AOR

MODEL AR-24

MSK RADIO MODEM
(1200bps/2400bps)

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1: INTRODUCTION

The AR-24 is designed as commercial grade of wireless modem interface between the computer and commercial two-way radio. The AR-24 allows you to operate using new computer base communications mode.

The most unique and important feature of the packet transmission is that they are virtually error free. Information that you intended to send is first made into digital groups, or packets. Confirmation of correct reception of these packets is then returned to the originating station by the destination station. If the originating station does not receive confirmation, however, it automatically re-sends the packets until the correct information is confirmed, or the contact is terminated.

A modem installed inside of the AR-24 can operate at very high baud rates of 2400bps. The results in very short transmission by each station, and allows several stations to use the frequency at the same time. Also, due to the choice of operating parameters, you of other station on the frequency.

In addition to your commercial radio equipment, you will need either an ASCII data terminal or a personal computer that has an RS-232C output and uses at terminal emulator program.

You may also need connectors to fit your equipment and an RS-232C serial cable.

2: FEATURES

(1) Error free wireless data communications (10^{-7}).

(2) 65,535 kinds of keyword for prevention of data leakage.

(3) EEPROM for data back-up.

(4) The AR-24 functions as a simplex automatic repeater. You may use it as and unattended repeater (DIGITAL REPEATER).

(5) The modem inside of the AR-24 is modulated by MSK (Minimum Shift Keying) at 2400bps. (switchable into 1200bps for the transceivers has optimized audio response level between 300Hz and 3000Hz.)

(6) 4 different programmable messages can be written as macros which can be activated by having TTL level signals at one of these signal input terminals, and one quick response channel is provided on the front panel.

(7) REMOTE function enables to remote the command parameters on distant station in RF link.

(8) 4 separate output terminals of a TTL open collector with maximum level of +30V 300mA against the preprogrammed switching keyword commands up to 16 characters.

(9) New broadcasting mode makes the base station being able to send one message to unlimited numbers of receiving terminal. In this broadcasting mode, the only need the AR-24 plus simple receiver tuned onto the frequency of base station transmitter.

(10) This broadcasting mode activates as follows:

a) all terminals call
b) group call
c) individual call

(11) Aluminum diecasting case for heavy duty in use.

(12) Battery operation is available from an optional ni-cad battery pack (4.8V450mA). Once the battery pack is fully charged, AR-24 will be operative in 10 hours approximately.

(13) Light weight and compact size (78W x 30W x 121D, 230g approximately)

3: STANDARD ACCESSORIES

The followings are the standard accessories. Please check with them when you unpack the carton box.

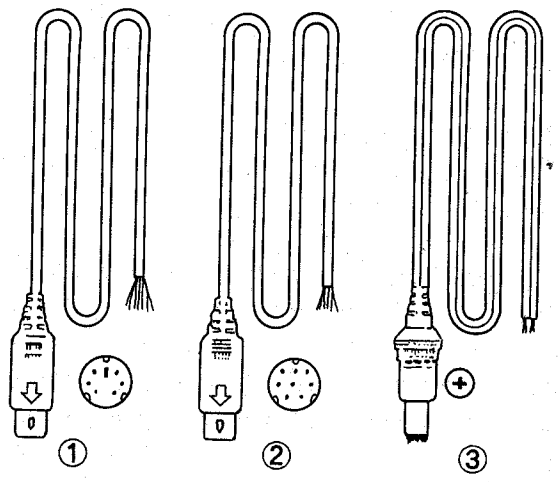
AR-24 main unit . . . . . 1 pce.

① RADIO Cable (6 PIN miniature DIN plug assembled) . . . . . 1 pce.

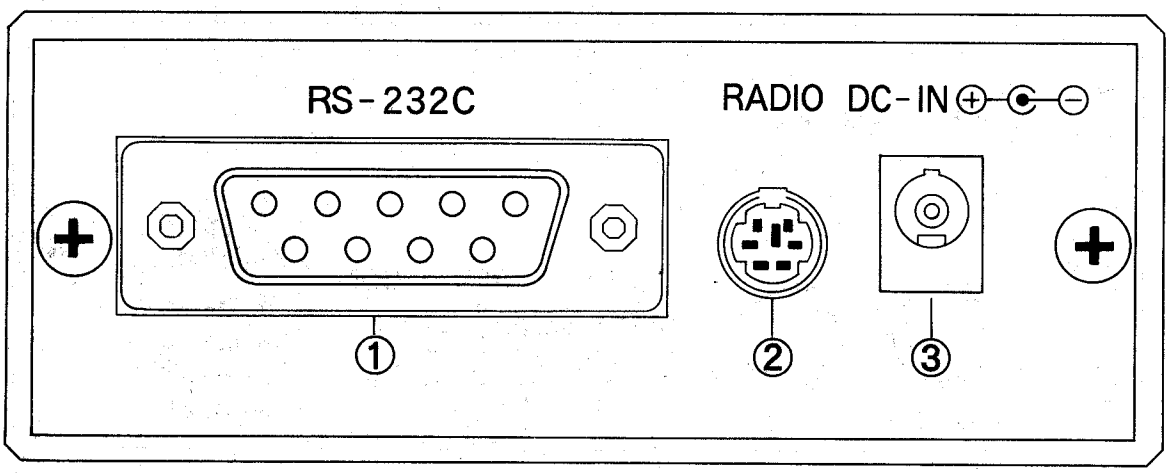
② IN/OUT Cable (8 PIN miniature DIN plug assembled) . . . . . 1 pce.

③ Black/Red twin color DC power cord (DC plug assembled) . . . . . 1 pce.

Operating manual with command reference . . . . . 1 copy.



4-2: Rear view



① RS-232C — D-SUB 9Pin connector for connecting to your computer with RS-232C level. The speed of 1200bps to 9600bps can be corresponded and the default setting value is 1200bps at factory.

② RADIO — This terminal is to connect transceiver. Use RADIO cable assembled with 6PIN miniature DIN plug supplied with AR-24.

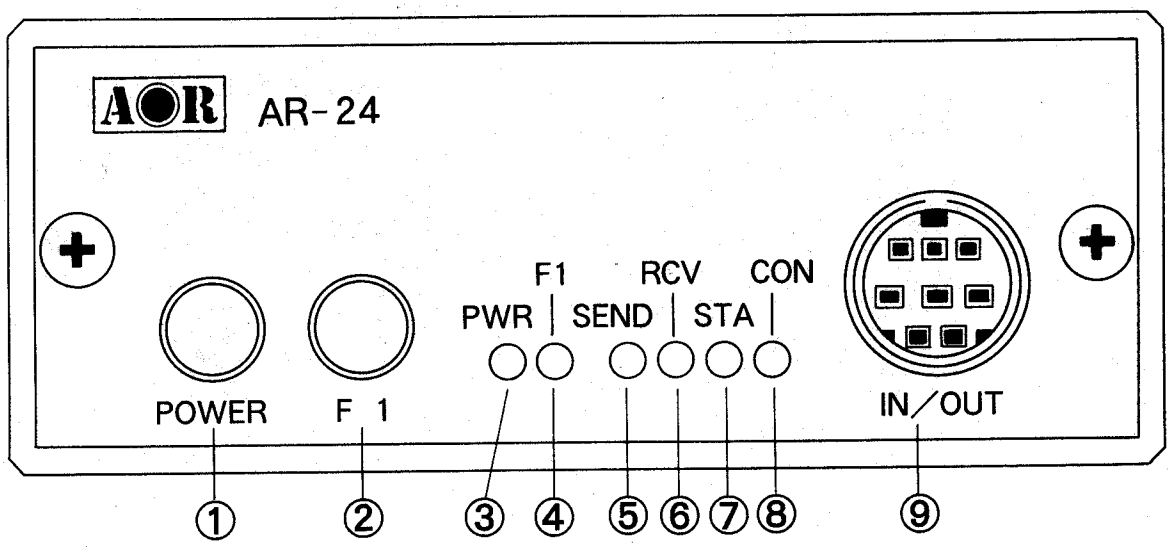
③ DC13.8V — This jack is to connect with an external DC regulated power supply. The rating voltage is DC13.8V +/-15%.

This jack also activates as a charge jack when ni-cad battery is installed.

The polarity is that outer is positive and center is negative. Use the DC power cord assembled with DC plug supplied with AR-24.

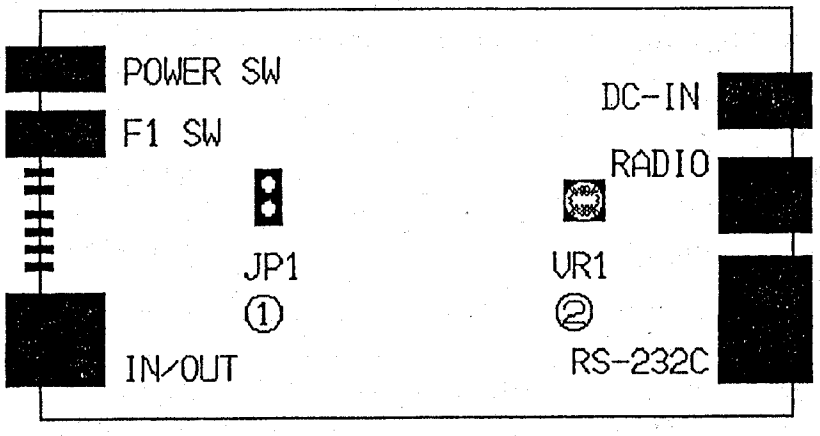
4: Location and Functions

4-1: Front view



①	POWER	Press to power on and press again to power off of the AR-24.
②	F1	Press to transmit a preprogrammed one of macros.
③	PWR-LED	Light when AR-24 turns ON.
④	F1 LED	Light when OUT4 is activated.
⑤	SEND-LED	Light when packet is transmitted.
⑥	RCV-LED	Light when packet is received.
⑦	STA-LED	Light while transmit packet is remained in buffer.
⑧	CON-LED	Light while AR-24 is in connect status.
⑨	IN/OUT	Connector for 4 different INPUT signals and 4 different OUTPUT signals.

4-3: Internal view



① JP1 This jumper pin is to select radio baud rate.

short: 1200bps
open: 2400bps

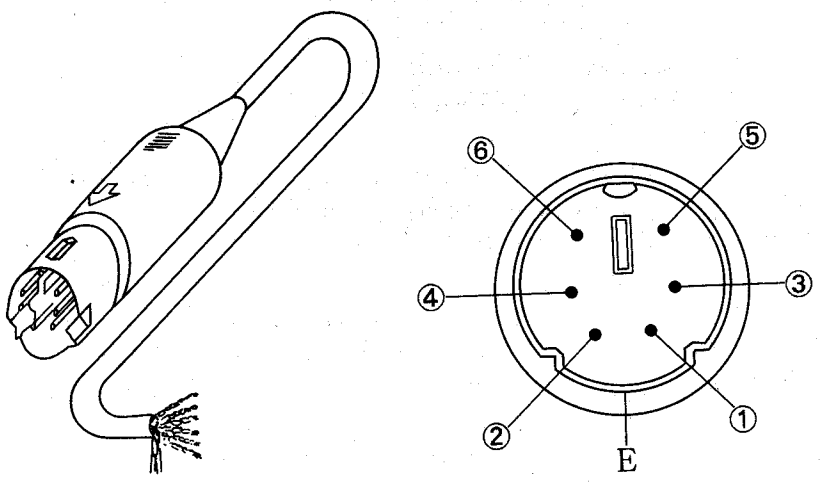
② VR1 This volume is to adjust AF output level releasing from RADIO terminal to transceiver.

5: CONNECTION TO TRANSCEIVER

The AR-24 provides a 6-pin miniature DIN jack on the front panel for transceiver connection by using a RADIO cable supplied with the AR-24 as standard accessory. Check with the operating manual carefully of the pin configuration depending on using transceiver.

The pin configuration and functions are shown below.

AR-24 (RADIO)				TRANSCEIVER
pin no.	color	functions		functions
1	brown	AF OUT	----------	MIC INPUT
2	red	GND	----------	GND
3	orange	PTT	----------	PTT
4	yellow	AF IN	----------	SP OUT
5	green	SQL		NC (no circuit)
6	blue	NC		NC (no circuit)
E		SHIELD	----------	GND



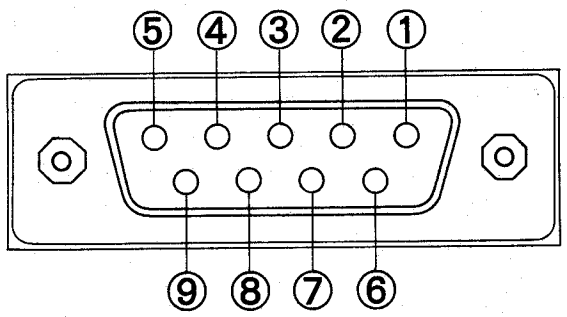
6: CONNECTION TO COMPUTER

The connection between the AR-24 and computer is confirmed with RS-232C serial interface. The AR-24 provides an RS-232C terminal with D-SUB 9 pin female of which pin configuration is compatible with the one on IBM PC or its 100% compatible computers.

The pin configuration is shown below.

IBM PC (D-SUB 25P female) Pin No.		AR-24 (D-SUB 9P male) Pin No.		
1				
2	----------	3	(TXD)	Transmit Data
3	----------	2	(RXD)	Receive Data
5	----------	8	(CTS)	Clear to Send
6	----------	6	(DSR)	Data Set Ready
7	----------	5,7	(GND)	Ground/Signal Ground
8	----------	1	(DCD)	Carrier Detect
20	----------	4	(DTR)	Terminal Ready
F.G	----------	F.G		

* F.G is case ground using shielded cable.



REAR ON AR-24

If your computer has an D-SUB 9 pin, use the straight cable.

6-1: Setting up command parameters on RS-232C port

To configure the data speed between the AR-24 and the computer, connect the AR-24 and the computer by the RS-232C cable. Turn the computer ON and boot up any necessary terminal emulation program. And set the terminal emulation program as follows:

data bit	:	7 bit
stop bit	:	1 bit
parity	:	even
X-flow	:	on
data speed	:	1200bps (default value)

6-2: How to change the data speed

AR-24 employs an EEPROM for data backup. Therefore once the command parameter is changed to the another value, execute "EEPROM" command to register the new value into the EEROM and RESTART , or AR-24 turns OFF and and ON again every time.

6-3: Automatic baud rate setting

AR-24 provides a function of automatic baud rate setting. This function activates to synchronize automatically with the baud rate on computer whenever AR-24 is ON.

Note : **This function is not activated when AR-24 goes into operation for the first time.**

① In the Command Mode set on the parameters shown above, set "ABAUD" command to 0(=zero).

cmd:ABAUD<>0<CR>
was ABAUD 1200

② To register the new value into EERPOM, execute "EEPROM" command. AR-24 will activate the process as follows:

```
cmd:ABAUD<>0<CR>
was  ABAUD 1200
cmd:EEPROM<CR>
Strings Area 852 bytes

0M WRITR
1M WRITR
2M WRITR
3M WRITR
4M WRITR
5M WRITR
6M WRITR
7M WRITR
8M WRITR
9M WRITR

cmd:
```

③ Once AR-24 is OFF and ON again.

④ Unreadable graphic characters will be appeared on the screen.

