for the most-used characters—to as long as 15 bits for the least-used characters. For English (and most other) languages, the use of Huffman compression results in a smaller number of bits necessary for a given message. For messages consisting of non-text information such as computer programs, Huffman compression would need more bits than ASCII and would be less efficient.

If PTH is *OFF*, PACTOR will never use Huffman compression. With PTH *ON*, Huffman compression will be used if it is more effective. *Don't use Huffman compression with binary file transfers as it only works with 7-bit data.*

PTList   Immediate Command
Mode: PACTOR   Host: PN

PTList switches your DSP into the PACTOR listen mode.

In PACTOR Listen (and ALIST) modes, monitored connect attempts are displayed like this: >W1AW <C>

The callsigns are shown one per line and are meant to resemble the way the TNC monitors connect frames in the packet mode. Since neither mode supports identification within the calling blocks, no source callsign can be shown.

You can usually monitor a PACTOR contact between two connected stations using PTLIST. Since your station isn't part of the error-free link, if the CRC check doesn't produce a correct check sum nothing will be displayed on your screen. If the receiving station requests a repeat and you've copied the packet without errors, the message won't print twice.

PTOver *n*   Default: CTRL-Z ($1A)
Mode: PACTOR   Host:PV

"n"   A hexadecimal value from $00 to $7F used to select the change-over character used in linked PACTOR.

PTOVER is the character—(CTRL-Z) by convention—that's used to change the direction of data transmission in a linked PACTOR QSO. (CTRL-Z) is the character defined by PTOVER that switches *your* system from being the Information Sending Station (ISS) to the Information Receiving Station (IRS) and switches the *distant* system from being the IRS to the ISS.

This single character, (CTRL-Z), operates like the "+?" does in AMTOR.

Also see ACHG.

PTRound *ON|OFF*   Default: OFF
Mode: PACTOR   Host:Pr

OFF   Returns the TNC to the PACTOR-Standby mode after a PTSEND transmission.
ON   Returns the TNC to the PACTOR-Listen mode after a PTSEND transmission.

PTROUND facilitates PACTOR "roundtable" conversations with multiple stations using the PTSEND (FEC) mode as opposed to the Connected mode.

As the unit finishes sending a PTSEND transmission it normally returns to PACTOR Standby mode. With PTROUND *ON*, the unit returns to PTLIST instead in order to copy another station's PACTOR transmission. PTROUND has no effect when PACTOR connection ends—the unit will always return to PACTOR Standby.

PTSend *n x*   Default: 1,2
Mode: PACTOR   Host: PD

"n"   1 or 2 selects the transmit baud rate. (1 = 100 baud, 2 = 200 baud)
"x"   1 to 5 selects the number of times the data is repeated.

PTSEND *n x* initiates an unproto PACTOR transmission. To end the transmission, type (CTRL-D).

In order to increase the probability of correct transmission, the unproto PACTOR transmission sends the message data a specified number of times. For example, entering PTSEND *1 3* would start a 100 baud unproto transmission with the message sent 3 times.

The transmission may be started using the default (100 baud, 2 repeats) by just entering *PTSEND*.

QPTor *n*   Default: 5 (Modem 5)
Mode: PACTOR   Host: QP

n   Modem number to be selected when PACTOR is entered.

QPTOR sets the DSP-232 modem that will automatically be selected when the PACTOR mode is entered.

Rcve   Immediate Command
Mode: Baudot/ASCII/AMTOR/PACTOR/ Morse   Host: RC

RCVE is used in Morse, Baudot, ASCII, AMTOR, and PACTOR modes to switch your DSP from transmit to receive.

You *must* (RETURN) to the Command mode to use RCVE.

RECeive *n*   Default: $04 (CTRL-D)
Mode: Baudot/ASCII/Morse/AMTOR/PACTOR   Host: RE

"n"   0 to $7F (0 to 127 decimal) specifies an ASCII character code.

Parameter *"n"* is the numeric ASCII code for the character you'll use when you want the DSP to (RETURN) to receive.

The RECEIVE command allows you to insert a character in your typed text that will cause the DSP to (RETURN) to receive after all the text has been transmitted.

TMail *ON|OFF*   Default: OFF
Mode: AMTOR and PACTOR   Host: TL

OFF   The DSP only operates as a normal AMTOR CCIR 476 or 625 or PACTOR controller.
ON   The DSP operates as a personal AMTOR or PACTOR BBS or Maildrop.

The DSPs Maildrop is a personal mailbox that uses a subset of the W0RLI/WA7MBL PBBS commands and is similar to operation of APLINK stations. Turn TMAIL *ON* to allow other stations to access your Maildrop in ARQ PACTOR; third-party messages aren't accepted by your AMTOR or PACTOR Maildrop unless 3RDPARTY is *ON*.

TRACe *ON|OFF*   Default: OFF
Mode: packet/ Baudot/AMTOR/PACTOR   Host: TR

OFF   Trace function is disabled.
ON   Trace function is activated.

Packet: TRACE activates the AX.25 protocol display. With TRACE *ON*, all received frames are displayed in their entirety, including all header information. The TRACE display is shown as it appears on an 80-column display. The following monitored frame is a sample:

```
KB6IUX*>TESTER <UI>:
This is a test message packet.
```

Byte		Hex			Shifted ASCII	ASCII
000:	A88AA6A8	8AA460AE	6494AAA0	406103F0	TESTER0KB6IUX0.x	......`.d...@a..
010:	54686973	20697320	61207465	7374206D	*449.49.0.:29:.6	This is a test m
020:	65737361	67652070	61636B65	742E0D	299032.80152:..	essage packet...

The byte column shows the offset into the packet of the first byte of the line. The hex display column shows the next 16 bytes of the packet, exactly as received, in standard hex format. The Shifted ASCII column decodes the high-order seven bits of each byte as an ASCII character code. The ASCII column decodes the low-order seven bits of each byte as an ASCII character code.

Interspersed command prompts and even the L and R commands would have no effect on the final data, and it could be translated back to binary data with a computer program.

WIdeshft *ON|OFF*   Default: OFF
Mode: Baudot/ASCII, RTTY, AMTOR, PACTOR   Host: WI

OFF   RTTY tones are shifted 200 Hz (emulates 170-Hz shift).
ON   RTTY tones are shifted 1000 Hz.

WIDESHFT permits the use of the DSP on VHF or HF with either wide (1000 Hz) or narrow (200 Hz) shifts. Many amateur radio VHF and HF RTTY operators use 170-shift. The DSPs 200 Hz shift is well within the filter tolerances of any RTTY demodulator in general service. MARS stations will find WIDESHFT generally compatible with MARS and Commercial 850 Hz shift RTTY operations.

WOrdout *ON|OFF*   Default: OFF
Mode: Baudot, ASCII, AMTOR, PACTOR and Morse   Host: WO

OFF   Inputted characters are sent directly to the transmitter.
ON   Inputted characters are held in the transmit buffer until a space, (RETURN), LF, (TAB), RECEIVE,
         CWID, ENQ or *+?* character(s) is typed.

Use WORDOUT to choose whether or not you can edit while entering text for transmission.

With WORDOUT *ON*, each character you type is held in a buffer until you enter a space, (RETURN), LF, ENQ
character ($05 [CTRL-E]) or the *+?*. You can edit or delete words before the transmit buffer's contents are sent to
the radio as long as you haven't entered pressed (SPACE), (RETURN) , LF, etc.

With WORDOUT *OFF*, each character you type is sent to the radio just as you typed it, without any delay. Also,
the backspace character is transmitted in Baudot, ASCII, AMTOR and PACTOR modes. With WORDOUT *ON*,
pressing the backspace key cancels out the preceding character and neither are transmitted.

In Baudot and AMTOR, the backspace character is transmitted as a "?" since there's no backspace in those modes.

In ASCII the backspace character is transmitted, but the destination station must be able to pass it. AEA products
should have MFILTER set to zero to allow backspaces to print.

Chapter 13

Troubleshooting

Overview

This chapter is by no means all-inclusive of everything that could cause your DSP not to operate as you expected, but it is a guide to help you solve the most common problems that occur.

Although the DSP is a complex piece of equipment, we've found that most troubleshooting problems are directly attributable to five, simple sources:

- ♦ Insufficient power supply
- ♦ Incorrect or improperly wired connections
- ♦ Incorrect tuning procedure
- ♦ Command unfamiliarization (that is, you didn't read the manual!)
- ♦ Software incongruities

Because there are scores of different software and hardware configurations available to use with the DSP-232, it's impossible to list all the solutions to the software/hardware-related problems you may encounter, but this Troubleshooting section should help you out of common problem situations.

A Troubleshooting Primer

The whole trick to troubleshooting is playing detective: you're job is to determine the cause of the problem by eliminating what can—or can't—be the culprit. By using your head, you'll succeed 99% of the time.

The first step is to break down the main components in your system into subsystems. They are:

Power supply
Power supply cable
DSP-232
Cable from DSP to computer
Computer/Software
Cable from DSP to radio
Radio

If you have an idea which sub-system might be the culprit, try to substituting it with a known good one. If your system works okay after the substitution is in place then you've found the culprit component.

If, after checking all the sub-systems and performing the loop-back test for proper operation, your DSP still fails to perform then you should either RESET, RESTART or REINIT the TNC. (Read about each command for more information about their function and effect.)

The Power Supply

The DSP needs to be fed by a regulated power supply that can provide *at least 12 VDC @ 1 Amp load*. Many amateurs connect all their station equipment to a single power supply and expect it to provide enough "juice" to make their tranceiver(s) operate at full power, operate its accessories or external ones like an autotuner, SWR meter, keyer, and the DSP-232. Alternately, you may have purchased a "power cube" that's dedicated to your DSP and no other device. With both arrangements, however, if the power supply is insufficient to supply all the electrical needs of the device(s) connected to it then something has to suffer—which brings us to the DSP.

You can find out if the DSP is getting enough juice by removing its chassic cover and measuring the voltage and current—while everything connected to its power supply is up and running at maximum current consumption—across and through its fuse. Measure the voltage from one end of the fuse to the chassis (or other grounding point). For the current reading, turn the DSP off, lift one end of the fuse, connect your meter's probes in series between the fuse holder and lifted fuse end, then turn the unit back on. If the DSP is receiving less than adequate power and operating peculiarly, you'll need to connect a beefier power supply to power it.

The Power Supply Cable
This is the second item you should check if your DSP doesn't power up; it's also the easiest subsystem component to troubleshoot. If you used the power cable that accompanied the DSP in its shipping carton, remember that the white stripe that runs alongside one edge of the wires is the positive (+) lead that goes from the (+) terminal on your power supply to the center conductor of the connector that plugs into the DSP; the other conductor, of course, goes to the (-) of the power supply and "sleeve", or outer ring, of the DSPs power connector. If you have these connected incorrectly or the supplied cable is polarized incorrectly, the DSP won't work, period.

If you're using a dedicated power cube for the DSP check it's polarity—no manufacturer is perfect and on rare occasion, the polarity of the wires might have been accidentally swapped. Again, use your VOM to see if this is the case.

If you find that the polarity is correct, then tug gently at the wires at both the power supply end and connector end while measuring voltage or continuity; Tugging can reveal if there's an "open" in one, or both, of the conductors. If you find an open, either repair the damaged section, replace the cable and/or the power supply.

The DSP-232
Each DSP is tested at AEA prior to shipping to make sure it operates flawlessly. Most of the time, however, troubles with the DSP are mode specific and related to cabling, power supply and "pilot error," rather than the hardware itself.

For mode-specific problems, refer to the respective chart at the end of this chapter.

Cable from DSP to Computer
If you use the cable supplied with the DSP-232, you should not have a problem. If you use a different cable for some reason, make sure the cable is not fully loaded (all pins being used). Only pins 1-3 and 5-8 are used. Refer to *Chapter 2* of this manual for an explaination of the pin assignments.

Computer/Software
If you don't have your COM port and software set up properly for modem communication, you won't be able to "talk" to the DSP. Since there are literally hundreds of computer configurations, it's up to you to make sure your system is set up correctly for serial port communciations.

Cable From DSP to Radio
Very rarely, the wires at the connector (DSP) end of the cable aren't seated correctly in their groves so proper contact isn't made; inspect the connector, and wiggle the cable leading into the connector while making a continuity check to see if this the problem.

More likely, you might have accidentally inserted this connector so the cable faces *up* rather than *down* as it leads away from the DSP. The other problem, of course, is that you didn't wire the radio end of the cable correctly for

your radio. Remember, *if there is a discrepancy between your radio's mike (or accessory port) connections and the ones listed in Appendix A, call AEA or your radio's manufacturer for assistance.*

Radio
If the DSP passes the loop-back test (*Chapter 3 - Radio Installation*) and you're absolutely sure that you wired the mike connector correctly , then you probably have your radio set in the wrong mode for operation, or if it's an older model radio, you need to set the DSPs timing parameters to compensate for slow key-up times and such.

The only specific radio problems we're familiar with are with some of the Kenwood HF models:

Kenwood TS-440S: Problems exist when hooking up the DSP to the TS-440S' accessory jack—the radio won't operate at full power whereas when you use the mic jack there's no problem; the problem has to do with preamplification of the audio signal. To compound the problem, each TS-440S seems be different: some have no problem at all and others do, so a generic fix for this problem isn't easy. We suggest you try removing R151 (for Radio Port 1) and/or R152 (for Radio Port 2) in the DSP, and if necessary, place a jumper across R160 to boost the output the DSPs output.

Kenwood TS-450/850/950: All three of these models suffer from RFI problems when hooking up the DSP to the mic connector, so we strongly suggest using their ACC ports. In *Appendix A* are special pinout diagrams for these models.

It's also recommended that if you use the ACC ports on the 440 and 940 radios, that a separate ground wire be run from the radio's ground lug to one of the screws that fasten the motherboard to the chassis inside the DSP.)

In Case You Need to Call for Help…
. . . call our Customer Service/Technical Support line at (206) 775-7373 between 8:00-4:30 Pacific time, weekdays. Please have your DSP's serial number and firmware version date available. (The version date is listed the first screen that comes up when you turn on the DSP.) We'll also need to know the nature of any other equipment that's connected to the DSP.

When you call, please have your DSP up and running beside the phone, if possible. Our technician(s) will likely ask you to perform certain keyboard routines to aid in diagnosis of the problem. Try to have a voltmeter handy, too.

AEA also provides technical assistance by way of fax (206-775-2340) and your personal computer through CompuServe's *HamNet* e-mail. If you're already a CompuServe subscriber, enter GO HAMNET and leave mail for us there in Section 13, or send your e-mail directly to our account (76702,1013).

Many of the products that are sent to us for repair are in perfect working order when we receive them. For these units, there is a check-out fee which we'll charge you. Please perform whatever steps are applicable from the installation sections of this manual before you call or write—you'll only add to the cost of your phone call if you don't! And please...**DON'T** return your DSP to us without contacting us first: we'd like to help you troubleshoot the problem over the phone (or by mail) first, saving you both time and money.

If you're instructed by one of our techs to return your unit to us, write the RMA number issued to you on the outside of the shipping carton—it will speed the processing of your unit so it can be returned to you as soon as possible. Inside the carton, enclose a note with your name, address, daytime phone number, RMA number, and a description of your DSPs problem.

If you send us the DSP by UPS it must be sent to our street address, *not* the post office box number. Our street address is:

> AEA. Inc.
> Attn: Repairs
> 2006 196th St. SW

Lynnwood, WA 98036-0918 USA

We'll need your street address for UPS return—be sure to use it.

UPS Service (Brown Label) takes 5-6 days to reach us, Blue takes 2-3 days. Red is an overnight service and is expensive. Send the DSP in a way that it can be traced if we can't verify receipt of shipment. We suggest UPS or insured postal shipment.

If the DSP is still under the original owner's warranty, AEA will pay the cost of the return shipment to you (U.S. only--international customers are responsible for all shipping costs). The current policy is that it'll be returned UPS Brown if received Brown or by US Mail; Blue, if received Blue or Red —or it will be returned as you prefer if you furnish the return cost for the method you select.

If the DSP is out of warranty, it'll be returned by UPS Brown COD unless:
1) It was received UPS Blue/Red in which case it will go back UPS Blue COD;
2) If you designate billing to VISA or MasterCard;
3) you pre-pay the service charges with a personal check, or
4) you specify some other method of return.