⑤ Enter "*" character via keyboard in 1 second internal and keep this action until the following message will be appeared.

```
Please type a star (*) for auto-baud routine.
```

⑥ Enter "*" character once more. Then the following sign-on message will be appeared.

```
RAM loaded with defaults

Wireless Data Recorder AR-24
Release 1.15  08/03/92
Checksum $39
cmd:
```

6-3-1: Fix the baud rate set on Automatic baud rate setting

① To fix the baud rate set on the automatic baud rate setting, set "ABAUD" to %. Then the baud rate set on the automatic baud rate setting will be appeared on the screen.

```
cmd:ABAUD<>%<CR>
was ABAUD 1200
```

② Execute "EEPROM" command to register the new value. AR-24 will activate the process as follows:

```
cmd:ABAUD<>%<CR>
was  ABAUD 1200
cmd:EEPROM<CR>
Strings Area 852 bytes

0M WRITR
1M WRITR
2M WRITR
3M WRITR
4M WRITR
5M WRITR
6M WRITR
7M WRITR
8M WRITR
9M WRITR

cmd:
```

③ Once AR-24 is OFF and ON again. The following sign-on message will be appeared.

```
RAM loaded with defaults

Wireless Data Recorder AR-24
Release 1.15 08/03/92
Checksum $39
cmd:
```

④ If you want to set 9600bps, set "ABAUD" to 9600.

```
cmd:ABAUD<>9600<CR>
was ABAUD 1200
```

⑤ Execute "EEPROM" command to register the new value. AR-24 will activate the process as follows:

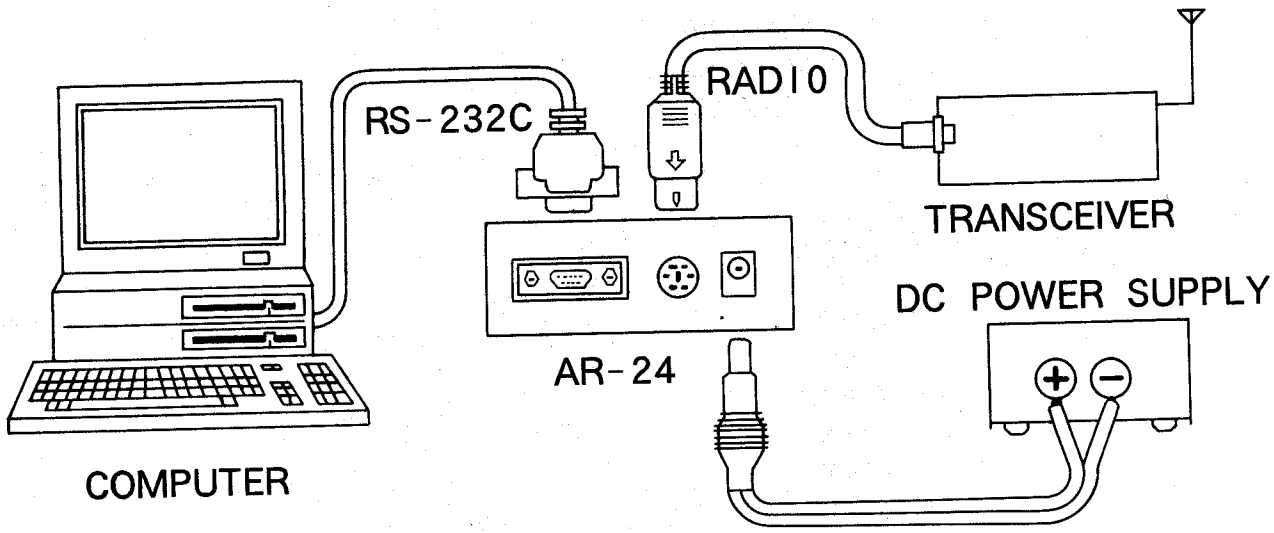
```
cmd:ABAUD<>9600<CR>
was  ABAUD 1200
cmd:EEPROM<CR>
Strings Area 852 bytes

0M WRITR
1M WRITR
2M WRITR
3M WRITR
4M WRITR
5M WRITR
6M WRITR
7M WRITR
8M WRITR
9M WRITR

cmd:
```

7: SYSTEM CONFIGURATION

The following is illustrated the basic wiring connection between computer and transceiver.



① **Connection to computer**

Use the RS-232C cable prepared according to the pin configuration shown on Section 6 of page 7.

② **Connection to transceiver**

Use the RADIO cable prepared according to the pin configuration shown on Section 5 of page 6.

③ **Connection to DC regulated power supply**

Prepare a DC regulated power supply rating at 13.8V 1A. Use the Black/Red twin color DC power cord. Connect Red wire to (+) terminal and Black wire to (-) terminal.

8: PRE-SETTING

This chapter explains how to standby AR-24 for practice operation.

8-1: Set up computer

Use your terminal emulation program and power on computer Set the command parameters for RS-232C port according to the list shown on Section 6-1 of page 8.

8-2: Set up AR-24

① Connect RS-232C cable between AR-24 and computer.

② Power the DC regulated power supply ON and check with the rating voltage at 13.8V.

③ Connect POWER cord between AR-24 and the power supply.

④ Power AR-24 ON. The following sign-on message will be appeared on the screen.

Wireless Data Recorder AR-24
Release 1.15 08/03/92
Checksum $39
cmd:

Note : * If unreadable graphic characters are appeared instead of the sign-one message above, please check with the command parameters on RS-232C port.

* If cmd: is not appeared as above, please try to enter <CR>.

8-3: Set up transceiver

① Connect RADIO cable between AR-24 and transceiver.

② Power transceiver ON.

③ Rotate Squelch volume on the transceiver to full counterclockwise. And rotate audio output volume on the transceiver to clockwise until RCV-LED on the AR-24 is lit.

④ In the condition of ③, rotate squelch volume to clockwise until RCV-LED is lit out.

⑤ In the Command Mode, type "MYCALL<>TEST" via keyboard and hit <CR>. Then MYCALL is now set as TEST.

⑥ Type K and hit <CR>. Then AR-24 goes into Converse Mode from Command Mode.

⑦ Hit <CR>, then SEND-LED on AR-24 will light simultaneously. Check with the SEND-LED to light whenever <CR> is entered. This is recognized that AR-24 is working properly.

⑧ Type CTRL-C to return Command Mode from Converse Mode.

8-4: The minimum commands to be used for operation

The minimum command parameters to be used for operation contain MYCALL, CONNECT, DISCONNE, CONVERS, DISPLAY, MONITOR and DAYTIME.

8-4-1: MYCALL

The "MYCALL" command is to set the station's ID (callsign). If you want to set the ID as 123,

① In Command Mode, type MYCALL<>123<CR>. Then the preprogrammed MYCALL is appeared promptly. (<> indicates a space and <CR> indicates Carriage Return and the both of them are not appeared in the screen.)

```
cmd:MYCALL<>123>
MYCALL was MIKE
```

If MMYYCCAALL is appeared although MYCALL is typed, this is effected by echo-back. In such case, set "ECHO" command to OFF.

```
cmd:MMYYCCAALL<CR>
was MYCALL MIKE
cmd:EECCHHOO<>OOFF<CR>
was ECHO ON
```

After ECHO command is executed, try ① again to set MYCALL to 123.

8-4-2: CONNECT

This command is an immediate command and uses to make connect to the other station. If you want to make connect with the station of 456,

① In Command Mode, type CONNECT<>456<CR>.

```
cmd:CONNECT<>456<CR>
```

② Once <CR> is entered, SEND-LED on AR-24 will light and transceiver transmit packet data simultaneously.

③ SEND-LED will light 10 times and after then AR-24 will send *** Retry count exceeded and *** DISCONNECT to the terminal immediately.

This is explained the progress if the station of 456 is not ready for operation.

④ Hit <CR> to return Command Mode.

```
cmd:CONNECT<>456
*** Retry count exceeded
*** DISCONNECTED
cmd:
```

⑤ If the station of 456 is ready for operation, AR-24 will send *** SENDING INFO TO 456 to the terminal once the connection between 123 and 456 is established.

8-4-3: DISCONNE

This command is an immediate command and uses to make disconnect from the other station. If you want to make disconnect from the station of 456,

① Return Command Mode from Converse Mode.

② Type DISCONNE<>456<CR>. *** DISCONNECTED will be appeared once disconnect was performed.

③ Enter <CR> to return Command Mode.

```
cmd:DISCONNE
*** DICONNECTED
cmd:
```

8-4-4: CONVERS

This command is an immediate command and uses to enter Converse Mode.

① In Command Mode, type CONVERS and hit <CR>.

② For example, type "THIS<>IS<>123" and <CR>.. This message will be transmitted promptly via transceiver after <CR> is entered and SEND-LED on AR-24 will light simultaneously.

```
cmd:CONVERS<CR>
THIS<>IS<>123<CR>
```

③ On monitoring station, CQ: on front of the above message will be appeared on their screen.

④ To return from Converse Mode to Command Mode, type CTRL-C. Then cmd: will be appeared promptly.

8-4-5: DISPLAY

This command is an immediate command and uses to display the status of command parameters. This command is divided into 7 groups by adding one character of A, C, H, I, L, M, and T.

A	.....	RS-232C port commands
C	.....	Computer control character commands
H	.....	Health counter commands
I	.....	ID commands
L	.....	Link commands
M	.....	Monitor commands
T	.....	Timing commands

If you want to see the status of RS-232C port commands,

① Type DISPLAY<>A<CR>. All commands existing in group A will be displayed promptly.

```
cmd:DISPLAY<>A<CR>
8BITCONV  OFF
ABAUD     1200
AUTOLF    ON
.
.
.
.
XFLOW     ON
```

8-4-6: MONITOR

This command is to monitor packet communication on air and is set ON as default. If you do not want to monitor, set MONITOR to OFF.

```
cmd:MONITOR<>ON
was MONITOR ON
```

8-4-7: DAYTIME

This command is to set current daytime and enables to activate while AR-24 is ON. Once AR-24 is OFF, daytime is not backed up. Therefore you should set DAYTIME whenever AR-24 is ON. If you want to enter the daytime of January 31, 1992 at 13:25,

① In Command Mode, Type DAYTIME<>9201311325<CR>

cmd:DAYTIME<>9201311325<CR>

② Once enter <CR>, daytime will start at 00 second.

8-5: Other commands

8-5-1: MFILTER command

Use the MFILTER command to "FILTER" selected characters from packets received. For example, you can command the AR-24 system to filter out form feeds or bell characters that may be sent by the station with which you are connected, but which may interface with your display or otherwise disturb your operations. You can specify up to four characters by giving the ASCII character codes in either hexadecimal or decimal numbers.

8-5-2: MSTAMP - MONITOR TIME - STAMP command

Monitored packets can be time-stamped if DAYTIME has been set. To enable this function, set MSTAMP ON. You can also time-stamp connect and disconnect messages with the command CONSTAMP ON.

* If DAYSTAMP is OFF, CONSTAMP and MSTAMP show only time.

* If DAYTIME is ON, the DATE is included in CONSTAMP and MSTAMP.

Set DAYSTAMP ON when you want a dated record of packet channel activity, or when you are unavailable for local packet operation.

9: OPERATION

This chapter explains a basic operation. For explanation smoothly, MYCALL is supposed;

Your station's MYCALL is set to AAA

Designated station's MYCALL is set to BBB.

9-1: Enter command parameter

① Type command's name first and then place a space and type parameter.

② To execute new command parameter, hit <CR>(= Carriage Return).

③ If "?EH" is appeared on the screen after the desired command parameter was entered, it is meant that you had mistake in progress. In such case, please try it again or refer to the command reference.

9-2: Make connect

① Type CONNECT<>BBB<CR>.

cmd:CONNECT<>BBB<CR>

② Once <CR> is executed, SEND-LED on front panel of the AR-24 will light and this message packetized will be transmitted to BBB via transceiver promptly.

③ Once connect link is established, AR-24 will send *** SENDING INFO TO BBB to your terminal and CON-LED on the front panel will turn ON simultaneously.

cmd:CONNECT<>BBB<CR>
***** SENDING INFO TO BBB**

After the above message was appeared, AR-24 will go into Converse Mode from Command Mode automatically and cmd: will not be appeared on the screen.

On the other hand, BBB station will also enter Converse Mode automatically.

④ Type message as THIS IS AAA and execute <CR> to confirm.

9-3: Make disconnect

① Type CTRL-C to return Command Mode.

② cmd: will be appeared promptly.

③ Type DSICONNE and hit <CR> to confirm.

④ SEND-LED will turn ON and OFF shortly.

⑤ *** DISCONNECTED will be appeared on the screen promptly and CON-LED will turn OFF simultaneously.

9-4: Change of current command parameter

① In Command Mode, type the command to be changed and place a space (<>) and type new parameter. And hit <CR> to confirm.

② If you want to change the parameter on "TXDELAY" commad to 50 (x 10ms),

cmd:TXDELAY<>50<CR>
was TXDELAY 30

It is always appeared the old parameter on the sencond line as shown above.

9-5: Backup command parameter

AR-24 employs EEPROM for backup of command parameter. Once the command parameter is written into EEPROM, the command parameter is being backed up although AR-24 turns OFF. To execute backup, AR-24 provides "EEPROM" command.

If you want to write MYCALL of 123 into EEPROM for backup,

① In Command Mode, type MYCALL<>123<CR>.

cmd:MYCALL<>123<CR>
was MYCALL NOCALL

② In Command Mode, type EEPROM<CR>.

```
cmd:MYCALL<>123<CR>
was MYCALL NOCALL
cmd:EEPROM<CR>
Strings Area 852 bytes

0M WRITR
1M WRITR
2M WRITR
3M WRITR
4M WRITR
5M WRITR
6M WRITR
7M WRITR
8M WRITR
9M WRITR

cmd:
```

Note : * Once EEPROM is executed, AR-24 will activate to write new parameter into EEPROM promtply. It takes about 0.5 seconds for saving. Do not turn off AR-24 while saving data into EEPROM.

* The following commands are not available for backup by EEPROM.

BEACON, BTEXT, CTEXT, DAYTIME, NEWMODE, PASSWORD, UNPROTO

10: SPECIAL OPERATION

This chapter explains the special commands that enables to operate further attractive data communications on AR-24.

10-1: REMOTE control operation

This command activates remote control of the command parameters on a distant station's AR-24 over RF links. This function is quite useful if you want to change the current command parameters on the distant station's AR-24 with no attendant operator.

Note:
* To execute this function, the REMOTE command should be ON on both station (default is ON).
* In REMOTE mode, the control station should connect to the MYCALL on the desired station adding SSID of 15 (MYCALL-15).
* In REMOTE mode, "rem:" will be appeared instead of "cmd:".

Now, if you want to change the TXDELAY command parameter on the desired station (MYCALL is BBB) to 50 using the remote control function;

① In Command Mode, the control station should set MONITOR command to OFF.

② In Command Mode, type CONNECT<>BBB-15<CR>. If the connect link is established, *** SENDING INFO TO BBB-15 will be appeared and then rem: will be also appeared promptly.

```
cmd:CONNECT<>BBB-15
***SENDING INFO TO BBB-15
rem:
```

③ Type TXDELAY<>50<CR>. If the TXDELAY is set 30 on the BBB station, the following message will be appeared.

```
rem:TXDELAY<>30<CR>
was TXDELAY 30
```

④ Press CTRL+C to enter Command Mode and execute disconnect. "cmd:" will be appeared promptly. In Command Mode, type DISCONNE<CR>.

```
rem:
cmd:DISCONNE<CR>
*** DISCONNECTED
```

10-2: SECURE operation

A PASSWORD is a string of up to eight (8) alphanumeric characters in eighter upper or lower case. The AR-24 ignores case in passwords.

If PASSWORD and SETPASS are set (activated), the user must enter the PASSWORD to acquire control of the AR-24. This applies to both local and remote operation. If SETPASS is not empty, PASSWORD must match SETPASS to obtain access.

PASSWORD and SETPASS are effective when using remote control by radio link.

Notice: **After using priviledge or password-protected commands, the user should clear PASSWORD to prevent subsequent users from seeing the PASSWORD - the contents of PASSWORD can be dispalyed on the screen.**

DO NOT DISCONNECT THE REMOTE LINK FROM THE REMOTE AR-24. RETURN TO THE COMMAND MODE AT YOUR LOCAL TD-24 AND SEND THE "D" (DISCONNECT) COMMAND TO THE REMOTE TD-24. CLEAR PASSWORD WITH ANY OF THE FOLLOWING: &, &, OFF, N, NO, NONE.

SETPASS is a string of up to eight (8) alphanumeric characters in eighter upper or lower case. The AR-24 ignores case in SETPASS.

You may wish restrict access to the AR-24 commands by non-technical operators, or prevent operation by unauthorized person. Access to most of the AR-24 commands and parameter values can be restricted by the use of SETPASS and PASSWORD.

SETPASS is typed into the AR-24 by the system administrator. This sets the PASSWORD for priviledged commands.

If SETPASS and PASSWORD are both set (activated), the user must enter the PASSWORD to match SETPASS in order to acquire control of the AR-24 or to execute priviledged command. This applies to both local and remote operation.

Notice: **After using priviledged or PASSWORD - protected commands, the user should clear PASSWORD to prevent subsequent users from seeing the PASSWORD - the contents of PASSWORD can be displayed on the screen.**

10-3: Keyword

You may wish to encrypt private conversations on the radio link, or to encrypt sensitive remote-control functions. When a AR-24 is addressed as MYCALL with any extension or SSID from 0 to 14, it uses KEYWORD on the link.

When a AR-24 is addressed as MYCALL-15, it uses RKEYWORD on the link. KEYWORD is any numeric value from 0 (zero) to 65535. KEYWORD specifies the encryption key to be used in encoding and decoding data.

When KEYWORD is set to any decimal value between 1 and 65535, encryption is enabled. When KEYWORD is set to the same value in the AR-24 at each end of the link and a "- 15" address is not used call the remote AR-24, then the data typed by the users on the radio link will be encrypted.

When a remote AR-24 is addressed as a "MYCALL-15" and RKEYWORD is set to the same value as KEYWORD in the other AR-24, then all commands and data on the radio link will be encrypted.

Note: Both ends of the link must use the same numerical key. See the following RKEYWORD command discussion.

Observers not involved in the encrypted link or unauthorized persons monitoring the link between the two AR-24 will see normal packet address headers. However, the user data or information contained in the packet frame is displayed as apparently random ASCII characters, unless KEYWORD matches that used by the linked AR-24. For example, a supervisor might wish to monitor the link.