We can't accept American Express or Discover cards. When you call for an RMA number, the technician can estimate the repair charges for you over the phone. This is another good reason to call us before sending your unit in for repair.

Typically, we repair equipment in five-to-ten working days after it has arrived at AEA *if we have all the facts*. If we must call you, it may take longer. AEA isn't responsible for damage caused by lightning, non-professional alterations, "acts of God", shipping damage, poor storage/handling, etc. (We'll make note of any shipping damage upon receipt.) See Appendix D of this manual for Warranty information.

Should your warranty card not be on file at AEA, you'll need to send the proof of purchase date to receive warranty service. Typically, a copy of your invoice from an AEA dealer will suffice.

The warranty is for the original owner only and is not transferable.

General Error Messages
An error message is displayed if the DSP doesn't understand what you typed or it needs more information. If you see this message, look up the command you want to enter to make sure you're entering it correctly.

`?What?`	Your DSP didn't understand your instructions—did you type the command in correctly?
`?bad`	You typed a command name correctly, but the remainder of the command line wasn't understood.
`?callsign`	You typed a callsign that doesn't meet the DSP's requirements.
`?clock not set`	You typed the command DAYTIME, but you haven't yet set the clock.
`?not enough`	You didn't type enough arguments for a command that needs several.
`?range`	You typed a numeric argument too large or too small for that command.
`?too many`	You typed too many arguments for the command to accept.
`?too long`	You typed a command line that is too long. For example, if you type a BTEXT or CTEXT message that is too long you'll get this message.

`?need ALL/NONE/YES/NO`

> This message indicates you have forgotten the *ALL*, *NONE*, *YES* or *NO* arguments in the CFROM, DFROM or MFROM commands.

`*** Transmit data remaining`

> You'll get this if the DSP is commanded back to receive (using the RCVE command) while it still has data in the transmit buffer waiting to be sent. To clear the transmit buffer, enter *TC.*

`not while in (MODE)`

> This message will appear any time you try to do something that isn't permitted in the current operating mode.

`Serial port configuration will change on next RESTART`

> This message means you've changed TBAUD, word length AWLEN, or PARITY. When you type the RESTART command, the new baud rate will take effect.

`?need MYSelcal or ?need MYIdent`

> This message will appear if you try to communicate with another AMTOR station before you have entered a valid SELCALL (MYSELCAL or MYIDENT.)

`?not enough memory available`

> This message appears if you try to change to the FAX mode when the Maildrop is full.

Packet Error Messages

In addition to the General Error Messages, the following messages may appear when entering packet related commands.

`?need MYcall`
> Appears if you attempt to make a packet connection but haven't yet entered your callsign in MYCALL.

`?not while connected`
> You attempted to change MYCALL or AX25L2V2 while in a connected state.

`?not while disconnected`
> You tried to set CONPERM while disconnected.

`LINK OUT OF ORDER, possible data loss`
> You're CONPERMed to another packet station but the link has failed.

`?VIA`
> You typed more than one callsign for the CONNECT or UNPROTO commands without the VIA keyword.

`?channel must be 0-9`
> You typed an invalid channel character after the CHSWITCH character.

`?different connectees`
> You tried to connect to more than one station on the same channel.

`?already connected (or attempting connection) to that station`
> You tried to connect to a station to which you're already connected.

`too many packets outstanding`	You typed enough data to fill the outgoing buffer in either the Converse or Transparent mode. You can't re-enter Converse or Transparent mode until some of the packets have been sent.
`WARNING: Beacon too often`	You've set the BEACON interval timer to less than *90* (15 minutes) which is too often for busy channels.
`WARNING: CHeck/FRack too small`	You've set the CHECK timer for too short a time relative to the FRACK timer.
`WARNING: RESptime/FRack too large`	You've set the RESPTIME timer for too long a time relative to the FRACK timer.
`WARNING: TXdelay too short`	The TXDELAY timer has been set too short to send at least one complete flag before the start of a packet.
`WARNING: AUdelay > TXdelay`	The AUDELAY timer has been set equal to or greater than the TXDELAY timer.
`Packet Link Status Messages`	Link status messages show you the status of AX.25 connections in which your DSP is involved.
`*** connect request:call1 [via call2[,call3...,call9]]`	Your DSP has received, but not accepted, a connect request from another station.
`*** DISCONNECTED:` *call*	Your DSP has switched to the disconnected state. This message may be preceded by a message explaining the reason for the disconnect.
`*** Retry count exceeded` `*** DISCONNECTED:` *call*	Your DSP has been disconnected because of a retry failure, rather than a disconnect request, from one of the stations.
`***` *call* `busy` `*** DISCONNECTED:` *call*	Your connect request was rejected by a busy signal from another station.
`FRMR sent: xx xx xx`or `FRMR rcvd: xx xx xx`	You're connected but a protocol error has occurred. Your DSP is trying to re-synchronize frame numbers with the distant station's packet system. The string `xx  xx  xx` is replaced with the hex codes for the three bytes sent in the FRMR frame.

Maildrop Error Messages

```
*** What?
```
You've entered a command that the Maildrop doesn't recognize.

```
*** Need callsign.
```
You've tried to send a message but you didn't specify who you want to send it to.

```
*** Message not found.
```
You tried to list or read message(s) that the Maildrop couldn't find. This also appears if you try to list messages when there aren't any messages in your Maildrop.

```
*** No free memory.
```
You have tried to send a message, but the Maildrop doesn't have any memory left for more messages. You must kill messages now to make room.

```
*** Not your message.
```
A user will get this when trying to read a message number that is addressed to another station.

DSP-232 Status and Error Messages

From time to time, the DSP will generate messages informing you of its status. Error messages will also be generated if the DSP didn't understand a command you've entered. This section describes the DSP's messages and the circumstances which cause them to appear.

Sign-on message:
```
      AEA DSP232 Data Controller
      Copyright (C) 1995 by
      Advanced Electronic Applications, Inc.
      Release DD.MMM.YY
      cmd:
```

The sign-on message appears when you turn on your DSP, after system RESTART or RESET, and after the autobaud routine. The release date is updated whenever the firmware is changed to a later release. Please write this date on the first page of this manual in case it's needed for future reference.

```
DSP232 is using    default values
```
This message appears the first time you turn on your DSP or every time you turn on the DSP if the battery jumper is missing. The message will also appear in response to the RESET command.

```
cmd:
```
This is the Command mode prompt. When this prompt appears, the DSP is waiting for you to issue a command. Anything you type after this prompt is interpreted as a command.

```
was
now
```
Whenever you change a parameter, both the previous value and the new value are displayed.

```
bbRAM scanned, checksum failed!
```
This message indicates there has been an error in the battery backed RAM. A weak lithium battery is the likely cause for this.

```
ERROR: Subroutine, Bank, Addr
```

This message indicates a program error has occurred. Write down any information accompanying this message and call AEA's Technical Support department. If possible, print a DISP Z parameter listing.

`ROM error, checksum $xxxx`

This message indicates there has been a failure in the DSP. If this message appears, call AEA's Technical Support department.

Out-of-the-Box Problems
The majority of these problems are directly attributable to insufficient power.

Problem	Symptom	Cause	Test/Solution
The DSP doesn't power up.	No lights come on.	No power to DSP	Check power supply to see if it's on and the DSPs power cord for an open connection or conductor.
		Blown power supply or DSP fuse	Replace the blown fuse. (Do NOT use over-rated fuses, nor should you try to power up the device if it blows the replacement fuse.)
			If it's the DSP that's blowing fuses, call AEA for assistance.

Computer to DSP-232 Problems
The majority of these problems are directly attributable to correctly addressed serial (COM) ports; incorrect wiring or poor solder joints. Make sure you use *only* pins 1-3 and 8-8 in the DB-9 connector. Also, perform a check of the cable to make absolutely sure it's not a open circuit that's causing a problem.

Problem	Symptom	Cause	Test/Solution
Computer won't talk to DSP.	You don't receive the sign-on (autobaud) message when you power up the DSP.	Open line in cable	Continuity check cable and repair, if necessary.
		Incorrectly wired cable.	Wire correctly.
		Incorrect COM port selected or IRQ conflict.	Select correct COM port. Change IRQ of shared device. (IRQ 5 generally works.)
		Software communication parameters set incorrectly.	Set per the parameters called out in *The Program* section of Chapter 2.
		Inoperative U19/U20.	Replace chips. (Replacement chips can be purchased from Radio Shack, cat # 276-2520 and 276-2521.)