Some of the received characters will be interrupted by the observer's system as control characters and cause erratic display behavior. The casual viewer may see random line feeds and carriage returns, clear-screen commands and meaningless screen effects.

Other users on the same channel may monitor the channel for their own traffic and block out the apparently unintelligible screen information.

RKEYWORD operates with the remote access functions when a caller connects to the AR-24 callsign with "-15" appended to MYCALL.

You may wish to use encryption when controlling a AR-24 remotely over the radio link. The AR-24 uses RKEYWORD on the link when addressed as MAYCALL-15. When the AR-24 is addressed as MYCALL with any extension or SSID from 0 - 14, it uses KEYWORD on the link.

RKEYWORD is any numeric value from 0 (zero) to 65535, and specifies the encryption key to be used in encoding and decoding data. When RKEYWORD is set to 0 (zero), encryption is disabled and plain text is transmitted over the radio link. When RKEYWORD is set to any decimal between 1 and 65535, encryption is enabled.

Set RKEYWORD greater than 0 (zero) to enable data encryption. Any value greater than zero encodes the data so that it can not be read by the casual observer. RKEYWORD and KEYWORD do not use a highly-sophisticated encryption algorithm.

RKEYWORD is set at the controlled remote AR-24, while KEYWORD is set at the controlling AR-24. RKEYWORD can not be changed remotely.

Packet protocol headers are transmitted in clear text. Only the user data field or information on RKEYWORD and encryption, see the discussion of the KEYWORD and REMOTE commands in this chapter.

The KEYWORD is a direct command and no appearance in the display even though DISPLAY command is executed to see the current status of command parameters. **Do not forget the KEYWORD numbers.**

If you want to set KEYWORD to 12345, type KEYWORD<>12345<CR>. "was KEYWORD will be appeared promptly. But no figures will be followed after KEYWORD is appeared. This is the secure numbers.

cmd:KEYWORD<>12345<CR>
was KEYWORD

10-4: DIGITAL REPEATER operation (Digi-peater)

The AR-24 provides Digital Repeater function to extend the communications area. The digital repeater function allows to communicate with the distant station where the distance is behind direct connection by constructing a digital repeater station between the stations.

The digital repeater station does not require to attend operator and a pair of transceiver and AR-24 is only required.

If you want to communicate with CCC station but the distance is behind direct connection. However, BBB station is existing between the CCC station. If the CCC station is located in where allows to communicate with direct connection to both you and CCC station, you can use the BBB station as digi-peater station and communicate with CCC station via CCC station.

The AR-24 provides a MYALIAS command which is the dedicated command for degi-peater station's ID. This command is constructed as MYCALL with SSID of 1 to 14 (i.e., MYCALL-2). The AR-24 also provides a DIGIPEAT command to turn ON and OFF of the digi-peater function.

Now if you want to connect CCC station via BBB station (digi-peater station's ID on BBB is supposed as BBB-2),

① Before AR-24 is entered in service of digi-peater operation, set both DIGIPEAT and MYALIAS commands as follows:

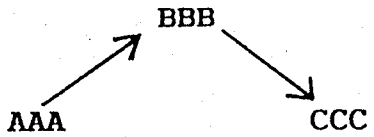
DIGIPEAT:ON (default is ON)

MYALIAS:MYCALL-n(n is a SSID)

② Type CONNECT<>CCC<>V<>BBB-2<CR>

cmd:CONNECT<CCC><>V<>BBB-2<CR>

(V is meant as Via)



Note: **The AR-24 can communicate with the desired station using 8 digi-peater stations as maximum.**

10-5: MACRO operation

The AR-24 can store up to ten commands or data strings numbered from 0M to M9. The maximum length of one macro is up to 120 characters including commands, space. A macro is a string of alphanumeric characters that can be 'recorded' and stored.

10-5-1: How to enter commands or data strigns into macro

For example, we now exercise the macro operation when we communicate with BBB station as follows:

cmd:CONNECT<>BBB<CR>
***** SENDING INFO TO BBB**
THIS IS THE BASE STATION

cmd:DISCONNE
***** DISCONNECTED**

To enter the above progress into MACRO channel 4, the command and data strings are shown on next page.

cmd:4M<>NEWMODE<>OFF/CONNECT<>BBB/WDISCONN/NEWMODE<>ON/CONVERS/
THIS IS THE BASE STATION<CR>

<>	....	Space
4M	....	Macro number
NEWMODE OFF	....	NEWMODE OFF to prohibit the TD-24 goes into Converse Mode at after connecting BBB.
CONNECT BBB	....	Connect to BBB.
WDISCONN	....	Activate Double-disconnect. Wait all commands are executed and, at least, disconnect the communication link automatically.
NEWMODE ON	....	NEWMODE ON to restore it as default value.
CONVERS	....	Go into converse mode.
	....	to separate command to execute the commands one by one.
<CR>	....	Carriage Return

The maximum length of one macro is up to 120 characters including commands, space. So that you can use abbreviation for those commands to shorten the number of characters per each macro.

If the command strings shown on former page are used the abbreviation;

cmd:4M<>NE<>N/C<>BBB/W/NE<>Y/K/THIS IS THE BASE STATION<CR>

10-5-2: How to transmit the stored commands or data strings in macro

To transmit the stored commands or data strings in macro, there are two ways.

① Execute the transmission by pressing F1 key provided on front panel of the AR-24. The F1 key is corresponded with macro 4 (4M).

② In Command Mode, hit the number of macro. If you want to transmit the data in macro 4, hit 4<CR>.

cmd:4<CR>

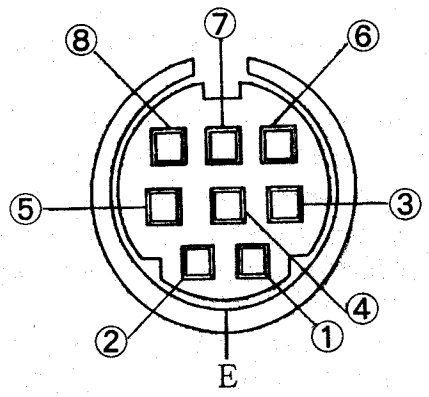
10-5-3: Macro operation using IN/OUT terminal

Macros can also be activated by TTL level signal provided onto one of these INPUT terminals of IN/OUT connector.

You can create macros containing frequently used commands or system instructions to improve the efficiency of operation by non-technical personnel or system instruction to proceed with automatic "TEXT" data sending out in conjunction with a sensor plus switch interface connected to IN/OUT connector.

TTL level signal or ON/OFF switching signal to one of these 4 input lines of IN/OUT terminal provided on front panel of the AR-24 described as follows:

IN/OUT terminal



pin no.

1M ⑤ ---- INPUT 1 ----

2M ⑥ ---- INPUT 2 ----

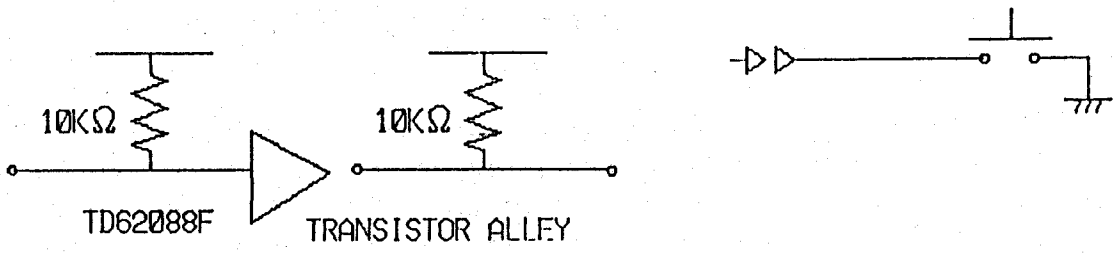
3M ⑦ ---- INPUT 3 ----

4M ⑧ ---- INPUT 4 ----

IN/OUT cable color coding

pin no.	signal	color	pin no.	signal	color
1	output	brown	2	output	red
3	output	orange	4	output	yellow
5	input	green	6	input	blue
7	input	purple	8	input	gray
GND	shield				

Input Signal Interface



TTL level	L = ON	H = OFF
Switching	CLOSED = ON	OPEN = OFF

For example;

---

cmd:1M<>NE<>N/C<>BBB/W/NE<>Y/K/warning, temp. high <CR>

Under the commands' string above, set a thermostat at certain level to close the switch (ON) and then connect that switch to the INPUT line 1 (pin no. 5, cable color coding green). If the environment temp. goes behind the set level of the thermostat, the switch goes closed (ON) and it activates the macro 1 and send the, WARNING, TEMP. HIGH, text string to the station ID of BBB.

If you wish to used the <CR> as a separator, you must type the PASS character (default is CTRL-V) before each Carriage Return to avoid ending the macro command.

For example;

---

cmd: 3M<>AX<>ON<CTRL-V><CR>TXD<>5(CTRL-V><CR>

Macro can not be executed remotely using the REMOTE command over radio link. Macro can not be used recursive, that is, you can not use a macro to set or execute another macro.

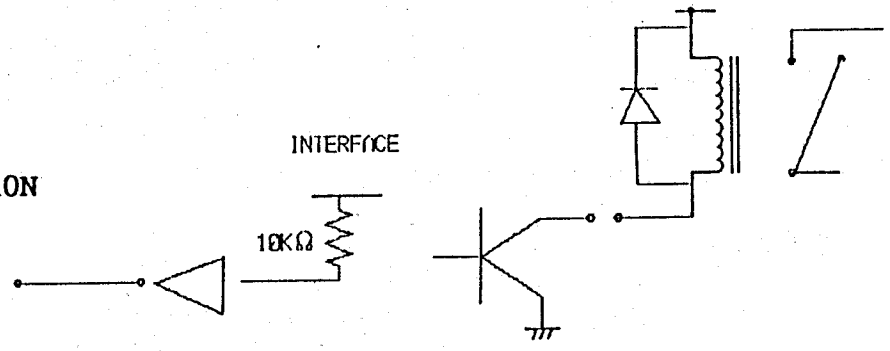
To erase a macro, type a new macro over it or enter the number, M, a space and OFF.

10-5-4: Switching function

The AR-24 has a 4 different output lines of transistor open collector type for maximum +30V 300mA. Each output line can be activate when the AR-24 receives predetermined character keyword consisting of up to 16 characters. Pin number 1 through 4 of the IN/OUT terminal are output lines. The LED indicator located just above the F1 switch is turned on when pin number 4 of the input line is activated by receiving the keyword to the pin.

For example;

cmd:1SET<>SW1ON
cmd:ONT<>10



After setting the parameters, as soon as the TD-24 receives "SW1ON" character string, output port no.1 (pin number 1 of IN/OUT connector) is turned on for 1000m sec. = 1 sec.

nSET is select the output port number (1 through 4) and SW1ON can be any of characters combination up to 6 characters. ONT is to determine the duration for how long that output port should be on. n = 0 to 250 (actual value to be x 100m sec.). If you set this parameter 0, the AR-24 keeps turning on the output port after receiving the character strings to activate that output port.

10-6: BROADCASTING operation

The AR-24 can send one particular data file or text data to the unlimited number of receiving terminals.

Receiving terminals does not require the "TRANSCEIVERS", only receivers plus the AR-24 and of course the computer or terminal can receive the data from the transmitting station. Also you can make 2 groups by having 2 different group IDs for this broadcasting mode. The data encryption is still available in this mode to protect the valuable data from the third party. And to extend the communications range, digi-peater function is also available for this mode too.

10-6-1: Parameter setting for the call to all terminals .

Transmitter

cmd:BC<>ON .... Broadcasting mode ON

cmd:BCT<>n .... n = 1 to 15. The larger n, the less error rate

cmd:U<>CQ .... To send all terminals

Receivers

cmd:BC<>ON .... Broadcasting mode ON

After setting the above parameter, the station to transmit the data give the AR-24 commands as follows:

cmd:I .... To initialize the receiving terminals for the mode

cmd:K .... To go into converse mode

10-6-2: Parameter setting for group calling

Transmitter

cmd:BC<>ON .... Broadcasting mode ON

cmd:BCT<>n .... n = 1 to 15. The larger n, the less error rate

cmd:U<>xxxx .... To select GROUP xxxx

Note: **Transmitter can call 2 different groups at the same time by giving the AR-24 instruction cmd: U xxxx, yyyy. Only the receivers with group call ID xxxx and yyyy can receive the data from the transmitter.**

Receivers

cmd:BC<>ON .... Broadcasting mode ON

cmd:GC<>xxxx .... To assign the AR-24 group call ID xxxx

After setting the above parameters, the transmitter can indicate the transmission by giving the AR-24 following instruction just same as process for call all terminals.

cmd:I

cmd:K

text

After sending out the data, type <CTRL-C> to go back to Command Mode.

Note: In this mode, there is no exchange of the acknowledge and unacknowledged among the stations to avoid the data collisions. The AR-24, instead, keeps sending the same block of the packet n times (which can be configured BCT n = 1 to 15). If the AR-24 could not receive particular packet, the AR-24 blank that packet data onto CRT monitor. As the PACLEN n = 0 to 255 can determine the size of one packet, you can adjust the parameter according to the RF condition to minimize the size of the packet to be blank when the AR-24 can not receive the packet after the multiple transmissions of the same packet block set by BCT parameter.

10-6-3: Parameter setting for individual calling

Transmitter

cmd:BC<>ON .... Broadcasting mode ON

cmd:BCT<>n .... n = 1 to 15. The larger n, the less error rate

cmd:U<>xxxx .... To send xxxx station

Receivers

cmd:BC<>ON .... Broadcasting mode ON

cmd:MY<>xxxx .... Set your ID to XXX

After sending out the data, type <CTRL-C> to go back to Command Mode.

10-7: MULTIPLE connections

Multiple connections are a powerful addition to the AR-24's operation. This feature can be very useful for message net operation, multi-users electronics mail, path checking and conversations with multiple stations. In a multiple connection, you can establish separate "POINT-TO POINT" links with several different stations.

The USERS command affects only the manner in which incoming connect requests are handled, and has no effect on the number of connections you initiate with the AR-24.

USERS 0 allows incoming connections on any free logical channel
USERS 1 allows incoming connections on logical channel 0
USERS 2 allows incoming connections on logical channel 0/1
USERS 3 allows incoming connections on logical channel 0/1/2

and so on, through USERS 26.

10-8: TRANSPARENT operation

For some types of data transfer operations the converse mode will work very well. You may want to send special information, however, such as ready to run programs to another station. The strange characters in the file may get the AR-24 confused in the Converse Mode. Transparent mode is a data mode like the converse mode, except there are no special characters. Everything you type or everything your computer sends to the AR-24, is sent over the radio exactly as it appears to the AR-24. Packets are sent at regular time intervals or when a full packet of information is ready. You may use the PACTIME command to change the time intervals at which data is put into packet form.

The display characteristics of the AR-24 are also modified in the transparent mode. Data is sent from the AR-24 to the terminal exactly as it is received over the radio channel, including all eight bits of each byte received. All features such as LINE FEED and RETURN insertion, ESCAPE translation, and case conversion are disable. None of the parameters which control these features in the converse mode are changed when you enter the Transparent Mode, and all display features are re-enabled when you return the AR-24 to the command mode. Most of the informative message that appear in the converse mode as the AR-24 moves between the disconnected and connected states are also disable.

If you wish to return from the Transparent Mode to the command mode, you must use the following special procedure.

Note: **After a time equal to PACTIME has elapsed, the last data you typed will have been put into packet form for transmission (although it may not have been transmitted yet.).**

---

① Wait for PACTIME to elapse. Then wait an additional time, which is set by the CMDTIME command.

② Type <CTRL-C> three times within a interval CMDTIME of each other. After final CMDTIME interval in which you did not type any characters, you will see the "cmd:" prompt. If you type any character in this interval, even if they are more command character, the escape will be aborted and the three command characters will be sent as packet data. If you set CMDTIME or PACTIME to 0, you will not be able to escape from the Transparent Mode except by performing a hard-reset (power down reset).

11: FLOW CONTROL

Whenever you transfer data to computers, there is a chance that the data will be received faster that the computer can handle it. To prevent lose of data, the computer must be able to make whatever is sending data stop sending, and later tell it to resume sending. If you are home computer user, you are probably already familiar with one type of flow control, which allows you to stop the output from the computer while you read it and re-start it when you have finished.

There are two methods of providing flow control that are supported by the AR-24. XON/XOFF flow control, sometimes called "software flow control", is accomplished by sending a special character(usually a CTRL-S)to request that the output stop and another special character (usually a CTRL-Q) to re-start the output. Hardware flow control may be used if both computers use the RTS (Request To Send) and CTS (Clear To Send) lines of the RS-232C interface.

Many terminal programs and file transfer programs for home computers do not implant flow control. Even if the RTS and CTS lines appear at the connector, software that directly reads the CTS line may be required in order for flow control to be implemented, if you find transfer, immediately suspect a flow control problem.