Radio to DSP-232 Problems

The majority of these problems are directly attributable to incorrect wiring or poor solder joints. Perform a continuity check of the cable to make absolutely sure it's not a open circuit that's causing a problem.

Problem	Symptom	Cause	Test/Solution
Radio won't talk to DSP.	You do not receive data on air	Open line in cable	Continuity check cable and repair, if necessary.
		Incorrectly wired cable.	Wire correctly.
		Incorrect modem loaded.	Load proper modem.
		Wrong mode selected.	Change to desired Opmode.

Morse Problems

Problem	Symptom	Cause	Test/Solution
No Copy.	No displayed Morse.	THRESHOLD command not set correctly.	Set command so DCD light comes on and goes off in concert with the signal.
		Not tuned correctly.	Adjust radio tuning so that 800 Hz pitch is produced; tuning indicator's lights should deflect to the left when CW tone is present.
			Set radio's AGC control to "slow."
		Audio level not set correctly.	Adjust volume level to DSP so tuning indicator's lights deflect to the left only when tone is present. DSP needs a minimum of 150 mV$_{P-P}$ of audio voltage to decode Morse; 400 mV$_{P-P}$ is best.

Poor copy (numerous errors during reception.)	Garbled text—lots of "E"s and "T"s.	DSP not synchronized or locked at wrong speed.	Unlock by entering *MO* in the Command mode.
		Poor keying timing.	Other operator is using manual or "bug"-sent Morse; DSP can only decode effectively if sender is using keyer or computer-generated code.
		Audio level not set correctly.	Adjust volume level to DSP so tuning indicator's lights deflect to the right only when tone is present. DSP needs a minimum of 200 mV of audio voltage to decode Morse; 400 mV$_{p-p}$ is best.
		Receiver AGC set to "fast" or poor S/N ratio.	Set radio's AGC control to "slow" or adjust RF gain cotnrol so that background noise level doesn't increase to same level as desired signal between elements, characters, or words.

ASCII/Baudot Problems

Problem	Symptom	Cause	Test/Solution
No Copy.		THRESHOLD control not set correctly.	Set control so DCD light comes on and goes off in concert with the signal.

Garbled copy.		RXREV not set to match signal.	Change RXREV.
		Wrong baud rate.	Change RBAUD and/or ABAUD rate.
		Wrong mode.	Choose correct mode. (Use SIAM for assistance.)
		Encrypted signals being received.	Try different values of BITINV.
		Apparently unable to match baud rate.	XBAUD isn't set to zero.
Steady carrier when transmitting.		Radio set for FSK.	Set radio for USB or LSB, as appropriate.
		No FSK cable installed.	Install cable.
		Radio set for CW.	Set radio for proper mode.
Wrong case of characters displayed in Baudot, FEC.		DSP missed LTRS or FIGS character.	Use "L" or "F" command to force case.
		Other station using—or not using—UnShift On Space (USOS)	Turn off/on USOS.
Tuning difficult.	Tuning bar only moves 2-3 segments.	WIDESHIFT is *ON* with narrow shift signal.	Turn WIDESHIFT *OFF*.
	Tuning bar seems to move just one way from center.	WIDESHIFT is *OFF* with wideshift signal.	Turn WIDESHIFT *ON*.

SIAM Problems

Problem	Symptom	Cause	Test/Solution
DSP repeatedly displays noise as its analysis.		Not properly tuned to station.	Tune the station
		Not tuned to an FSK data transmission.	Try tuning to a different station.

		Signal is encrypted or is a synchronous data transmission—that is, it has no start/stop bits or recognizable repeating pattern.	Tune to a station that uses asynchronous data transmission.
DSP repeatedly displays UNKNOWN MODE during its analysis.		Signal is packet radio.	These transmissions are too short and unpredictable to be analyzed by SIAM.
		Signal is PACTOR.	This signal type is currently unidentifiable by SIAM.

Maildrop Problems

Problem	Symptom	Cause	Test/Solution
Unable to connect to other stations.	DSP prints What? when you try to connect.	You're still logged onto your own Maildrop.	Exit your Maildrop—enter a *B*, for *B*(ye)
Maildrop messages aren't date and time stamped.	When scanning the message list you see " . . . . " in the Date and Time fields.	DSP has been "restarted" since the clock was last set; the power failed the DSP was turned off, or RESTART was issued.	Set clock. Verify stability of the DSPs power supply—must not drop below 12 VDC @ 1 A.
Other stations are unable to connect or link with your Maildrop.	Stations receiving a Busy response.	DSPs memory buffer is full.	Empty buffer by either turning the DSP off, then on again; Start serial communications between the DSP and your computer by pressing (CTRL-Q) and/or (CTRL-X).
		USERS command set to zero.	Set USERS to *1* or greater.
		You're currently logged into your Maildrop.	Exit your Maildrop—enter a *B*, for *B*(ye).
		MailDrop is OFF	Turn MailDrop ON

Packet Problems

Problem	Symptom	Cause	Test/Solution
Unable to transmit.	You copy stations on the frequency you're operating on, but when you attempt to connect your radio doesn't transmit or nothing appears to happen.	Threshold control mis-adjusted.	Adjust Threshold control so that the DCD indicator is on when other stations are sending and is off when the channel is free.
		SQUELCH is turned on and squelch (black) input in the radio cable isn't connected.	Turn SQUELCH *OFF*.
		Squelch input is connected	In virtually all cases we recommend that the Squelch input not be used and to turn SQUELCH *OFF*.
	You copy stations on the frequency you're operating on, but when you attempt to connect your radio doesn't transmit. You eventually see a message that says: `Retry Count Exceeded, Disconnected`	XMITOK is *OFF.*	Turn XMITOK *ON.*
		Fault in radio cable wiring.	Recheck radio cable wiring.
Other stations are unable to connect to you.	Your station appears to ignore connect requests. Other station doesn't acknowlege that your station is on-the-air.	CFROM is set to ignore incoming connect requests.	Set CFROM to *ALL*.
		MYCALL isn't set or is incorrectly set.	Set MYCALL to your callsign.
		USERS set to zero.	Set USERS to a value greater than zero.
		Possible unable-to-transmit problem.	See "*Unable to Transmit in Packet*"

You are unable to connect to others	Your radio seems to transmit and receive normally , that is, it transmits for about 1/2 second every 5 to 10 seconds.	AFSK level not correctly adjusted.	Adjust this control following the procedures in Chapter 3 where FM and SSB calibration procedure is detailed. Proper adjustment of this control is critical to AFSK FM packet operations.
		TXDELAY is too small for your radio; radio takes longer than the period of TXDELAY to key up on the air.	Increase and experiment with setting of TXDELAY for optimum performance.
		AUDELAY is too large for the value of TXDELAY you have chosen.	AUDELAY should be set to no more than 5 units less than TXDELAY when HBAUD is *1200*, no more than 30 units less then TXDELAY when HBAUD is *300*.

Unable to monitor packets	With obvious activity on the channel, you don't see any activity on your screen.	HBAUD incorrectly set.	Set HBAUD to *1200* for VHF FM operations. Set HBAUD to *300* for HF narrow shift applications.
		VHF command incorrectly set.	Turn VHF *ON* for 1200 baud VHF FM operation; Turn it off for HF 300 baud operation.
			Use WHYNOT to assist in isolating the cause or the command incorrectly set.
		Wrong Modem loaded	Load proper modem
	WHYNOT reports -MONITOR	MONITOR turned off	Set MONITOR to a non-zero level. (The default is MONITOR *4*.)
	WHYNOT reports -MCON	You're currently connected, or in the process of connecting, to another station and MCON is set such that received packets aren't being displayed.	Usually, you won't want to monitor while you're connected, especially on busy channels. If you do, set MCON to a value greater than zero.
	WHYNOT reports -MPROTO.	You're receiving packets which contain special network addressing	Either accept that you probably don't really want to see those packets, or turn MPROTO *ON*.
	WHYNOT reports -MBX	You have entered a one or two calls into the special monitoring setting called MBX.	Enter MBX *%* to clear this setting.
	WHYNOT reports -PASSALL	The packet you received has an error and wasn't displayed for this reason.	Turn PASSALL *ON* to see the damaged packets if you want
	WHYNOT reports -frame too short	This was probably due to receiving a squelch burst or noise at the end of a valid transmission.	No corrective action possible.
	WHYNOT reports -frame too long	This packet may have been sent by a station using a higher level networking protocol that allows packets larger than the AX.25 standard.	No corrective action possible.