11-1: XON/OFF Flow Control

If you are using a terminal rather than a computer, or if your computer does not support RTS/CTS flow control, you can use the XON/XOFF flow control. You can enable this method by setting XFLOW ON. The special flow control characters are set to <CTRL-S> and <CTRL-Q> by default. In the command mode, the AR-24 input buffer may fill up if you try to type too long a command. In the data mode, the buffer may fill up if you are using your computer to transfer data at a rate that is faster than the data rate for radio transmission, if radio data transmission has slowed down due to noise or other users on the channel or if the operator or computer at the other end has stopped the output from his AR-24. The AR-24 will send the terminal an XOFF character after each character received. When the buffer fills up completely, data will be lost. When the buffer empties out, the AR-24 will send a single XON character to the terminal.

If you disable XON and XOFF by setting them to 0, the AR-24 will automatically use the RTS/CTS flow control to stop input from the terminal.

XON/XOFF flow control is normally disabled in the Transparent Mode. This is done because character are treated as data therefore, the XON and XOFF characters will not be recognized, if you can not use RTS/CTS flow control, you may enable the XON and XOFF characters (the commands from the AR-24 to the terminal) by setting TXFLOW ON and XFLOW ON, START and STOP characters (the commands to the AR-24 from the terminal), however, will still be treated as data.

11-2: Hardware Flow Control

This method of flow control is preferred, since it usually does not depend on the programming of particular communications program.

8BITCONV	ON:OFF	Mnemonic: 8B	Default: OFF

Parameters: ON ..... The high order bit is not stripped in converse mode.
OFF ..... The high order bit is stripped in converse mode.

8BITCONV permits packet transmission of eight-bits data in the converse mode. If 8BITCONV is OFF, the high-order bit (bit seven) of character received from the terminal is removed before the characters are transmitted in a packet.

The standard ASCII character set requires only seven bits - the eight or final bit is used as a parity but or ignored.

* Setting bit seven in text characters transmitted over the air may cause confusion at the other end.

If you need to transmit eight-bit data but do not want all the feature of transparent mode, set 8BITCONV ON and AWLEN 8. This may be desirable if you are using a special non ASCII character set. Because commands require only the standard seven-bit ASCII character set, bit seven is always removed in command mode.

ABAUD n (300 - 9600)	Mnemonic: AB	Default: 1200

Parameters: n .... RS-232C communication baud rate is set.
300/600/1200/2400/4800/9600 can be specified for n.

Default of RS-232C communication baud rate is set with auto-baud rate. The value of n is an auto-baud rate so that, when the AR-24 is used with a computer having a different baud rate, it must be changed auto-baud rate with RESET command or the baud rate must be changed with this command. The parameter becomes effective when RESTART command is entered or when the power is turned off and backed on again.

AUTOLF	ON:OFF	Mnemonic: AU	Default: ON

Parameters: ON ..... A line feed character <LF> is sent to the terminal after each carriage return character <CR>.
OFF ..... A <LF> is not sent to the terminal after each <CR>.

AWLEN n	7:8	Mnemonic: AW	Default: 7

Parameters: 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 (IO) terminal port and your computer or terminal program.

* Set AWLEN 7 for most packet operations, such as conversation, working electronic mail and bulletin board systems and transmission of ASCII files.

If eight-bit words are sent to the AR-24 in the command or converse modes, the eighth bit is normally removed, leaving a standard ASCII character, regardless of the setting of AWLEN.

All eight data bits of each character must be retained to send executable files or other special data.

* Set AWLEN to 8 and use the transparent mode.

You can also use converse mode and set AWLEN 8 and 8BITCONV ON. However, you must precede the converse mode special characters with the PASS character in the data you send.

AX25L2V2	ON:OFF	Mnemonic: A	Default: ON

Parameters: ON ..... The communication protocol is set to AX.25 Level 2 Version 2.
OFF ..... The communication protocol is set to AX.25 Level 2 Version 1.

AXDELAY n		Mnemonic: AXD	Default: 0

Parameters: n ..... 0 - 120 specifies voice repeater hang time in 10 millisecond intervals.

The numeric value can be used to increase channel efficiency when an audio repeater has a hang time greater than 100 milliseconds. For a repeater with a long hang time, it is not necessary to wait for the repeater key-up delay after keying the transmitter if the repeater is still transmitting.

When the AR-24 has heard a packet sent within the hang period, it does not add the repeater key-up (AXDELAY) to the key-up time. If you are using a repeater that has not been used for packet operation before, try various values to find the best value for "n".

If other packet stations have been using the repeater, ask them for the appropriate setting. AXDELAY acts in conjunction with AXHANG.

AXHANG n **Mnemonic: AXH** **Default: 0**

Parameters: n ..... 0 - 120 specifies voice repeater hang time in 10 millisecond intervals.

The numeric value can be used to increases channel efficiency when an audio repeater has a hang time greater than 10 milliseconds.

For a repeater with a long hang time, it is not necessary to wait for the repeater keyup delay after keying the transmitter if the repeater is still transmitting.

When the AR-24 has heard a packet sent within the hang period, it does not add the repeater key-up delay (AXDELAY) to the key-up time. If you are using a repeater that has not been used for packet operation before, try various values to find the best value for "n".

If other packet stations have been using the repeater, ask them for the appropriate setting.

BEACON Every/After n (0 - 250) **Mnemonic: B** **Default: Every 0**

Parameters:	Every	..... Send BTEXT as beacon in 10 seconds intervals.
	After	..... Send BTEXT as beacon once after the specified time intervals with no packet activity.
	n	..... Specify the beacon timing in 10 seconds intervals. If n is 0 (zero), beacon is not activated.

This command enables beacon sending and causes the first beacon frame to be transmitted. A beacon frame consists of the text specified by BTEXT in a packet addressed to "BEACON" and sent via digi-peat addresses specified UNPROTO command, if any.

The keyword EVERY is specified, a beacon packet is sent every n x 10 seconds. This mode might be used to transmit packets for testing purposes.

If AFTER is specified, a beacon is sent only after n x 1 seconds has passed with no packet activity. In this case, the beacon is sent only once until further activity is detected. This mode can be used to send announcements or test messages only when packet stations are on the air. If you choose n properly you can avoid cutting a busy channel with unnecessary transmission.

Beacon frames from other AR-24s can be monitored by setting MONITOR ON.

BBSMSGS **ON:OFF** **Mnemonic: OFF** **Default: OFF**

Parameters: ON ..... AR-24 changes message statu to display on terminal.
OFF ..... AR-24 displays message status as formed.

BBSMSGS is ON, the message affected are described as follows:

Message		Effect when BBSMSGS ON
*** SENDING INFO TO XXXX	.....	A new line added preceding "***"
*** DISCONNECTED	.....	"
*** Retry count exceeded	.....	"
*** xxxx Busy	.....	"
*** FRMR sent	.....	"
*** FRMR rcvd	.....	"
*** Connect request: xxxx	.....	This message is omitted.

If you set BBS ON and CONOK OFF, AR-24 will send "Busy" against all of connect request but this status is not displayed on the terminal. This should be most useful for preventing corruption of messages when forwarding with important frames.

BCMODE **ON:OFF** **Mnemonic: BC** **Default: OFF**

Parameters: ON ..... Broadcasting mode is on to send the one data to multiple terminals simultaneously.
OFF ..... Broadcasting mode is off.

When the BCMODE is on, the AR-24 can transmit a data to unlimited number of local terminals simultaneously. And the local terminals can be consisting of the AR-24 plus receiver tuned to the frequency of the transmitter.

BCTIME n **Mnemonic: BCT** **Default: 10**

Parameters: n ..... Transmit same one packet block n time and send next packet block n time until completing the transmission of whole data.

When the AR-24 is in the broadcasting mode, BCTIME is to determine how may n times, the AR-24 is to transmit the same packet block. The less n number, the faster transmission.

The larger number, the less data error but the slower transmission speed. Suggest to proceed with pre-filed test before set up this parameter and select the value for minimum number for minimum data error according to the RF link condition you are intending to use for the AR-24.

BKONDEL	ON:OFF	Mnemonic: BK	Default: ON

Parameters: ON ..... The sequence <BACKSPACE><SPACE><BACKSPACE> is echoed.
OFF ..... The <BACKSPACE> character (\) is echoed when a character is detected.

The <BACKSPACE><SPACE><BACKSPACE> sequence will properly update the screen of a video display. If you have a video terminal or computer, you should set BKONDEL ON.

The <BACKSPACE><SPACE><BACKSPACE> sequence on printing terminal would result in overtyped text. If you have a paper-output display, or if your terminal does not respond to the <BACKSPACE> character <(CTRL-H>), you should set BKONDEL OFF.

The AR-24 will type a <BACKSLASH> for each character you delete. You can display the corrected input line by the redisplay-line character, which is set by the command REDISPLA.

Note: This command is only activated in Command and Converse Modes.

BTEXT text	Mnemonic: BT	Default: empty

Parameters: text ..... Any combination of characters and spaces, up to a maximum length of 120 characters.

BTEXT is content of the data portion of a beacon packet. The default text is an empty string (no message).

You can send multiple line messages in your beacon by including <CR> characters in the text. <CR> is inserted by typing the PASS character before the <CR>.

BUDLIST	ON:OFF	Mnemonic: BU	Default: OFF

Parameters: ON ..... Ignore frames from stations which are not in the LCALLS list.
OFF ..... Ignore frames station which are in the LCALLS list.

BUDLIST works in conjunction with the command LCALLS, which sets up a callsign list. These commands determine which packets will be displayed when you have set MONITOR ON. BUDLIST specifies whether the callsigns in the list are the ones you want to ignore or, alternatively, are the only ones you want to listen to.

If you want to listen only for packets from a limited list, you should enter this list with LCALLS and set BUDLIST OFF.

BXDELAY n Mnemonic: BXD Default: 0

Parameters: n ..... If 0 (zero) is set, the SQUELCH input line is used as a true squelch input, as described under the SQUELCH command.

If 1 - 120 is set, n in 10-millisecond intervals sets the input line to be used a "grant" or "OK to send a data frame" line.

An active-going transition initialized the BXDELAY counter. An inactive-going transition disables the BXDELAY countdown. If the countdown reaches a value of zero, the frame is sent. n (in 10-millisecond increments) sets a time value.

If the grant lasts longer than the BXDELAY time, the frame will be sent. If the grant does not occur or occurs but does not last longer than BXDELAY, the cycle starts with PTT to occur again. The SQUELCH command will accommodate reserve logic polarities.

CANLINE n(0 - $7F) Mnemonic: CAN Default: $18(CTRL-X)

Parameters: n ..... 0 to $7F, specify an ASCII character code to cancel an input line.

This command is used to change the cancel-line input editing command character. The parameter n is the ASCII code for the character you want to type in order to cancel an input line. You can enter the code in either hex or decimal.

For example, to change the cancel-line character to <CTRL-U>, you would set CANLINE $15 or CANLINE 21.

If you cancel an input line in Command Mode, the line will be terminated with a <BACKSLASH> character, and you will see a new cmd:prompt. If you cancel a line in Converse Mode, you will see only the <BACKSLASH> and a new line. You can cancel only the line you are currently typing. Once a <CR> has been entered, you can not cancel that inputline using the cancel-line character. Note that if your send-packet character is not <CR>, the cancel-line packet. To cancel the entire packet, use the CANPAC character.

CANAPC n(0 - $7F)	Mnemonic: CAP	Default: $19(CTRL-Y)

Parameters: n ..... 0 to $7F, specify an ASCII code to cancel the entered packet.

CANPAC is used to change the cancel-packet input editing command character. The parameter n is the ASCII code for the character you want to type in order to cancel an input packet. You can enter the code in either hex or decimal.

If you cancel a packet in Converse Mode, the line will be terminated with a <BACKSLASH> character and a new line. You can only cancel the packet that is currently being entered. One you have typed the send-packet character, or waited PACTIME (if CPACTIME enabled), the packet can not be canceled even if it has not been transmitted. Packet cancellation, line other input editing features, is disabled in Transparent Mode.

The cancel-packet character also functions to cancel display output in Command Mode. If you are in Command Mode and type the cancel-packet character, any characters that would be typed on the screen (except echoed characters) are "thrown away" by the AR-24. Typing the cancel-output character a second time restores normal output. To see how this works, try typing DISPLAY, then type a <CTRL-Y>. The command list display will stop. You won't see any response from the AR-24's commands. Now type another <CTRL-Y>, and type DISPLAY again to see that the display is back to normal.

CBELL	ON:OFF	Mnemonic: CB	Default: OFF

Parameters: ON ..... Connect bell enabled.
OFF ..... Connect bell disabled.

This command is used to control whether an ASCII $07 (BELL) character is sent as part of the connected message.

When set On, the bell character immediately precedes the asterisk portion of the connected message.

CHECK n	Mnemonic: CH	Default: 30

Parameters: n ..... 0 to 250 specifies the check time in 10 seconds intervals.
0 ..... Zero disables this feature.

CHECK sets a timeout value for a packet connection.

Without the CHECK feature, if your AR-24 were linked or "connected" to another station and the other station seemed to "disappear", your AR-24 would remain in the connected state indefinitely, refusing connections from other stations.

This might happen if propagation changes unexpectedly or an intermediate digi-peater station fails or is shut down while you and the distant station are connected "via" that digi-peater. Your AR-24 tries to prevent this situation from occurring by sending a new connect request packet when RELINK is ON and the specified time elapses without any packets being heard from the other TNC.

If RELINK is ON, when a pre-version 2 link is inactive for (CHECK times then seconds), your AR-24 tries to save the link by starting a reconnect sequence. The AR-24 enters the "connect in progress" state and sends SABM (connect request) frames. In addition, the AR-24 adds a random time of up to 30 seconds each time CHECK is used.

The "check" packet frame contains no information, but is interpreted by the distant station's TNC is still connected, the distant station sends an appropriate response packet.

If your AR-24 initiates the "check" and does not get an answer after RETRY+1 attempts, the AR-24 starts a reconnect sequence just as if you had typed the connect command. If RELINK is OFF, the AR-24 goes to disconnected state.

CLKADJ n	Mnemonic: CLK	Default: 8

Parameters: n ..... 0 to 65535 specifies a correction factor to be applied to the real-time clock routine.

A value of "0" is a special case and means that NO correction will be applied. If the value of CLKADJ is anything other than 0 (zero), then the correction factor is calculated as follows:

Relative clock speed in % = 100 - (9.16667 * 1/n)

The real-time clock routine keeps track of year, month, day, hour, minute and second as specified in the DAYTIME command.

CMDTIME n **Mnemonic: CM Default: 1 (1msec)**

Parameters: n ..... 0 to 250 specifies timeout value in 100-millisecond intervals while the controller is in transparent mode.

If "n" is 0 (zero), you will have to send the BREAK signal or interrupt power to the controller to exit from the transparent mode. CMDTIME sets the timeout value in the transparent mode. A guard time of "n" seconds allows escape to the command mode from the transparent modem while permitting any character to be sent as data.

The same command mode entry character (default <CTRL-C>) that is used to exit from the converse mode is also used to exit the transparent mode, although the procedure is different.

Note:
1. The command mode entry character is set by COMMAND.
2. Three command mode entry characters must be entered less than "n" seconds apart, with no intervening characters, after delay of "n" seconds following the last characters you typed.
3. After a final delay of "n" seconds, the controller exists the transparent mode and enters the command mode.
4. You will then see the normal command mode prompt.

```
cmd :
```

CMSG **ON:OFF** **Mnemonic: CMS** **Default: OFF**

Parameters:
ON ..... The recorded CTEXT message is sent as the first packet after a connection is established by a connect request from another station.
OFF ..... The text message is not sent at all.

CMSG enables or disables automatic transmission of the CTEXT message when your controller accepts a connect request from another station.

Note:
1. Set CMSG ON to tell callers that you are not available to connect to your controller.
2. Set CMSG OFF when you are available to operate or answer calls manually.

CMSGDISC ON:OFF Mnemonic: CMSGD Default: OFF

Parameters:
- ON ..... Causes an automatic disconnect upon completion of CTEXT message.
- OFF ..... The AR-24 will remain connected after it sends the CTEXT message.

Normally, you will want to set CMSGDISC to ON. If CMSGDISC is set to OFF and another station connects to you, your station will remain in a connected state until either you or the other station issues a DISCONNECT. This feature helps prevent your station from being hung up by a distant station that connects you, but for some reason can not disconnect, such as fading band conditions.

CONMODE CONVERSE:TRANS Mnemonic: CONM Default:CONVERS

Parameters:
- CONVERS ..... Your controller automatically enters the converse mode when connection is established.
- TRANS ..... Your controller automatically enters the transparent mode when connection is established.

CONMODE selects the mode your controller uses after entering the CONNECTED state.

CONNECT call1[via call2, call3,..,call9] Mnemonic: C immediate command

Parameters:
- call1 ..... Call sign of the distant station to which you wish to be connected.
- call2 ..... Optional call sign(s) of up to eight digi-peaters via which you'll be repeated to reach the distant station.

CONNECT sends a connect request to station "call", directly or via one or more digi-peaters. Each call sign can include an optional SSID or extension "n", immediately after the call sign.

The part of the command line shown in brackets below is optional. The double-bracketed text, call3 ...., call9' is also optional and is used only when "VIA call2" is used, that is, when connecting through one or more digi-peaters. (the brackets and quotation marks are used in this text only for clarity - please do not type them!)

Type CONNECT or "C" without arguments to see the link status and the number of unacknowledged, outstanding packets.

COMMAND n(0 - $7F) Mnemonic: COM Default: $03(CTRL-C)

Parameters: n ..... 0 to $7F, specify an ASCII code to change the Command Mode.

Command Mode is entered from Converse Mode or Transparent Mode when this character is typed. If you type the Command Mode entry character while you are already in Command Mode, nothing will happen. To see how this works, enter Converse Mode by typing CONVERS. Anything you type will become packet data. Now type <CTRL-C>. You will see the Command Mode prompt, indicating successful exist to Command Mode.

See the entry under CMDTIME for information on how to use the Command Mode entry character to escape from Transparent Mode.

CONOK ON:OFF Mnemonic: CONO Default: ON

Parameters: ON ..... Connect requests from other stations are accepted.
OFF ..... Connect requests from other station are not accepted.

The CONOK command determines the action that the AR-24 will take when it receives a connect request from another station. If CONOK is set to ON, the request is acknowledged, the normal connect message is displayed, and the AR-24 will enter either the converse or the transparent mode.

CONPERM ON:OFF Mnemonic: CONP Default: OFF

Parameters: ON ..... The current connection on the current stream will not be allowed to enter the disconnected state.
OFF ..... The current steam may be connected to and disconnected from other stations.

This command, when switched On, forces the AR-24 to always maintain the current connection, even when frames to the other station exceed RETRY attempts to get an acknowledgment. RESTART and power ON/OFF cycling will not affected this connected state. This command only takes effect when a connection is established. If functions on a stream-by-stream basis when multiple connections are allowed. It is useful for certain networking applications, meteor scatter and other noisy, less-reliable links, while still allowing connections on other streams to operate normally (automatic disconnected based on RETRY, etc.).

CONSTAMP **ON:OFF** **Mnemonic: CONS** **Default: OFF**

Parameters: ON ..... Connect status message are time stamped.
OFF ..... Connect status message are not time stamped.

CONSTAMP activates time stamping of *** CONNECTED.

If CONSTAMP is ON and DAYTIME (the controller's internal clock) is set, date and time information generated in the controller is available for bulletin board programs or other host computer applications.

Date and time must be set initially by the DAYTIME command before time stamping will occur.

CONVERS or (K) **Mnemonic: CONV (K) immediate command**

CONVERS is an immediate command that causes the controller to change from the command mode to the converse mode.

To return the controller to the command mode from the converse mode, type the command mode entry character (default is <CTRL-C>).

CPACTIME **ON:OFF** **Mnemonic: CP Default: OFF**

Parameter: ON ..... Packet transmit timer is sued in the converse mode.
OFF ..... Packet transmit timer is not used in the converse mode.

CPACTIME activates automatic, periodic transmission of packets while the controller is in the converse mode.

CPACTIME may be used for several types of computer communications such as bulletin board or host computer operation when you do not want the full transparent mode features.

CR	ON:OFF	Mnemonic: CR Default: ON

Parameters:

ON ..... The send-packet character (normally <CR>) is appended to all packets that are sent in the converse mode.

OFF ..... The send-packet character is not appended to packets.

When CR is set to ON, all packets that are sent in the converse mode will include, as the last character of the packet, the send-packet character. This character causes the packet to be sent. If CR is set to OFF, the send-packet character is interpreted only as a command to the AR-24, and is not included in the packet. In addition, it will not be echoed to the terminal.

Set CR ON and SENDPAC to $0D for a natural conversation mode. Each line is sent whenever you enter a <CR>, and arrives at the other station with a <CR> at the end of the line.

Note: If the other station reports overprinting of lines on his display, you can either set LFADD to ON or the other station can set AUTOLF to ON.

CSTATUS	Mnemonic: CS	immediate command

CSTATUS is an immediate command that is used during multiple connections. When you type CSTATUS, your monitor displays:

The number of each logical channel.

The link state of all 26 logical channels.

The current input/output channel - the one you are using.

CTEXT text **Mnemonic: CT Default: empty**

Parameters: text ..... Any combination of characters and spaces up to maximum of 120 characters.

CTEXT is the "automatic answer" text you type not a special section in the controller's memory.

If CMSG is set to ON, the CTEXT message is sent as soon as another station connects to your station.

To type multiple-line CTEXT messages and include a carriage return (<CR>) character in your text, use the PASS character (<CTRL-V> is the default value) immediately preceding the carriage return.

Use a percent sign (%), an ampersand (&), "N", "NO", "NOTE", or "OFF" as the first characters in the CTEXT message to clear the previous message without having to type a RESET command.

DISCONNECT **Mnemonic: D immediate command**

DISCONNECT is an immediate command that initiates a disconnect request to the other station to which you are connected.

DAYTIME date & time **Mnemonic: DA Default: no time**

Parameters: date & time ..... Current date and time to set.

DAYTIME sets the AR-24's internal clock current date and time. The date & time parameter is used in the packet mode by the command CONSTAMP and MSTAMP to "time stamp" received and monitored messages. The format for entering the date & time is; yymmddhhmm.

cmd: daytime 9011281610

yy is the last two digits of the year
mm is the two-digit month code (01-12)
dd is date (01-31)
hh is the hour (00-23)
mm is the minutes after the hour (00-59)

AYSTAMP ON:OFF Mnemonic: DAYS Default: OFF

arameters: ON ..... The DATE is included in CONSTAMP and MSTAMP.
OFF ..... Only the TIME is included in CONSTAMP and MSTAMP. DAYSTAMP activates the date in CONSTAMP and MSTAMP.

t DAYSTAMP ON when you want a dated record of packet channel activity, or hen you are unavailable for local packet operation.

AYUSA ON:OFF Mnemonic: DAYUSA Default: OFF

arameters: ON ..... The date is displayed in a mm-dd-yy format.
OFF ..... The date is displayed in a dd-mm-yy format.

ISPLAY [class] Mnemonic: DISP immediate command

arameters: Class optional parameter identifier, one of the following:

(A) sync ..... display asynchronous port parameters.
(C) haracter ..... display special characters.
(H) ealth ..... display health parameters.
(I) D ..... display ID parameters.
(L) ink ..... display link parameters.
(M) onitor ..... display monitor parameters.
(T) iming ..... display timing parameters.

ype DISPLAY without a class parameter to display all control parameters and heir
urrent values.

DELETE ON:OFF Mnemonic: none Default: OFF

Parameters: ON ..... The delete character input editing character is <DELETE ($7F).
OFF ..... The delete character input editing character is <BACKSPACE> ($08).

This command is used to change the input editing command for character deletion. When this character is typed, the last character from the input line is deleted. How the AR-24 indicates the deletion is controlled by the BKONDEL command.

You can not use this character to delete past the beginning of a line, although you can delete <CR> characters that have been entered in the text with the pass character.

To see corrected display of the current line after you have deleted characters, type the redisplay-line character, which is set by the REDISPLA command .

This command does not work while in Transparent Mode.

DIGIPEAT On:OFF Mnemonic: DIG Default: ON

Parameters: ON ..... The AR-24 will digipeat packets if requested.
OFF .....The AR-24 will not digipeat packet.

When this parameter is ON, any packet received that has your AR-24's callsign (including SSID) in the digipeat list of its address field will be retransmitted. Each station included in the digipeat list relays the packet in its turn, marking the packet so that it will not accidentally relay it twice (unless so requested), so that the stations will replay the packet in the correct order. Digipeating takes place concurrently with other AR-24 operations and does not interfere with normal operation of a packet station.

The command HID enables automatic transmission of identification packets if your station is acting as a digipeater.

DWAIT n Mnemonic: DW Default: 16(160msec)

Parameters: n ..... 0 to 250 specifies default wait time in ten-millisecond intervals.

DWAIT helps avoid collisions with digipeated packets.

Unless the AR-24 is waiting to transmit digipeated packets, DWAIT forces it to pause after last receiving data on the channel for the duration of the DWAIT (Default Wait) time, before it begins its transmitter key-up sequence.

ECHO	ON:OFF	Mnemonic: E	Default: ON

Parameters: ON ..... Characters received from the computer or terminal are echoed by the AR-24.
OFF ..... Characters are not echoed.

The ECHO command controls local echoing by the controller when it is in the command or converse mode. Local echoing is disabled in the transparent mode.

EEPROM	Mnemonic: none	immediate command

This command is an immediate command and is used when you change the current command parameters to other parameter value. Execute "EEPROM" in Command Mode and RESTART or AR-24 turn off and on again to store the new parameters into EEPROM.

ESCAPE	ON:OFF	Mnemonic: ES	Default: OFF

Parameters: ON ..... The <ESCAPE> character ($1B) is output as $ ($24).
OFF ..... The <ESCAPE> character is output as <ESCAPE> ($1B).

This command specifies the character which will be output when an <ESCAPE> character is to be sent to the terminal. The <ESCAPE> translation is disabled in Transparent Mode.

This command us provided because some terminals, and computer programs that emulated such terminal interpret <ESCAPE> character as a special command prefix. Such terminals may alter their displays depending on the characters following the <ESCAPE>. If you have such a terminal. You can protect yourself from unexpected text sequences and from other AR-24's stations by setting ESCAPE ON.

See also MFILTER command, which allows general character stripping (rather than character translation) in monitored packets.

FLOW ON:OFF Mnemonic: F Default: ON

Parameters: ON ..... Type-in flow control is active.
OFF ..... Type-in flow control is not active.

When FLOW is ON, Type-in flow control is active. Any character typed on your keyboard causes the output from the AR-24 to the terminal to stop until any of the following conditions.

exist: A packet is forced (in the converse mode).
A line is completed (in the command mode).
The packet length (see PACLEN) is exceeded.
The terminal output buffer fills up.

Canceling the current command or packet or typing the redisplay-line also causes output to resume. Type-in flow control is not used in the transparent mode.

Setting FLOW ON prevents inbound or received data from interfering with your keyboard data entry. If you (and The person) you are taking to) normally wait for a packet from the other end before starting to respond, you can set FLOW OFF.

Some computers with "software UARTs" may be unable to send and receive data at the same time. If you are using that type of computer, set FLOW to ON.

FRACK n Mnemonic: FR Default: 2(2 sec)

Parameters: n ..... 1 to 15, specifying frame acknowledgment time-out in one second intervals.

FRACK is the FRame ACKnowledgment time in seconds that your AR-24 will wait for acknowledgment of the last sent protocol frame before resending or retrying that frame. After sending a packet requiring acknowledgment, the AR-24 waits for FRACK seconds timeout before incrementing the retry counter and sending the frame again.

FULLDUP **ON:OFF** **Mnemonic: FU Default: OFF**

Parameters: ON ..... Full duplex mode is enabled.
OFF ..... Full duplex mode is disabled.

When full-duplex mode is disabled, the AR-24 makes use of the DCD (Data-Carrier Detector) signal from its modem to avoid collisions; the AR-24 acknowledges multiple packets in a single transmission with a single acknowledgment.

When full-duplex mode is enabled, the AR-24 ignore the DCD signal and acknowledges packets individually.

Full-duplex operation is useful for full-duplex radio operation. It should not be used unless both your station and the other station can operate in full-duplex.

You may also find full-duplex mode useful for some testing operations, such as analog or digital-loopback tests.

GCALL xxxx, yyyy **Mnemonic: GC Default: -**

Parameters: To set up the 2 different group call IDs and select specified group(s) for group calling when you are in broadcasting mode. To delete the group call(s), type % or & after the GCALL command. To command "U" followed by group call ID.

U xxxx, to call all the local terminals who have xxxx group call ID.

HEADERLN **ON:OFF** **Mnemonic: HE Default: OFF**

Parameters: ON ..... The header for a monitored packet is printed on a separate line from the packet text.
OFF ..... The header and packet text of monitored packets are printed on the same line.

HEADERLN affects the display of monitored packets. When HEADERLN is OFF, the address information is shown on the same line.

When HEADERLN is ON, the address is shown, followed by a <CR> <LF> that puts the packet text on a separate line.

HEALLED ON:OFF Mnemonic: HEAL Default: OFF

Parameters: ON ..... The AR-24 will "dither" the CON and STA LEDs.
OFF ..... The AR-24 will control the CON and STA LEDs in normal fashion.

This command allows the user to redefine the functions of the two CPU controllable LEDs (i.e., the STAtus and CONnect LED) When HEALLED is set ON, the two LEDs flash in a seeming random fashion. At a glance, the user may make a judgement on whether the software has crashed, since the LEDs will probably not flash if the software fails catastrophically.

With HEALLED set OFF, the LEDs function as before.

HHANG n Mnemonic: HH Default: 0 (zero)

Parameters: n ..... 0 to 250 specifies a flag burst repetition rate intervals of 100 milliseconds.

Repeaters both truncked and standard very widely in the switching delays between receive and transmit. This imposes additional special requirements on a packet radio controller.

The HHANG parameter aids in handling operation with these repeaters.

When in a connected state, if HHANG is set to any value other than 0 (zero), the AR-24 keys the PTT line and sends bursts of sync flag at regular intervals. This keeps the channel active and the repeater keyed.

When there is activity on the channel, bursts are not sent. The AR-24 waits HHANG times 100 milliseconds after the last activity on the channel, sends a burst and then repeats it every HHANG times 100 milliseconds. Bursts are not sent while in the disconnected state or if HHANG is set to 0 (zero). The length of the HHANG burst is set by the value assigned to TXDELAY.

Note: TXDELAY must be less than HHANG.

HID **ON:OFF** **Mnemonic: HI Default: OFF**

Parameters: ON ..... Enables HDLC identification by a digipeater.
OFF ..... Disables HDLC identifications.

This command is used to enable or disable the sending of identification packets by the AR-24. IF HID is OFF, the AR-24 will never send an identification packet. If HID is ON, the AR-24 will send an identification packet every 9.5 minutes if the station is digipeating packets. The ID command allows the operator to send a final identification packet if the station is being taken off the air.

An identification consists of an unsequenced information (UI) frame whose data filed is you station identification. The identification packet is addressed to the "CQ" address set by the UNPROTO command. Your station identification is your callsign as set by MYCALL, with "/R" appended.

ID **Mnemonic: ID immediate command**

ID is and immediate command that sends a special identification packet. The ID command allows you to send a final identification packet when you are taking your station off the air. ID forces a final identification packet to be sent when a digipeater station is taken off the air. The identification consists of an unnumbered I-Frame, with its data field containing your MYALIAS (if any) and your MYCALL station identification and the word "digipeater".

The ID identification packet is sent only if the digipeater has transmitted since the last automatic identification. The ID identification packet is addressed to "ID".

KEYWORD n **Mnemonic: KE Default: none**

Parameters: n ..... 1 to 65535 enables encryption and specifies the key to be used in encoding and decoding data.
n ..... 0 (zero) disables encryption and produces plain text.

You may wish to use encryption when controlling a AR-24 remotely by radio link, or when users of the link wish to communicate privately. Use KEYWORD greater than 0 (zero to enable data encryption. KEYWORD is used in the controlling AR-24, while RKEYWORD is used at the controlled remote AR-24.

<Note>:Both ends of the link must use the same numerical key. See the RKEYWORD command discussion. Observers not involved in the encrypted link or unauthorized persons monitoring the link between the two AR-24 will see normal packet address headers. However, the user data or information contained in the packet frame is displayed as apparently random ASCII characters. Some of the received characters will be interpreted by the observer's casual viewer may see random line feeds and carriage returns, clear-screen commands and meaningless screen effects.

LCOK **ON:OFF** **Mnemonic: LC** **Default: ON**

Parameters:
- ON ..... Causes the AR-24 to send lowercase characters to the computer or terminal.
- OFF ..... Causes the AR-24 to translate lowercase characters to uppercase.

If LCOK is set to OFF, lowercase characters are translated to uppercase before they are sent to the terminal. Input characters and echoes are not translated.

'Note: Case translation is disabled in the transparent mode.

LFADD **ON:OFF** **Mnemonic: LF Default: OFF**

Parameters:
- ON ..... A line feed <LF> character is added to outgoing packets following each carriage return <CR> that is transmitted in the packet.
- OFF ..... No line feed character is added to outgoing packets.

Set LFADD to ON if the station you are communicating with reports that your packets are being overprinted.

Note: This character insertion is disabled in the transparent mode.

LFIGNORE **ON:OFF** **Mnemonic: LFI** **Default: OFF**

Parameters:
- ON ..... Causes the AR-24 to ignore any line feed characters it receives from another station.
- OFF ..... Causes the AR-24 to print any line feed characters it receives.

Set LFIGNORE to ON if you feel you are receiving too many line feeds from another station.

Note: This command has not effect in the transparent mode.