MHEARD list doesn't display recently heard calls.	No calls listed, or all information is very old	PASSALL is *ON*.	Turn PASSALL *OFF*
Monitored packets not correctly displayed.	You see monitored packets with garbage characters or obvious mistakes.	PASSALL is *ON*.	Turn PASSALL *OFF*.
		Mismatch between terminal or computer program serial settings, and DSPs settings.	Match settings between DSP and computer program. For example, if computer is set for 8 data bits and no parity, set theDSP for AWLEN *8* and PARITY *0*, then issue a RESTART to cause these changes to take effect.

AMTOR and PACTOR Problems

Problem	Symptom	Cause	Test/Solution
Unable to receive. No characters appear on the screen.	PACTOR—You're able to issue commands and receive confirmation from the DSP, but no on-air data is displayed.	Station you're tuned to isn't sending in the mode you are set to receive.	Choose the correct receiving mode for the transmission in progress.
	AMTOR	Mark/Space relationship mismatched between DSP and signal being received.	Toggle RXREV to opposite status, e.g., RXREV *T*, or use SIAM to assist in identifying proper setting of RXREV.
Difficulty tuning in stations.	When you try to tune stations it appears that you can only get one of the tones to track on the tuning display at a time.	WIDESHIFT is turned off while you're trying to receive a station sending with a wide shift.	Turn WIDESHIFT *ON*.
	You aren't able to get a definite spread on the tuning bar when tuning this station.	Station may not be a teletype station—it may be transmitting fax.	Try another station.

Garbled print.	When using AMTOR or ALIST, you occasionally end up getting meaningless sequences of punctuation and numbers.	Your station incorrectly decoded a LTRS character or mistook some other character to be a FIGS character.	If you're in the Command mode, enter *L* to force the DSP to the Letters mode. If you aren't in the Command mode, type a (CTRL-C), first.
	When using AMTOR or ALIST you occasionally end up getting meaningless sequences of letters.	Your station incorrectly decoded a FIGS character or mistook some other character to be a LTRS character.	If you're in the Command mode, enter *N* to force the DSP to the Figures mode. If you're not in the Command mode, type a (CTRL-C), first.
Linking difficulties	You're able to make an ARQ link with stations that are distant, but for close stations (less than 300 miles) you have difficulty.	Your radio'sT/R switching time is too slow, resulting in your missing the beginning of the response from the other station.	A temporary solution is to request the other station to increase his transmit delay (ADELAY) to allow the QSO to proceed. Many older radios do not have switching times appropriate for efficient use of ARQ at all distances.
		Your radio's AGC delay control is set for slow operation and is retarding receiver recovery to full sensitivity.	Set AGC control on radio for FAST or OFF.
	You have difficulties making ARQ links with stations with path distances over 10,000 miles using AMTOR ARQ,	Your transceiver's receive-to-transmit switching delay may be too long.	At long distances, ARQ requires a radio with fast key-up time to avoid having to activate the PTT before the completion of the received data block.
		Your ADELAY setting is greater than necessary.	Reduce ADELAY to the lowest value which results in sufficient delay in data to allow for your radio's receive to transmit delay.

DSP-232 Problems

Problem	Symptom	Cause	Test/Solution
Unable to transmit.	TX indicator on the DSP illuminates but radio doesn't switch to transmit.		Disconnect radio cable from Data Controller, then connect the Red and Brown wire on the radio cable plug together. While short exists, radio should transmit.
	TX indicator does not illuminate.	XMITOK is *OFF*.	Turn XMITOK *ON*.
	Operating mode is packet and DCD indicator is illuminated.	Threshold control on DSP isn't properly adjusted.	Adjust Threshold control so that DCD illuminates only when other stations are sending.
	Radio cable PTT functional test good.	PTT polarity selection jumper set incorrectly.	Set jumper for correct PTT polarity.
		PTT keying transistor damaged.	Replace damaged component (Q5) or contact AEA for assistance.
Sign-on banner not correctly displayed.		Mismatch between terminal or computer program serial settings and DSPs settings.	Match settings between DSP and computer program. For example if your computer is set for 8 data bits and no parity, set the DSP for AWLEN *8* and PARITY *0*, then issue a RESTART to cause these changes to take effect in the DSP.
DSPs buffer is filling with undesired information when computer is off-line.	MULT indicator is flashing when after a period of absence from the DSP.	Text was received or monitored unintentionally.	Check that following commands are set as follows: MONITOR *0* MCON *0* MDMON *OFF* MDIGI *OFF* MBX *%* MBELL *OFF* RFEC *OFF* UBIT 13 *ON*

Baudot and ASCII Problems

Problem	Symptom	Cause	Test/Solution
Unable to receive. No characters appear on the screen.	You are able to issue commands and receive confirmation from the DSP, but no on-air data is displayed.	DCD indicator isn't illuminated because Threshold control isn't properly adjusted.	Adjust Threshold control so that DCD indicator illuminates when you are properly tuned to another station.
Difficulty in tuning stations.	Only 2 or 3 tuning bars light and you're unable to spread them apart for normal display When you try to tune stations it appears that you can only get one of the tones to track on the tuning display at a time.	WIDESHIFT is on while you're trying to receive a station sending with narrow shift.	Turn WIDESHIFT *OFF*.
		WIDESHIFT is off while you're trying to receive a station sending with a wide shift.	Turn WIDESHIFT *ON*.
	You are not able to get a definite spread on the tuning bar when tuning this station.	Station may not be a teletype station, for example it may be transmitting Facsimile.	Try another station.
Garbled print	You appear to get nothing but unreadable garbage	Wrong mode or baud rate.	Use Signal Analysis to assist in identifying transmission type.
		Mark / Space relationship mismatched between Data Controller and signal being received.	Toggle RXREV to opposite status, i.e. 'RXREV T', or use Signal Analysis to assist in identifying proper setting of RXREV.
	When using Baudot, you occasionally end up getting meaningless sequences of punctuation and numbers.	Your station incorrectly decoded a LTRS character or mistook some other character to be a FIGS character	If you are in command mode, type 'L(return) to force the data controller to Letters mode. If you are not in command mode, type a (CTRL-C) first.
		The other station is configured to automatically 'unshift on space', which leaves you set in FIGS case while other station is in LTRS case	Set USOS to ON.

	When using Baudot, you occasionally end up getting meaningless sequences of letters.	Your station incorrectly decoded a FIGS character or mistook some other character to be a LTRS character.	If you are in command mode, type 'N(return)' to force the data controller to Figures mode. If you are not in command mode, type a (CTRL-C) first.
		The other station is not configured to automatically 'unshift-on-space, while your Data controller is configured to assume the sending station will revert to LTRS case when a space is received.	Set USOS to OFF
	When using ASCII, you get garbled text for periods of time.	A bit error probably occurred in the reception and your station is not synchronized to the sender.	There is no solution other than improving signal to noise ratio of received signal to reduce errors. Because the start and stop bits in ASCII are the same length as the data bits, once synchronization is lost, it may take a number of characters before synchronization can be re-established.

Addendum

AFSK Level Adjustment

AFSK level jumper

If you find the "correct" AFSK level setting occurs in the first 20% of the potentiometers range, the adjustment may be difficult. If you find this adjustment difficult, the internal AFSK adjustment level jumper may be moved to the LOW setting which will improve the adjustment range of the potentiometer.

To locate the internal AFSK level jumpers in the DSP-232, remove the six screws that secure the top chassis, and carefully remove it.

Look for jumpers JP10 and JP11 near the fuse at the rear of the DSP-232 as shown in figure AD-1 below. Jumper JP10 controls the output level of radio port 1, and JP11 controls the output level of port 2. When the jumper is towards the right, the output level is high (high and low are printed on the circuit board near the jumper for your convenience). Move the jumper for the radio port being adjusted to the left two pins to set the AFSK output level to LOWer range. Repeat step 7 of FM Transceiver Ajustments on page 3-6 of this manual when this has been completed.

Figure AD-1   DSP-232 AFSK HIGH/LOW Jumpers

Appendix A

Radio Connections

Overview

This appendix provides radio connection information from your AEA data controller to approximately 400 different models of amateur transceivers.

Each radio listed references a connection figure and possibly a not on connections. Notes are below on this page. Connection figures appear following the table of radios. All PIN type wiring connections are viewed from wiring/solder side of plug.

The wire colors used on the diagrams refer to the wires in the radio cables supplied with your AEA data controller. The standard minimum configuration will allow operation of all HF modes with your radio set for SSB operation. When wiring information refers to FSK connections, these connections allow you to operate you radio in the RTTY or FSK mode, and usually results in a purer transmitted signal and usually allows using narrow filters not always available when the radio is set for SSB operation.
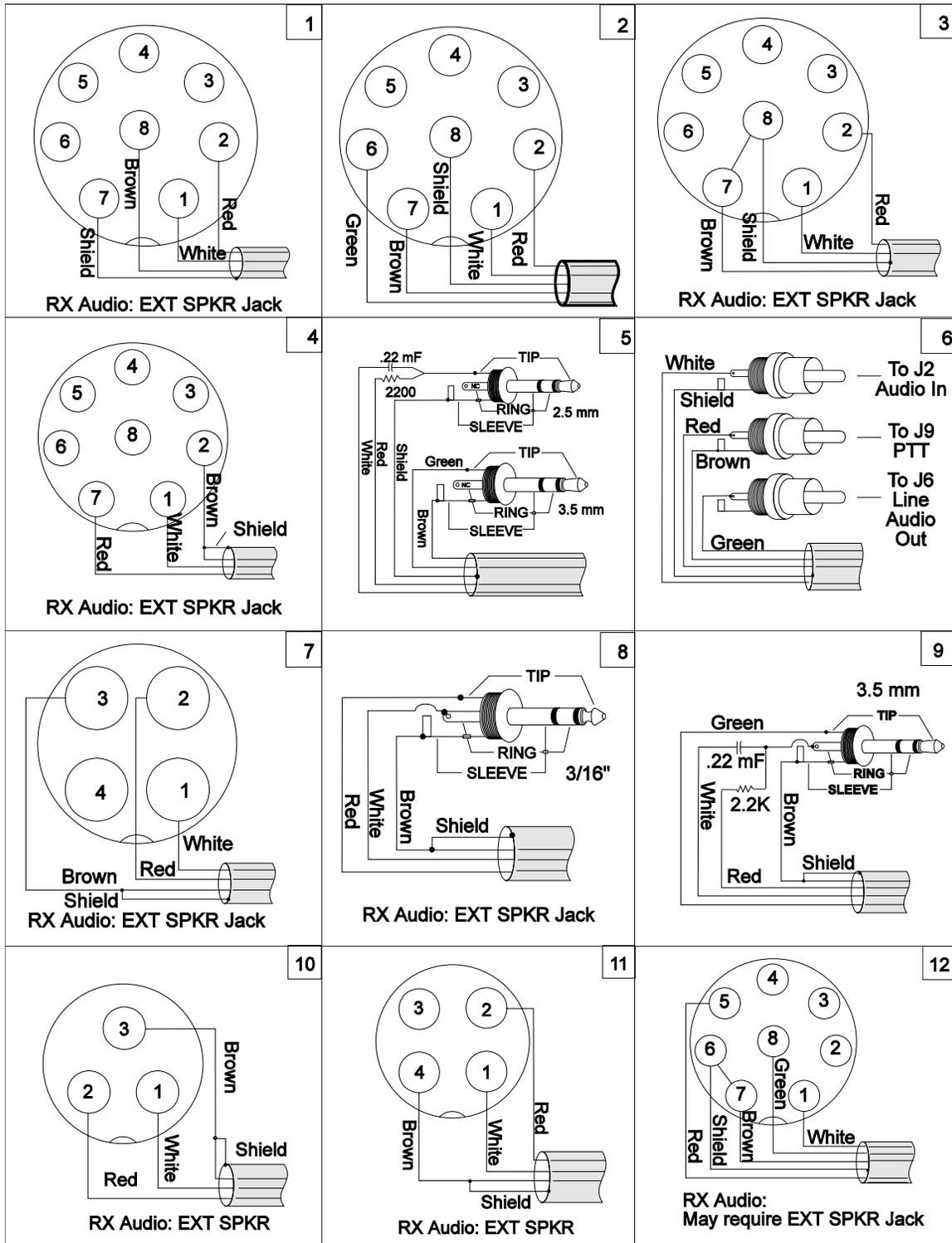
Radio Connection Notes

Note 1   Receive audio is not available on the micro phone jack of all radios. If you make this connection and are unable to receive, use the speaker jack on the rear panel of the radio as a source of receive audio.

Note 2   Your radio may not require a plug with 3 connections, i.e. tip, ring, and sleeve. We suggest you use the 3-connector "stereo plug wired as shown so that if you change radios in the future to another model with this same connection scheme, your cable will be compatible without modification.

Note 3   Older Icom transceivers which use the 8-pin microphone plug may not have receive audio connected to the microphone jack on pin 8. In this case, pin 8 is unused. We suggest you make the connection as diagrammed even if your radio does not have receive audio available at pin 8, so that if you change to a newer model Icom radio, the cable will be ready to use without modifications. If you make this connection and are unable to receive, use the speaker jack on the rear panel of the radio as a source of receive audio.

Note 4   If you have difficulty in locating an 8-pin DIN plug for this connection, a 5-pin DIN may be used in its place. A 5-pin DIN has all the required pins for connections to Icom HF rigs, because pins 6, 7, and 8 are not used. The numbering and arrangement of the remaining pins is unchanged.

Note 5   In most Ten-Tec radios where an FSK input is provided, a pull-up resistor to a positive power source is required to produce proper function of the FSK keyer in the radio. Contact Ten-Tec for recommendations on how to add this resistor to the radio to which you are connecting.
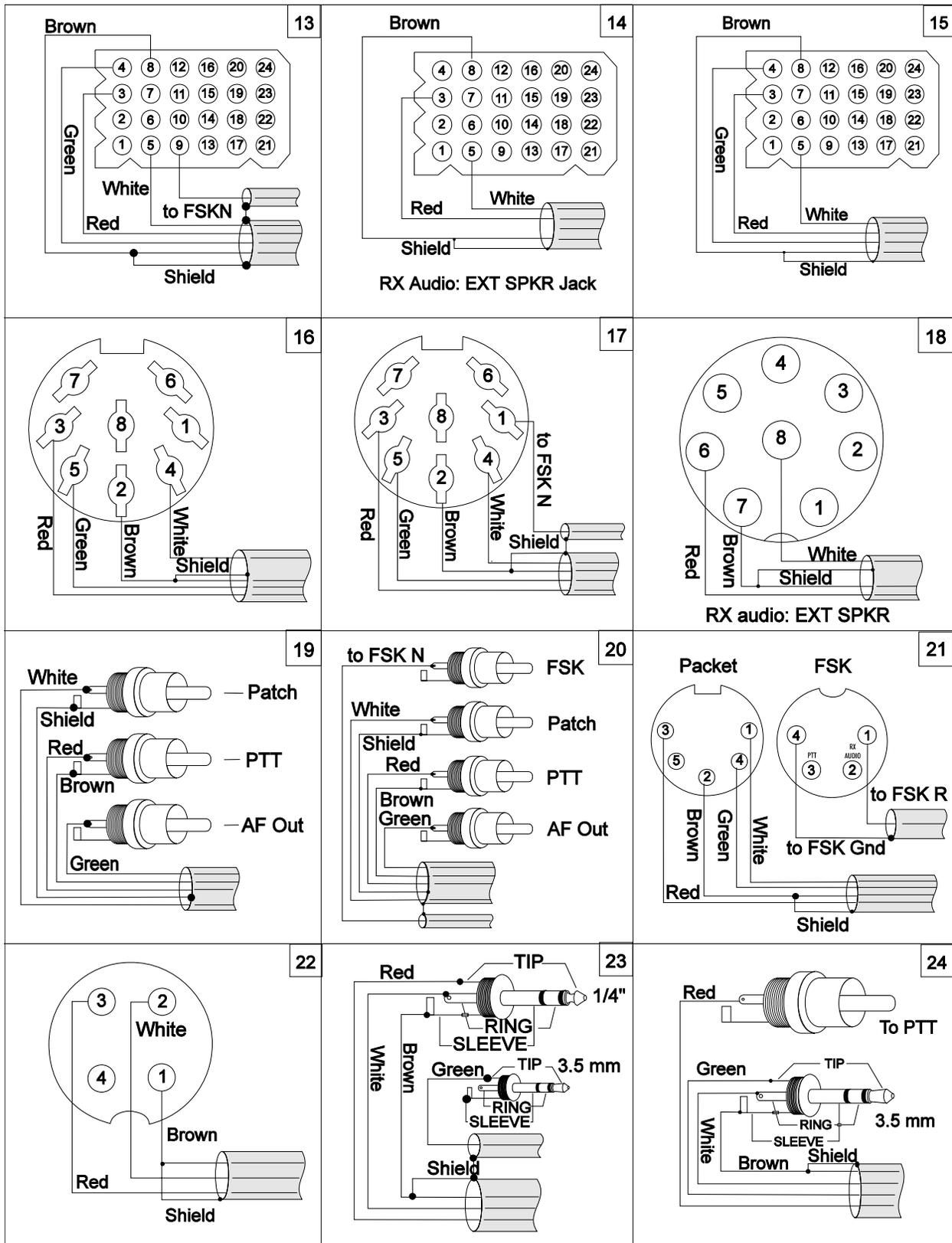
Note 6   This connection only valid with PCB-88, PK-96, DSP-232 Radio Port 2 only, DSP-2232, and PK-900 Radio Port 2 only. This connection is also appropriate for use at 9600 baud applications with radio in DATA mode.