LCALLS	all, none, yes/no call1[call2]	Default: empty

Parameters: Call, All none, YES list, NO list. The list can contain up to eight stations, separated by commands.

LCALLS uses arguments to determine how our AR-24 monitors the packet channels an displays information - which stations' packets will be displayed and which stations' packets will be masked or hidden. LCALLS is set to "all" when you start your AR-24 for the first time.

The LCALLS to display the ALL/NONE YES list /NO list status of station call signs whose packets will or will not be displayed. You can an use the abbreviated command form or mnemonic:

```
cmd: Lcalls
LCALIS all
cmd: lca
LCALIS yes 1111,2222,3333,4444
```

To stop any packets from being displayed, type LCALLS NONE.

To display packets from one or more specific station type LCALLS YES (followed by a list of call signs). Packets will be displayed only from stations whose call signs are listed after YES.

To hide or mask packets from one or more specific stations, type LCALLS NO (followed by a list of call signs). Packets from stations whose call signs are listed after NO will not be displayed.

LCSTREAM	ON:OFF	Mnemonic: LCS	Default: ON

Parameters:
- ON ..... The AR-24 will translate the character immediately following the STREAMSWITCH character to upper case before processing it.
- OFF ..... The AR-24 will process the character immediately following the STREAMSWITCH character as it is entered.

When operating multi-connect, the user must enter a stream identifier (default A though Z) after the STREAMSWITCH character (default) to select a new logical stream to send data. Normally, the stream identifier must be in upper case, or error message will result.

When LCSTREAM is ON, the character immediately following the streamswitch character is converted to upper case before being acted upon. Thus, the case (upper or lower) becomes insignificant. Use of LCSTREAM is useful if you are typing in lower case and don't want to be bothered with remembering to switch to upper case when changing streams.

MONITOR	ON:OFF	Mnemonic: M	Default: ON

Parameters: ON ..... Packet activity is monitored.
OFF ..... Packet activity is not monitored.

If MONITOR is set to ON and the AR-24 is not in the transparent mode, packets not addressed to you are displayed. The address in the packet are displayed along with the data portion of the packet. HEADERLN controls the format of the monitor display. If you wish to see the station addresses on a separate line from the text, set HEADERLN ON.

MRPT enables monitoring of the digipeater routing as well as source and destination addresses for each packet.

MALL	ON:OFF	Mnemonic: MA	Default: ON

Parameters: ON ..... Monitored packets X both"connected" packets and "unconnected" packets.
OFF ..... Monitored packets include only "unconnected" packets.

This command determines the class of packets which are monitored. If MALL is OFF, only otherwise eligible packets (as determined by the BUDLIST and LCALLS commands) sent by other AR-24s in the unconnected mode are displayed. This is the normal manner of operation when this AR-24 is being used to talk to a group of AR-24s of which are unconnected.

If MALL is ON, all otherwise eligible frames are displayed , including those sent between two other connected AR-24s. This mode may be enabled for diagnostic purpose or for "reading the mail".

MOCON	ON:OFF	Mnemonic: MC	Default:OFF

Parameters: ON ..... Monitor mode remains active when AR-24 is connected.
OFF ..... Monitor mode is disabled while the AR-24 is connected.

If MCON is ON, the MONITOR command will enable monitoring while your AR-24 is connected to another AR-24. If MCON is OFF, the display of monitored packets it suspended when a connect occurs, and is resumed when the AR-24 is disconnected. If you want to see all packets displayed when you are not connected but have such display suppressed when you connect to another station, you should set MCON OFF.

MAXFRAME "n"	Mnemonic: MAX	Default: 4

Parameters n ..... 1 to 7 signifies a number of packet frames.

MAXFRAME sets an upper on the unacknowledged packets your AR-24 permits on the radio link at nay one time. MAXFRAME also sets the maximum number of contiguous packets your AR-24 will send during any given transmission.

The best value of MAXFRAME depends upon your local channel conditions. In most cases of keyboard-to-keyboard direct or local operation (link that do not require going through digipeaters), you can use the default value MAXFRAME 4.

If packet traffic is heavy or the path is poor, reduce it to 3 or 2.

If you are sharing the channel with several PBBSs and digipeaters, or when you are working a PBBS or other types of host computer, reduce MAXFRAME to 1.

MCOM	ON:OFF	Mnemonic: MCOM	Default: OFF

Parameters: ON ..... Connected, disconnected, information, UA (Unnumbered Acknowledgment) and DM (busy signal) frames are monitored.

OFF ..... Only information frames are monitored.

When MCOM is set to ON, both connected and disconnected frames are displayed, if MONITOR is also set to ON. Connected, disconnected, information UA, and DM frames are indicated by <C>, <D>, <I>, <UA>, and <DM>, respectively.

Set MCOM to OFF to display only frames (packets that contain user information).

MFILTER n1, n2, n3, n4 **Mnemonic: MF Default: $00**

Parameters: n ..... 0 to $7F (0 to 127 decimal) specifies an ASCII character code. Up to four characters may be specified.

Use MFILTER to select characters to be "filtered", or excluded from monitored packets. Parameters "n1", "n2", etc are the ASCII codes for three characters you want to filter.

You can enter up to four characters in either hex or decimal.

1. To prevent a <CTRL-L> character from clearing your screen, set MFILTER 12.

2. To eliminate <CTRL-Z> character, which some computers interpret as end-of-file makes, set MFILTER 26.

3. To eliminate <CTRL-G> character, which beep you computer or terminal, set MFILTER 7.

MHCLEAR **Mnemonic: MHC** **immediate command**

The MHCLEAR command clears the list of station heard. You can use this command together with the Mheard command to keep track of any station heard over particular period of time, such as an evening or week. Be sure to clear the list of stations heard when you first begin to monitor packet activity. MHEARD is an immediate command that displays a list of stations heard since the last time the MHEARD buffer was cleared.

MRPT **ON:OFF** **Mnemonic: MR** **Default: ON**

Parameters: ON ..... Show digipeaters in the header; stations heard directly are marked with an asterisk.
OFF ..... Show packets only from originating and destination stations.

MRPT affects the way monitored packets are displayed. When MRPT is OFF, only packets from the originating station and the destination are displayed.

When MRPT is ON, the call signs of all stations in the entire digipeat path are displayed. The call sign of the stations received directly are flagged with an asterisk.

MSTAMP **ON:OFF** **Mnemonic: MS** **Default: OFF**

Parameters: ON ..... Monitored frames are time stamped.
OFF ..... Monitored frames are not time stamped.

The MSTAMP command activates or disables time stamping of monitored packets. When your AR-24's internal clock is set, date and time information is available for automatic logging of packet activity or other applications.

MYCALL ID (-"n") **Mnemonic: MY** **Default: MIKE**

Parameters: ID ..... call ID sign.
n ..... 0 to 15, an optional substitution ID.

Use the MYCALL command to load the ID sign into the AR-24.

MYALIAS ID (-n) **Mnemonic: MYA** **Default: none**

Parameters: ID ..... Alternate identity of your AR-24.
n ..... 0 to 15, an optional substation ID.

MYALIAS specifies an alternate call ID (in addition to the ID specified in MYCALL) for use as a digipeatr only.

Note: The AR-24 will not allow other station to connect to your MYALIAS call ID.

NEWMODE **ON:OFF** **Mnemonic: NE** **Default: OFF**

Parameters: ON ..... The AR-24 automatically returns to the command mode at disconnect.
OFF ..... The AR-24 does not return to the command mode at disconnect.

NEWMODE determines how your AR-24 behaves when the link is broken. Your AR-24 always switches to a data transfer mode at the time of connection, unless NOMODE is ON. Set NEWMODE for the type of operation most suitable to your NEED.

NOMODE	ON:OFF	Mnemonic: NO Default: OFF

Parameters:
- ON ..... The AR-24 switches modes (command, converse, transparent) only upon an explicit command. The NEWMODE function is ignored.
- OFF ..... The AR-24 changes modes according NEWMODE.

When NOMODE is ON, your AR-24 never switches from the converse or transparent mode to the command mode (or vice versa) by itself. Only specific commands (converse, trans, or <CTRL-C>) typed by you can change the operating mode.

When NOMODE is OFF, your AR-24 switches modes automatically.

NUCR	ON:OFF	Mnemonic: NU	Default: OFF

Parameters:
- ON ..... <NUL> characters are sent to the terminal following <CR> characters.
- OFF ..... <NUL> characters are not set to the terminal following <CR> characters.

This command causes transmission of <NULL> characters (ASCII code $00). producing an effective delay following any <CR> sent to the terminal. The number of <NULL> characters is determined by the command NULLS> This delay is required by some hard-copy terminals. You need to set NUCR ON if your terminal misses one or more characters after responding to a <CR>. If this is the case, you will sometime see overtyped lines.

NULF	ON:OFF	Mnemonic: NUL	Default: OFF

Parameters:
- ON ..... <NULL> characters are sent to the terminal following <LF> characters.
- OFF ..... <NULL> characters are not sent to the terminal following <LF> characters.

This command causes transmission of <NULL> characters (ASCII code $00), producing an effective delay following any <LF> sent to the terminal. The number of <NULL> characters is determined by the command NULLS. This delay is required by some display terminals. You need to set NULF ON if your terminal sometimes misses characters at the beginning of the line.

NULLS n(0 - 30) **Mnemonic: NULL** **Default: 0 (zero)**

Parameters: n ..... 0 to 30, specify the number of <NULL> characters to send after <CR> or <LF>.

This command specifies the number of <NULL> characters (ASCII code $00) to send to the terminal after a <CR> or <LF> is sent. In addition o setting this parameter value, NUCR and/or NULF must be set to indicate whether nulls are to be sent after <CR> or <LF> or both. Devices requiring nulls after <CR+ are typically hard-copy devices requiring time for carriage movement. Devices requiring nulls after <LF> are typically CRTs which scroll slowly. Extra null characters are sent only in Converse and Command Mode.

ONTIME n (0 - 250) **Mnemonic: ONT** **Default 10 (1sec)**

Parameters: n ..... 0 to 250 (x 100ms), specify the time interval to activate the designated output port to turn ON when characters specified on SETCHAR are received.

PACLEN n (0 - 255) **Mnemonic: P** **Default: 128**

Parameters: n ..... 0 to 255, specify the maximum length of the data portion of packet. The value 0 (zero) is equivalent to 256.

The AR-24 will automatically transmit a packet when the number of input bytes for a packet reaches n. This value is used in both Converse and Transparent Modes.

If you want to send file for transfer, you should experiment with both MAXFRAME and PACLEN. If the link is good, there is an optimum relationship between the parameters set by these commands so that the maximum number of characters outstanding does not exceed the packet receive buffer space of the AR-24 receiving the data.

Note that although there is no requirement for two AR-24s exchanging data to have the same PACLEN value, allowing more than 128 characters of data in a packet may be incompatible with some varieties of AR-24s.

PARITY "n" Mnemonic: PAR Default: 3 (even)

Parameters: n ..... 0 to 3 selects a parity option from the table below.

PARITY sets the AR-24's data parity for terminal or computer data transfer according to the following table.

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

The parity bit, if present, is stripped automatically on input, and is not checked in the command and converse modes.

In the transparent mode all eight bits (including parity) are transmitted in packets. When "no parity" is set and AWLEN is 7, the eight bit is set to (0).

PASS n (0 - $7F) Mnemonic: PAS Default: $16

Parameters: n ..... 0 to $7F, specify an ASCII character code.

This command selects the ASCII character used for the "pass" input editing command. The parameter n is the ASCII code for the character you want to type in order to include the following character in a packet or text string. You can enter the code in either hex or decimal.

You can use this character to send any character in packets, even though that character may have some special function. For example, suppose you have set COMMAND 3, specifying that <CTRL-C> is your Command Mode entry character. If you want to send <CTRL-C> character in your packet. Of course, if you do this frequently you would be better off to change your Command Mode entry characters.

A common use for the pass character is to allow <CR> to be included in the BTEXT and CTEXT messages. Similarly, you can include <CR> in text when you are in Converse Mode, to send multi-line packets. (This default send-packet character is <CR>.)

PASSALL **ON:OFF** **Mnemonic: PASSA** **Default: OFF**

Parameters: ON ..... AR-24 will accept packet with invalid CRCs.
OFF ..... AR-24 will only accept packets with valid CRCs.

This command causes the AR-24 to display packets received with invalid CRC fields. Packets are accepted for display despite CRC errors if they consist of an even multiple of 8 bit and up to 339 bytes. The AR-24 will attempt to decode the address filed and display the callsign(s) in the standard monitor format.

This mode is no normally enabled, since rejection of any packet with an invalid CRC filed is what insures that received packet data is error-free. This mode might be enabled for testing a marginal RF link or during operation under other unusual circumstances.

If you PASSALL ON and monitor a moderately noisy channel you will periodically see "packet" displayed in this mode, since there is no basis for distinguishing actual packets received with error from random noise.

Logging of stations heard (for display by MHEAD) is disabled whenever PASSALL is ON, since the callsings deleted may be incorrect.

PASSWORD n **Mnemonic: PAS** **Default: none**

Parameters: n ..... Any characters up to a total of eight (8), case insensitive.

You may wish to place certain restriction on non-technical operators' use of the AR-24 command set, or operation by unauthorized persons. Access to most of the AR-24's commands and parameter values can be restricted by the use of PASSWORD and SETPASS.

If SETPASS is not empty, PASSWORD must match SETPASS to obtain access.

Notice: After using privileged or password-protected commands, the user should clear PASSWORD to prevent subsequent users from discovering the PASSWORD - the contents of PASSWORD can displayed on the screen.

PASSWORD and SETPASS are effective when using remote control by radio link. See the discussion of REMOTE, KEYWORD and RKEYWORD for details on encryption of the command link.

Clear PASSWORD with any one of the following: %, &, OFF, N, NO, NONE.

PACTIME EVERY:AFTER "n" Mnemonic: PACT Default: AFTER 10 (100 msec.)

Parameters:	n	.....	0 to 250 specifies 100-millisecond intervals.
	EVERY	.....	Packet timeout occurs every "n" times 100 milliseconds.
	AFTER	.....	Packet timeout occurs when "n" times 100 milliseconds elapse without input from the computer or terminal.

A PACTIME parameters is always used in the transparent mode.

When EVERY is specified, the characters you type or send from disk are packetized and queued for transmission every "n" times 100 milliseconds. When AFTER is specified, the characters you type or send from disk are packetized when input from the terminal stops for "n" times 100 milliseconds.

A zero-length packet will never be produced. The timer is not started until the first character or byte is entered.

A value of 0 (zero) for "n" is allowed; zero means packets are sent with no wait time.

PERSIST n **Mnemonic: PE** **Default: 63**

Parameters:
- n ..... 0 to 255 specifies the threshold value for a random number attempt to transmit.
- 0 ..... Signifies a 1/256th chance of transmitting every SLOTTIME.
- 256 ..... Causes the AR-24 to transmit right away without delay.

The PERSIST command works with the SLOTTIME command to achieve true p-persistent CSMA (carrier-Sense Multiple Access) in AX.25 operation. No real advantage, however, is obtained in AX.25 operation unless the other station on the channel are also using PERSIST and SLOTTIME.

When your computer has queued data for transmission, the AR-24 monitors the DCD (Data Carrier Detect) signal from its internal modem. The AR-24 waits indefinitely for DCD to go inactive.

When the channel is clear, the AR-24 generates a random number between 0 and 255. If this number is less than or equal to "P", the AR-24 then unkeys the PTT line and returns to the idle state.

If the random number is greater than "P", the AR-24 waits .01 x SLOTTIME seconds and repeats the procedure. If the DCD signal has gone active during this wait time, the AR-24 again waits for DCD to clear before it continues.

The AR-24 waits an exponentially-distributed random interval, after it senses that the channel i clear, before it tries to transmit. When PERSIST and SLOTTIME are carefully set, several station sending traffic are much less likely to collide with each other when they simultaneously detect that the channel is clear.

Note: P = 255 directs the AR-24 to transmit as soon as possible, regardless of the random number.

PPERSIST **ON:OFF** **Mnemonic: PP** **Default: ON**

Parameters:
- ON ..... The AR-24 uses PERSIST and SLOTTIME parameters when it executes p-persistent CSMA (Carrier-Sense Multiple Access).
- OFF ..... The controller uses DWAIT for TAPR-type 1 persistent CSMA.

When PPERSIST is set to ON, the AR-24 uses the PERSIST and SLOTTIME parameters for p-persistent CSMA instead of normal TAPR-type DWAIT procedure to achieve CSMA operation.

RETRY n **Mnemonic: RE** **Default: 10**

Parameters: n ..... 0 to 15 specifies the maximum number if packet retries.

The AX.25 protocol uses retries-retransmission of frames that have not been acknowledged. Frames are retransmitted "n" times before the link is disconnected.

The Time between retries is specified by the command FRACK. A value of 0 for "n" specifies an infinite number of retries. Also, refer to the FRACK command.