Note 7   This connection only valid with PCB-88, PK-96, DSP-232 Radio Port 2 only, DSP-1232, DSP-2232, and PK-900 Radio Port 2 only.

Note 8   This radio uses negative push-to-talk signaling. Change the appropriate keying polarity jumper in the data controller. see installation chapter for details.

Note 9   Based on our experiences with this radio and its RF susceptibility, we recommend using this connection diagram if you choose to use ACC2 connector. This radio has shown susceptibility to entry of RF on pin 11 of the ACC2 connector, so we do not connect the AFSK (White wire) in this diagram. Use the FSK mode of this radio when you wish to operate data modes.
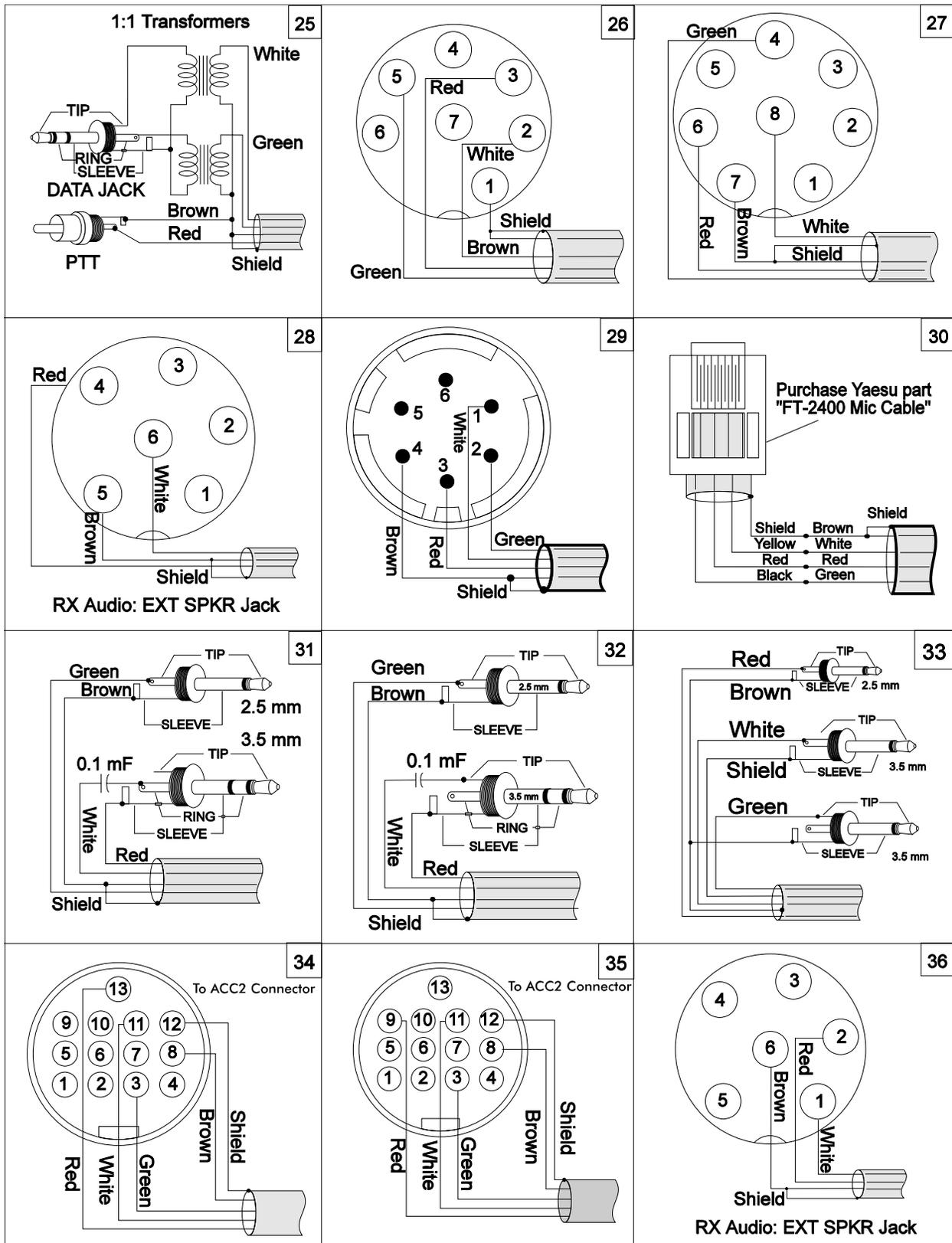
On the following pages are a list of radios with referenced to the above notes and the connection diagrams shown at the end of this Appendix.
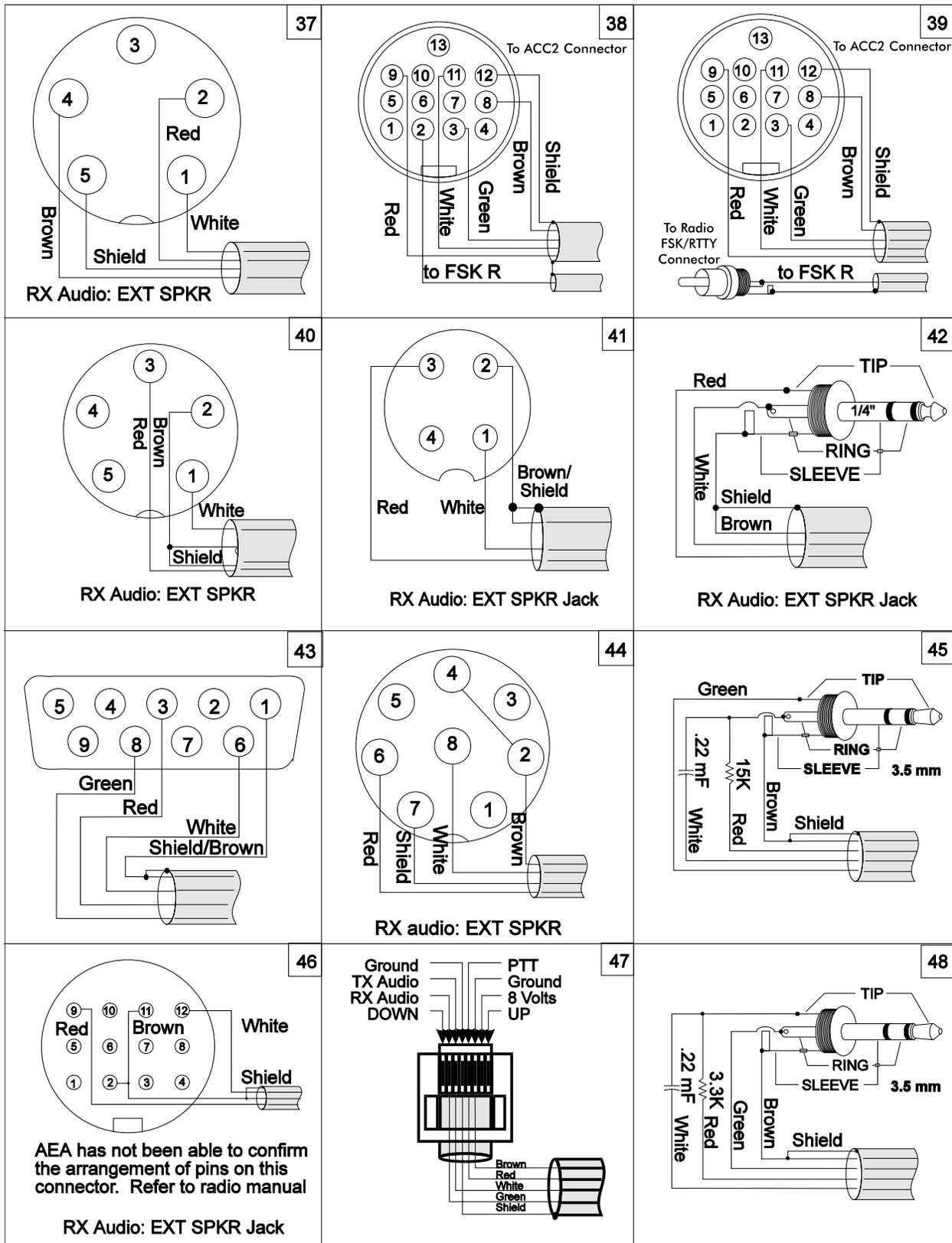
Radio Connection Diagrams