REDISPLA n **Mnemonic: RED** **Default: $12**

Parameters: 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 will use when you want to redisplay the current input line.

Note: You can enter the code in either hex or decimal. The REDISPLA character to redisplay a line you have just typed.

RELINK **ON:OFF** **Mnemonic: REL** **Default: OFF**

Parameters: ON ..... AR-24 will send packets of connect request again after retry-count reaches to the retry-count number specified by RETRY command.

OFF ..... AR-24 will send packets of disconnect request after retry-count reaches to the retry-count number specified by RETRY command.

AR-24 will retry and continue the action to send packet up to the number specified by RETRY command after I frames is sent out. If RELINK is ON, AR-24 will send packets of connect request again after retry-count reaches to the retry-count number specified by RETRY command.

You can use any time of RELINK ON even though no connect link is established, but CONPERM is used only in connect kink status.

The RELINK is used for avoidance of sending a disconnect packet while in multiple task operation to the other station.

REMOTE	ON:OFF	Mnemonic: REM	Default: ON

Parameters:
- ON ..... When addressed as MYCALL-15, the AR-24 responds to connect requests as a remotely-controlled TNC, as well as normal connect requests addressed to MYCALL.
- OFF ..... The AR-24 responds only to normal connect requests addressed to MYCALL.

The REMOTE command provides a remote-control port which is accessible when the AR-24 is addressed as MYCALL with an extension of -15. Set REMOTE to ON for remote control of the AR-24 by radio link commands.

If a remote AR-24 has a MYCALL of HIM123 and its REMOTE is ON, your AR-24 can connect to HIM123 and issue commands to HIM123 as if your terminal were connected to his AR-24.
Your screen "becomes" his screen. The command prompt on your (his) screen for a remote connect is "rem:" rather than "cmd:" in order to distinguish between local and remote commands. Your AR-24 needs not have REMOTE on.

The following sample connection assumes that your AR-24 "YOU789" will be connected to "HIM123". Your screen display:

```
cmd: txd
TXDELAY 30
cmd: c HIM123-15
cmd: *** SENDING INFO TO HIM123-15
rem:
txd
TXDELAY 30
rem: txd 50
TXDELAY was 30
rem: <CTRL-C> cmd:d
cmd: *** DISCONNECTED: HIM123-15
txd
TXDELAY 30
cmd:
```

MYCALL, REKEYWORD, and KEYWORD can not be changed remotely. RESET, and macros can not be executed remotely.

Notice: **Do not install the remote AR-24's MYCALL with an extension or SSID of "-15". Do not execute any commands that could disable normal AR-24 functions or lose control over the radio link. Never set TXD to 0; never XMITOK to OFF.**

RESET Mnemonic: RESET Default: none

This is an immediate commands. It sets all parameters except ABAUD and DAYTIME commands to their default settings and re-initialize the AR-24.

You can execute RESET command only in packet mode but all parameters except ABAUD command are set to the default setting.

RESTART Mnemonic: RESTART Default: none

This is an immediate command. It re-initialize the AR-24 using the defaults stored in bbRAM. The effect of this command is the same as turning the AR-24 OFF then ON again. RESTART does not cause a reset of the parameters in bbRASM.

RESPTIME n Mnemonic: RES Default: 5 (500msec.)

Parameters: n ..... 0 to 250 specifies 100 millisecond intervals.

RESPTIME adds a minimum delay before your AR-24 sends acknowledgment packets. This delay may run concurrently with the default wait time set by DWAIT and any random wait in effect.

Uses RESPTIME delay to increase throughput during operations such as file transfer when the sending AR-24 usually sends the maximum number of full-length packets. Occasionally, the sending AR-24 not have a packet ready in time to present transmission from being stopped temporarily, with the result that the acknowledgment of earlier packets collides with the final packet of the series.

These collisions can be avoid if the receiving AR-24 sets RESPTIME to 10.

RKEYWORD n **Mnemonic: RK Default: none**

Parameters:
- n ..... 1 to 65535 enables encryption and specifies the key to be used in encoding and decoding data in remote mode.
- 0 ..... 0 (zero) disables encryption and produces plain text.

You may wish to use encryption when controlling a AR-24 remotely by radio link.

Set RKEYWORD greater than 0 (zero) to enable control link encryption. Any value greater than zero encodes the data so that it can not be read by the casual observer. RKEYWORD and KEYWORD do not use a highly sophisticated encryption algorithm.

RKEYWORD is set at the controlled remote AR-24, while KEYWORD is set at the controlling AR-24. RKEYWORD can not be changed remotely.

Packet protocol headers are transmitted in clear text. Only the data typed by the user is encrypted.

Note: Both ends of the link must use the same numerical key.

For additional information on RKEYWORD and encryption, see the discussion of the KEYWORD and REMOTE commands in this chapter.

RECONNECT ID1[VIA ID2,ID3....., ID9] **Mnemonic: RECO** **immediate command**

- ID1 ..... This is the call ID of the station you are trying to reconnect to.
- ID2 ..... Optional call ID9(s) of station(s) you are attempt to digipeat through. You can use up to eight digipeat stations.

The RECONNECT command allows you to change the path you are using to communicate with another station.

Note: This comand works only when you are already connected to the station you are attempting to reconnect to.

When you are use this command, any frames that may be in process between your station and the station you are reconnecting to may be lost.

Refer to the CONNECT command for more information about the parameter list.

RXBLOCK ON:OFF Mnemonic: RX Default: OFF

Parameters: ON ..... AR-24 will send data to the terminal in RXBLOCK format.
OFF ..... AR-24 will send data to the terminal in standard format.

RXBLOCK is designed for automated operations, such packet bulletin board stations. It is intended to help such systems discriminate between data received from the connected station and AR-24 generated messages.

Correct operation of RXBLOCK is dependent on the AWLEN parameter being set to 8 bit since the character FF hex marks the beginning of a received data unit header.

SCREENLN n (0 - 255) Mnemonic: S Default: 0

Parameters: n ..... 0 to 255, specify the screen or platen width, in characters, of the terminal.

This value is used to format terminal output. A <CR><LF> sequence is sent to the terminal at the end of a line in Command Converse Modes when n characters have been printed. A value of 0 (zero) inhibits this action.

If your computer automatically formats output lines, you should set screenLN 0 to avoid a conflict between the two line formats.

SENDPAC n (0 - $7F) Mnemonic: SE Default: $0D

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

Use the SENDPAC command to select the character used to force a packet to be sent in the converse mode. The parameter "n" is the numeric ASCII code for the character you want to use to force your input to be packetized and queue for transmission. You can enter the code in either hexadecimal or decimal numbers.

Use default SENDPAC value $0D for ordinary conversation with CR ON to send packets at natural intervals with <CRs> included in the packet.

When you are setting CPACTIME ON, set SENDPAC to some value not ordinarily used (say <CTRL-A>, with CR OFF). This setting forces packets to be sent without extra <CR> characters being sent in the text.

n SETCHAR n (characters) Mnemonic: SETC Default: none

Parameters: n ..... 1 - 4 followed by up to 16 characters.

The AR-24 has 4 different transistor open collector type output port for maximum +30V, 300mA loading. These output port can be turned on when the AR-24 receives preprogrammed character set.

Please refer to SWITCHING FUNCTION of the manual.

SETPASS n Mnemonic: SETP Default: none

Parameters: n ..... Any characters up to a total of eight (8), case insensitive.

You may wish restrict access to the AR-24 commands by non-technical operators, or prevent operation by unauthorized persons. Access to most of the AR-24's command and parameter values can be restricted by the use of SETPASS and PASSWORD (discussed earlier in this chapter).

SETPASS is typed into the AR-24 by the system operator. This sets the PASSWORD for privileged commands.

If SETPASS is not empty, PASSWORD must match SETPASS to obtain access.

SLOTTIME n (0 - 250) Mnemonic: SL Default: 10(100msec.)

Parameters: n ..... 0 to 250 specifies the time in ten-millisecond intervals during which the AR-24 waits between generating random numbers to see if it can transmit.

The SLOTTIME parameter works with PPERSIST and PERSIST parameters to achieve true p-persistent CSMA (Carrier-Sense Multiple Access) in AR-24 operation. However, no real advantage will be obtained in the AX.25 operation unless the other stations on the channel are also using PERSIST and SLOTTIME.

SOFTDCD **ON:OFF** **Mnemonic: SOFTDCD** **Default: OFF**

Parameters: ON ..... AR-24 will detect DCD with software.
OFF ..... AR-24 will detect DCD with hardware.

The SOFTDCD is effective in use of transceiver which as no squelch functions.

SQUELCH **ON:OFF** **Mnemonic: SQ Default: OFF**

Parameters: ON ..... The AR-24 responds to positive - going squelch voltage.
OFF ..... The AR-24 responds to negative - going squelch voltage.

Normally, to decide if the channel is clear so that it can transmit, the AR-24 uses its CSMA (Carrier-Sense Multiple Access) circuit by sending audio mark and space tones from your packet receiver.

If there are signals other than packet on the channel you are using (such as voice operation), it's possible that the AR-24 might not be quite as polite as it is normally and transmit on top of the other signals.

The AR-24 can use true RF-carrier CSMA by monitoring the squelch line voltage from your radio. This line can be easily connected in many radios to the "busy" light or indicator on the radio's front panel, or to other circuit locations that indicate the presence or absence of carrier or received signals. Because your carrier-sensing signal can be active-low or active-high (depending on the individual radio manufacturer's design), you can set the AR-24 to sense either positive or negative squelch voltage.

START n (0 - $7F) **Mnemonic: STA** **Default: $11**

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

Use the START command to choose the User Start character you want to use to restart output from the AR-24 to the terminal after you have halted it by typing the user stop character.

Note: 1. The user stop character is set by the STOP command .
2. You can enter the value in either hex or decimal.

If the User Start and User Stop characters are set to $00, software flow control the AR-24 is disabled; the AR-24 will only respond to hardware flow control (CTS). If the same character is used for both the User Start and User Stop characters, the AR-24 alternately starts and stops transmission on receipt of the character ("toggles").

STATUS	ON:OFF	Mnemonic: STA	Default: ON

Parameters: ON ..... AR-24 displays sign-one message and cmd: prompt as formed.
OFF ..... AR-24 does not display sign-one message and cmd: prompt.

STOP n (0 - $7F)		Mnemonic: STO	Default: $13

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

Use STOP command to select the User Stop character you want to use to stop output from the controller to the terminal. Type this character to halt the AR-24 output to your monitor so that you can read the received text before it scrolls off your screen display.

STREAMCA	ON:OFF	Mnemonic: STREAMC	Default: OFF

Parameters: ON ..... Callsign of other station displayed.
OFF ..... Callsign of other station not displayed.

This command is used to enable the display of the connected-to station after stream identifier. This is particularly useful when operating with multiple connections allowed. It is somewhat analogues to the use of MRPT to show digipeat paths when monitoring.

STREAMDB **ON:OFF** **Mnemonic: STREAMD** **Default: OFF**

Parameters: ON ..... Double all received STREAMSWitch characters.
OFF ..... Do not "double" received STREAMSWitch characters.

This command is used to display received STREAMSWitch set to "|", the following might be displayed from your AR-24.

|| This is a test.

In this case the sending station actually transmitted below.

| This is a test.

The same frame received with STREAMSWitch OFF would be displayed as:

| This is a test.

When operating with multiple connections, this is useful for differentiating between STREAMSWitch characters received from other stations and STREAMSWitch characters internally generated by your AR-24.

STREAMSW n (0 - $7F) **Mnemonic: STR** **Default: $07C**

Parameters: n ..... 0 to $7F, specify an ASCII character code.

This command selects the character used by both the AR-24 and the user that a new "STREAM" (connection channel) is being addressed.

This character can be PASSed and Converse Mode. It is always ignored as a user-initiated stream switch in TRANSPARENT mode and flows through as data. This means that the outgoing stream can not be changed while "on line" in TRANSPARENT mode (you must escape to COMMAND Mode to switch stream.).

SWTIME n (0 - 250) **Mnemonic: SWT** **Default: 10(1sec)**

Parameters: n ..... 0 to 250 (x 100msec), specify the number of time interval to turn ON the output port.

TCLEAR **Mnemonic: TC** **immediate command**

The TCLEAR command clears the AR-24's transmit buffer and cancels further transmission or data except for a few remaining packets. You must be in the command mode to use TCLEAR.

TIME n (0 - $7F) **Mnemonic: TI Default: $14**

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

The TIME command specifies a control character in the text you type into the transmit buffer or into a text file stored on disk.

Type <CTRL-T> to embed the TIME command in your text or file. At transmit time, the AR-24 reads the embedded control code (default <CTRL-T>), reads the time of day from the AR-24's internal clock and then sends the time to the radio in the data transmission code in use at that time.

TRACE **ON:OFF** **Mnemonic: TRAC Default: OFF**

Parameters: ON ..... Trace mode is enabled.
OFF ..... Trace mode is disabled.

This command is used to enable the protocol debugging function. When TRACE is ON, all received frames will be displayed in their entirely, including all header information. In normal operation you will probably never this function; however, if you need to report an apparent software bug, you may be asked to provide trace information if possible.

TRACE will display sequence of 16 bytes, shifted ASCII codes and ASCII codes.

TRANS **Mnemonic: T immediate command**

TRANS is an immediate command that switches the AR-24 switch from the command mode to transparent mode.

TRFLOW	ON:OFF	Mnemonic: TRF	Default: OFF

Parameters: ON ..... Software flow control for the computer or terminal can be activated in transparent mode.
OFF ..... Software flow control for the computer or terminal is disabled in transparent mode.

If TRFLOW is ON, the settings of START and STOP are issued to determine the type of flow control used in Transparent Mode. If TRFLOW is OFF, only hardware flow control is available to the computer and all characters received by the AR-24 are transmitted as data. If START and STOP are set to $00, disabling the user Stop and user Restart characters, hardware flow control must always be used by the computer.

If TRFLOW is ON, and START and STOP are none-zero, software flow control is enabled for the user's computer or terminal. The AR-24 will respond to the user's Restart ad user's Stop characters (set by START and STOP) while remaining transparent to all other characters from the terminal. Unless TXFLOW is also ON, only hardware flow control is available to the AR-24 to control output from the terminal.

TRIES n (0 - 15)	Mnemonic: TRI	Default: 0

Parameters: n ..... 0 to 15 specifies the current RETRY level on the selected input channel.

TRIES retrieves (or forces) the count of "tries" on the data channel presently selected.

TXLIMIT n (0- 250)	Mnemonic: TXL	Default: 150(150 sec)

Parameters: n ..... 0 to 250 (x 100ms), specify the number of time interval to transmit packet in order to keep the current communication channel using MCA or trunking system.

TXDELAY n (0 - 120) **Mnemonic: TX Default: 30(300msec.)**

Parameters: n ..... 0 to 120 specifies ten-millisecond intervals.

The TXDELAY command tells your AR-24 how long to wait before sending packet frame data after keying your transmitter's PTT line.

All transmitters need some amount of start-up time to put a signal on the air; some need more, some need less.

Some general rules apply to these radios:

1. Crystal-controlled radio with diode antenna-switching do not need much time.
2. Synthesized radios need time for their phase-lock-loops (PLLs) to lock up.
3. Radios with mechanical transmit/receive relays need time for the physical movement of the relays.
4. External amplifiers that use RF-driven relay switching usually require you to increase TXDELAY to allow for the additional delays.

TXFLOW **ON:OFF** **Mnemonic: TXF** **Default: OFF**

Parameters: ON ..... Software flow control for the AR-24 can be activated in the transparent mode.
OFF ..... Software flow control for the AR-24 is disabled in the transparent mode.

When TXFLOW is ON, the setting of TXFLOW determines the type of flow control used in the transparent mode.

When TXFLOW is OFF, the AR-24 uses only hardware flow control; all data sent to the terminal remains fully transparent.

When TXFLOW and XFLOW are both ON, the AR-24 uses the Start and Stop the characters (set by XON and XOFF) to control the input from the terminal.

Unless TRFLOW is also ON, only hardware flow control is available to the compute or terminal to control output from the terminal.

If the AR-24 Start and Stop characters are set to $00, hardware flow control will always be selected regardless of the setting of TXFLOW.

TXUIFRAM **ON:OFF** **Mnemonic: TXU** **Default] ON**

Parameters: ON ..... The AR-24 will "flush is buffers" to the radio port loss of a connection.
OFF ..... The AR-24 will only send BEACON and ID frames as unconnected (UI) frames. It will discard information in its buffers upon loss of a connection.

This command determines whether the AR-24 will transmit most unconnected information packets.

Setting TXUIFRAMe OFF will prevent all but BEACON and ID unconnected (UI) frames from being originated and transmitted. This is most useful for BBS and other stations which tend to leave unacknowledged data in the AR-24 transmit buffer data as "UI" frames., adding to channel congestion. The behavior with TXUIframe OFF serves to reduce channel congestion because the now-useless data is never sent.

Note that TXUIFRAM has no effect on the digipeating of UI frames. It only affects frames being originated at this station.