RX Audio: EXT SPKR Jack

RX audio: EXT SPKR

25 — 1:1 Transformers

White
Green
Brown
Red
Shield
TIP
RING
SLEEVE
DATA JACK
PTT

26

4
3
5
Red
7
6
2
White
1
Shield
Brown
Green

27

Green
4
5
3
6
8
2
7
1
Red
Brown
White
Shield

28

Red
3
4
2
6
White
5
1
Brown
Shield

RX Audio: EXT SPKR Jack

29

6
5
1
White
4
2
3
Brown
Red
Green
Shield

30

Purchase Yaesu part
"FT-2400 Mic Cable"

Shield
Shield   Brown
Yellow   White
Red   Red
Black   Green

31

Green
Brown
TIP
2.5 mm
SLEEVE
3.5 mm
0.1 mF
TIP
White
RING
SLEEVE
Red
Shield

32

Green
Brown
TIP
2.5 mm
SLEEVE
0.1 mF
TIP
White
3.5 mm
RING
SLEEVE
Red
Shield

33

Red
TIP
Brown
SLEEVE   2.5 mm
White
TIP
Shield
SLEEVE   3.5 mm
Green
TIP
SLEEVE   3.5 mm

34

13
To ACC2 Connector
9   10   11   12
5   6   7   8
1   2   3   4
Red   White   Green   Brown   Shield

35

13
To ACC2 Connector
9   10   11   12
5   6   7   8
1   2   3   4
Red   White   Green   Brown   Shield

36

3
4
2
6
Red
5
Brown
1
White
Shield

RX Audio: EXT SPKR Jack

37 — RX Audio: EXT SPKR

38 — to FSK R

39 — to FSK R

40 — RX Audio: EXT SPKR

41 — RX Audio: EXT SPKR Jack

42 — RX Audio: EXT SPKR Jack

43

44 — RX audio: EXT SPKR

45

46 — AEA has not been able to confirm the arrangement of pins on this connector. Refer to radio manual

RX Audio: EXT SPKR Jack

47 — Ground / TX Audio / RX Audio / DOWN / PTT / Ground / 8 Volts / UP

48

Appendix B

Specifications

Modem:	Analog Devices 2105 Digital Signal Processor running at 12.3 MHz in conjunction with Analog Devices 28msp02 audio CODEC (analog to digital/digital to analog converter).
Modulator Output Level:	5-100 mV RMS, adjustable with rear panel controls for each radio port.
Processor System:	Motorola 68340 running at 16.7 MHz.
RAM:	Battery backed 32K standard, expandable to 256K.
ROM:	128K Standard, expandable to 256K.
Hardware HDLC:	Zilog 8530 SCC.
Power Requirements:	+13 VDC (+12 to +16 VDC) @ 1A.

Input/Output Connections

Radio Interface:	One 5-pin DIN connector. One 8-pin DIN connector.
Direct FSK Outputs:	Normal/Reverse.
Auxillary Port:	5-pin DIN.
Terminal Interface:	RS-232-C DB-9S connector with hardware/software handshake.
Terminal Data Rates:	300, 600, 1200, 2400, 4800, 9600, and 19,200bps.
RX Audio:	Port 1 and Port 2.
TX Level:	Port 1, Port 2, and 9600bps.
Other:	Station ground connector and external reset button.

Physical

Demensions:	9.35" (237mm)W x 7.90" (201mm)D x 2.30" (58mm)H.
Weight:	3 lb. (1.36kg)

Appendix C

Limited Warranty

Advanced Electronic Applications, Inc. warrants to the original purchaser that this product shall be free from defects in material or workmanship for one year from the date of original purchase. To obtain warranty service: 1) Complete and mail the warranty registration card within 10 days to Advanced Electronic Applications, Inc., and 2) Send written notification to the address below (or telephone) as soon as possible after discovering a possible defect:

Advanced Electronic Applications, Inc.
Attention: Service Department
2006 - 196th Street SW
Lynnwood, WA 98036-7042
USA
(206) 775-7373

The written notification must include a copy of the invoice. Include a description of the defective part or condition, with details of the electrical connections to associated equipment and list such equipment. Enclose your name, phone number, and address. Shipping charges for any parts or units submitted for replacement under this warranty must be paid by the purchaser.

Correct maintenance, repair, and use are important to insure proper performance from this product. Carefully read this manual. This warranty does not apply to any defect AEA determines is caused by 1) Improper maintenance or repair, including installation of parts or accessories that do not conform to the quality and specification of the original parts; 2) Misuse, abuse, neglect, or improper installation; 3) Accidental or intentional damage. The field installation of circuits according to the explicit instructions of AEA will not nullify this warranty.

All implied warranties, if any, terminate one year from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential damages. Some states do not allow limitations of how long an implied warranty lasts or do not allow the exclusion of incidental or consequential damages, therefore, the above limitations and exclusions may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.

Appendix D

Mailbox Upgrade

Increasing the size of your mailbox

You purchased your DSP-232 with the standard 18K mailbox (32K RAM). You may increase the size of the mailbox in your DSP-232 by installing either one or two additional SRAM chips. If you install only one, you will have a 150K mailbox (160K RAM). If you install two chips, you will have a 242K mailbox (256K RAM).

The firmware in your DSP-232 does not need to be changed. All that is necessary is to install the additional SRAM chip(s).

The SRAM chip required is Hitachi part number HM628128:128K. You may buy this part from your local electronics market or directly from AEA. AEA's part number is 332-628. To order or check price and availability, call AEA's Upgrade Hotline at (206) 774-1722 between 8:00 a.m. and 4:30 p.m. PST, Monday through Friday. You can also fax us your inquiries at (206) 775-2340. Or write: AEA, Inc., P.O. Box C-2160, Lynnwood, WA 98036.

To install additional mailbox space do the following:

150K (160K RAM) instructions

Remove the SRAM IC in socket U6 and install it in U7. Make sure you install the IC with pin one oriented correctly.

Install the new SRAM chip in socket U6. Make sure you install the IC with pin one oriented correctly.

242K (256K RAM) instructions

Remove the SRAM IC in socket U6 and set it aside.

Install a new SRAM IC in both sockets U6 and U7. Make sure you install the IC with pin one oriented correctly.

If you encounter problems with the above procedures call AEA's Technical Service Department at (206) 775-7373.

Timewave Technology Inc.

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Schematic - DSP232 DSP