UNPROTO ID1[ID2, ID3 ....,ID9] **Mnemonic: U Default: CQ**

Parameters: ID1 ..... Call ID to be placed in the TO address field.

UNPROTO sets the digipeat and destination address fields of packets sent in the unconnected (unprotocol) mode.

Unconnected packets are sent as unsequenced I-frames with the destination and digipeat fields taken from ID1 through ID9 options. When a destination is not specified, unconnected packets sent form other packet station by setting MONITOR to a value greater than 1 and setting MFROM to all. For the broadcasting mode, please refer to BCMODE.

USERS n (0 - 26) **Mnemonic: US** **Default: 1**

Parameters: n ..... 0 to 26 specifies the number if active simultaneous connections that can be established with your AR-24.

USERS only affects the way that incoming connect requests are handled. If does not affect the number of connections you initiate with your AR-24.

For example:

USERS 0 ..... Allows incoming connections on any free logical channel.
USERS 1 ..... Allows incoming connections on logical channel 0 only.
USERS 2 ..... Allows incoming connections on logical channel 1 only.
USERS 3 ..... Allows incoming connections on logical channel 2 only and so on, through USERS 26.

WDISCONN **Mnemonic: W** **immediate command**

WDISCONN is an immediate command used in the command mode, which stands for "wait for acknowledgment and Disconnect". WDISCONN initiates a disconnect request with the currently-connected station after all data sent by the AR-24 has been acknowledged. At least one data packet must have been sent and acknowledged before the disconnect will start.

WDISCONN is useful as a part of a macro. If you wish to connect to a AR-24, report on an event and disconnect, the precess can be automated with a macro.

XFLOW **ON:OFF** **Mnemonic: X** **Default: ON**

Parameters: ON ..... XON/OFF (software) flow control is activated.
OFF ..... XON/OFF flow control is disabled and hardware flow control is enabled.

When XFLOW is ON, software flow control is in effect; it is assumed that the computer or terminal will respond to the AR-24's start and stop characters defined by the XON and XOFF commands.

When XFLOW is OFF, the AR-24 sends hardware flow control commands via the RTS line.

For full hardware control in both directions, set START, STOP, XON and XOFF all to $00.

XMITOK ON:OFF Mnemonic: XM Default: ON

Parameters: ON ..... Transmit functions (PTT line) are active.
OFF ..... Transmit functions (PTT line) are disabled.

When XMITOK is OFF, the PTT line to your radio is disabled; the transmit function is inhibited. All other AR-24 functions remain the same. Your AR-24 generates and send packets as requested, but does not key the radio's PTT line.

Use the XMITOK command at any time to ensure that your AR-24 does not transmit. Set XMITOK OFF if you are absent and wish to leave your AR-24 on as a channel activity monitor. Set XMITOK OFF for testing in loop-back or direct wire connections when PTT operation is not required.

XOFF n (0 - $7F) Mnemonic: XO Default: $13

Parameters: n ..... 0 to $7F (0 to 127 decimal) specifies an ASCII code.

Use XOFF to select the stop character to be used to stop input from the computer or terminal.

Note: You can enter the code in either hex or decimal.

XON n Mnemonic: XON Default: $11

Parameters: n ..... 0 to $7F (0 to 127 decimal) specifies an ASCII code.

XON selects the AR-24 start character that is sent to the computer or terminal to restart input from that device.

Note: You can enter the code in either hex or decimal.

The Start character default value is <CTRL-Q> for computer data transfer. If you are operating in the converse mode and there is a chance that activity might fill the AR-24 buffers, you can define the Stop character as <CTRL-G> ($07), which "beeps" many terminals.

nMACRO	[TEXT]	Mnemonic: nM	Default: empty

Parameters: n ..... 0 to 9, specify the number of MACRO channel.
[text] ..... Text manage up to 120 characters including space, hyphen, comma and period.

The AR-24 provides 10 Macros (0 to 9) and 1M is corresponded with F1 switch provided on the front panel for quick response. 0M to 9M are also controllable via computer for transmission of the macro message. The message can be stored in each macro channel up to 120 characters. In the message, if you want to separate command to execute the commands one by one, you should enter / code instead of <CR> (=CTRL-V).

For example; 1M<>C<>123-1<>V<>456<CR>

If the enter messages above, it means that you request to connect 123-1 station via 456's digipeater in macro 1. To transmit the message in macro 1, you press F1 switch on the front panel or you press 1 and execute <CR> in Command Mode. If you want to erase the stored message you enter 1M<>%<CR>.

13: COUNTER COMMAND LIST

ASYRXOVER ..... Increase when the software does not service the asynchronous receiver in time. It indicates data from the user to the TNC is being dropped. This error counter should never become non-zero under supported data rate.

DIGISENT ..... Each frame digipeated by the AR-24 causes the counter to increase.

BBFAILED ..... Counts number of times bbRAM checksum was in error.

HOVRERR ..... Increase when HDLC receiver is not serviced rapidly enough and data is lost. This counter should never increment at any supported data rate.

HUNDRERR ..... Increase when the HDLC transmitter is not serviced rapidly enough and data is lost. This counter should never increment at any supported data rate.

RCVDFRAMR ..... Increase when Frame Reject frames are received from a connected station.

RCVDIFRA ..... Increase for each reception of an I frame from a connectee.

RCVDREJ ..... Increase for each reception of an REJECT frame from a connectee.

RCVDSABM ..... Each received SABM frame addressed to the AR-24 cause this counter to be increased by one.

RXCOUNT ..... Increase when any frame is received with good CRC (or any CRC if HGARBAGE is turned on).

RXERRORS ..... Increments each time received frame is thrown out due to it being too short, suffering overrun(s), or it having a bad CRC. Letter occurs only when CRC checking is enabled (i.e. HGARBAGE is OFF). This counter will often increment in the presence of noise.

SENTFRMR ..... Increments each time a frame reject frame is transmitted.

SENTIFRA ..... Increases by one each time and I frame is sent.

SENTREJ ..... Whenever a REJect frame is transmitted, this counter is incremented.

TXCOUNT ..... Incremented whenever a frame is correctly transmitted.

TXQOVFLW ..... Incremented whenever packet frame which is abandonded without transmission is existed.

Increment of this counter indicates that the data in transmit packet frame may may be garbled.

TXTMO ..... Incremented whenever HDLC frame gets time out.

14: MESSAGES

This chapter describes the messages your AR-24 may produce and the circumstances under which they can appear.

bbRAM loaded with defaults

This messages appears if the AR-24 loads the defaults in response to the RESET command.

cmd:

This is the Command Mode prompt. When this prompt appears, the AR-24 is waiting for you to issue a command. Anything you type after this prompt will be interpreted as a command to the AR-24. If a monitored packet has been displayed, the prompt may not be visible, even though you are in Command Mode. You can type the redisplay-line character (set by REDISPLA) to retype the prompt.

was

Whenever you change the setting of one of the AR-24's parameters, the previous value will be displayed. This confirms that the AR-24 properly interpreted your command, and reminds you of what you have done.

15: COMMAND MODE FOR MESSAGES

If you make a mistake typing a command to the AR-24, an error message will be printed. You may see any of the following messages depending on the type of error you have made.

?bad

You typed a command correctly, but the remainder of the command line couldn't be interpreted.

?call

You entered a callsign argument that does not meet the AR-24's requirements for callsigns. A callsign may be any string of numbers and letters. Including at least the letter. Punctuation and spaces are not allowed. The sub-station ID, if given, must be a (decimal) number from 0 to 15, separated from the cal by a hyphen.

?too many

You gave too many arguments for a command that expects several parameters.

?too many packets outstanding

This message would appear in response to a CONVERS or TRANS command, under special circumstances. If you have previously entered packet data filling the outgoing buffer in Converse Mode or Transparent Mode and then returned to Command Mode. You will be allowed to enter one of these modes when some of the packets have been successfully transmitted.

?not enough

You didn't give enough arguments for a command that expects several parameters.

?too long

You entered too long a command line, and the line was ignored. this might happen, for example, if you try to enter too long a message with BTEXT or CTEXT. If you get this message, the previous text entry was not changed.

?range

A numeric argument for a command was too large.

?EH

The first word you typed is not a command or command abbreviation.

?not while connected

You attempted to change MYCALL or AX25L2V2 while in a connected or connecting state.

?need MYCALL

This message may appear when you are going to connect to the other station without your MYCALL is not set. You should set MYCALL first.

16: LINK STATUS MESSAGES

These messages inform you of the status of AX.25 connections your AR-24 may be involved in. You can always interrogate the link status by giving the CONNECT command without parameters. If you attempt a connection when your AR-24 is not in the disconnected states., the AR-24 will display the link status but will take no other action. The following messages appear in response to the CONNECT command.

Link state is: CONNECTED to

This display shows the station your AR-24 is connected to and the digipeater route if nay. the callsign sequence is the same sequence you would enter to initiate the connection.

Link state is: DISCONNECTED

No connection currently exists. You may issue the CONNECT command to initiate a connection.

Link state is: CONNECT in progress

You have issued a connect request, but the acknowledgement from the other station has not been received. If you issue a DISCONNE command, the connect process will be aborted.

Link state is: DISCONNECT in progress

You have issued a disconnect request, but the acknowledgement from the other station has not been received. If you issue a second DISCONNE command, the AR-24 will go immediately to the disconnected state.

Link state is: FRMR in progress

The AR-24 is connected but a protocol error has occurred. This should never happen when two AR-24 are connected. An improper implementation of the AX.25 protocol could cause this state to be entered. The AR-24 will attempt to re-synchronize frame numbers with the AR-24 on the other end, although a disconnect may result. Connects are not legal in this state, and a disconnect will sate the disconnect process.

The AR-24 will inform you whenever the link status changes. The link status may change in response to a command you give the AR-24 (CONNECT or DISCONNECT), a connect or disconnect request packet from another station, a disconnect due to retry count being exceeded, an automatic time-out disconnect (CHECK), or a protocol error.

***** SENDING INFO TO <callsign>**

This message appears when the AR-24 goes from the "disconnected" or "connect in progress" state to the connected state. The connection may be a result of a CONNECT command you issued, or of a connect request packet received from another station.

***** CONNECT REQUEST**

This message indicates that the AR-24 has received a connect request from another station which it has not accepted. This can happen if you have set CONOK OFF or if you are a;ready connected to another station. When the AR-24 types this messages it also sends a DM packet (busy signal) to the station that initiated the connect request. If the AR-24 rejects a connect request because you have set CONOK OFF, you can issue your own request to the station that called.

***** DISCONNECTED**

This message is displayed whenever the AR-24 goes to the disconnected state from any other link state. This message may be preceded by a message explaining the reason for the disconnect, below.

***** retry count exceeded**
***** DISCONNECTED**

This message is given if the disconnect was caused by a retry failure rather than by a disconnect request from one of the stations.

***** <callsign> busy**
***** DISCONNECTED**

This message indicates that your connect request was rejected by a DM packet (busy signal) from the other station. AR-24 will reject a connect request if CONOK is OFF or if it is already connected to another station.

FRMR sent:

The AR-24 is connected, and a protocol error has occurred. The AR-24 has sent a special FRMR packet to attempt to re-synchronize frame numbers with the AR-24 on the other end. The string XXXXXX is replaced with the hex codes for the three bytes sent in the information part of the FRMR frame. This message will not appear if your AR-24 is in Transparent Mode.

FRMR rcvd:

This message is followed by a display of the FRMR packet received in the trace display format. This format is explained in the TRACE command entry. This message will not appear if your AR-24 is in Transparent Mode.

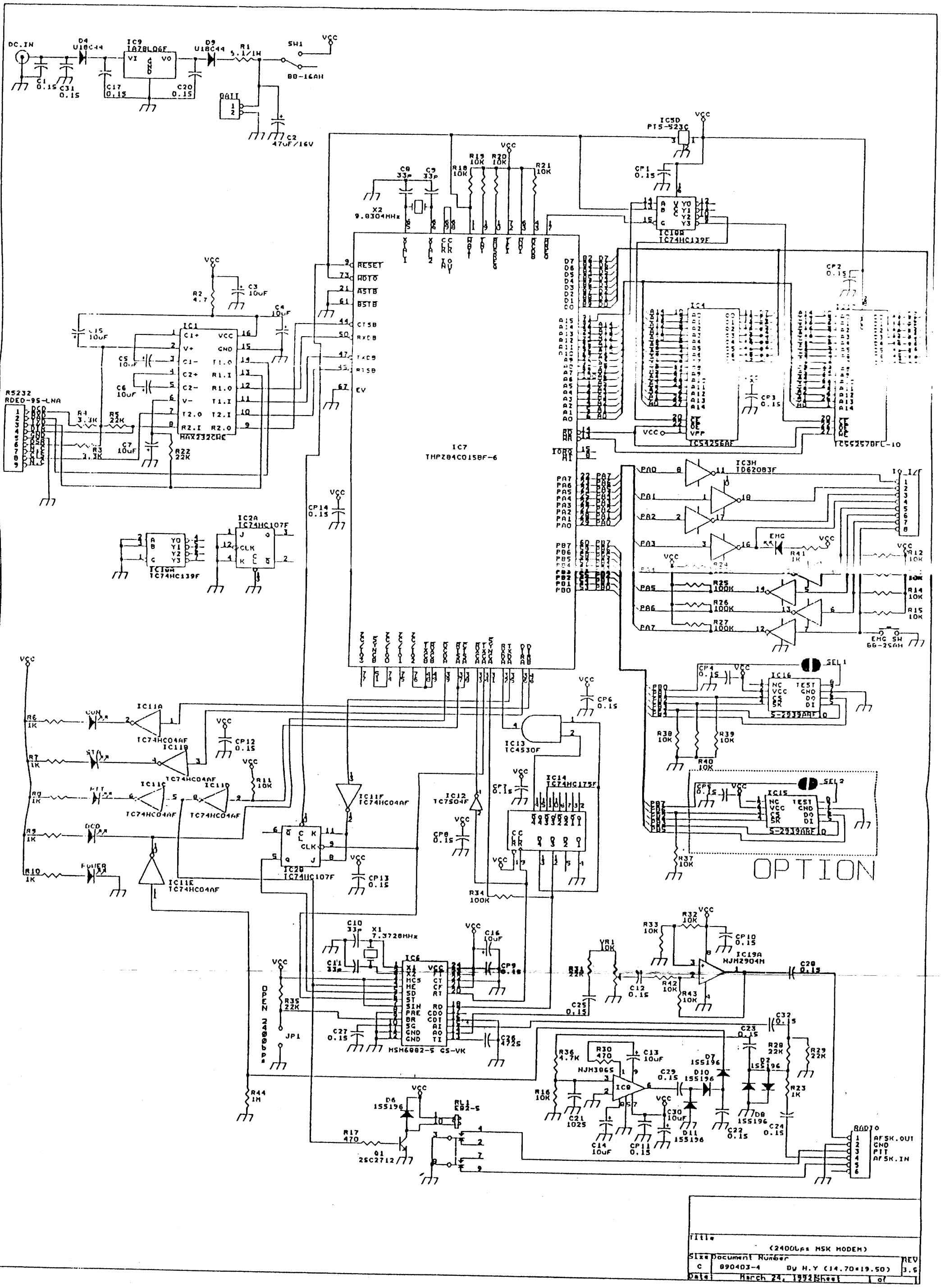
17: PART LIST (P.C.B. NO.890403-4)

ITEM	PART NO.	DESCRIPTION	Q'TY
LITHIUM BATT CONNECTOR	BATT	B2B-EH	1
CONDENSOR	C1,CP1,CP2,CP3,CP4,CP5,CP6,CP7, CP8,CP98CP10,CP11,CP12,CP13, CP14,C17,C20,C22,C23,C24,C25, C27,C28,C29,C31,C32	MCH215F104ZK	27
CONDENSOR	C2	UWX1C470MCR1GB	1
CONDENSOR	C3,C4,C5,C6,C7,C13,C14,C15,C16, C30	UWX1C100MCR1GB	10
CONDENSOR	C8,C9,C10,C11	MCH215A330KK	4
CONDENSOR	C21	MCH215A102KK	1
CONDENSOR	C26	MCH215A472KK	1
LED	CON,DCD,F1,POWER,PTT,STA	GL-2PR6	6
DIODE	D2,D6,D7,D8,D10,D11	1SS196	6
DIODE	D4,D9	U1BC44	2
DC JACK	DC.IN	HEC0470-01-230	1
SWITCH	F1	BB-25AH	1
IC	IC1	MAX232CWE	1
IC	IC2	TC74HC107F	1
IC	IC3	TD62083F	1
IC	IC4	TC54256AF	1
IC	IC5	PTS523C	1
IC	IC6	MSM6882-5 GS-VK	1
IC	IC7	TMPZ84C015BF-6	1
IC	IC8	NJM386S	1
IC	IC9	TA78L06F	1
IC	IC11	TC74HC04AF	1
IC	IC12	TC7S04F	1
IC	IC13	TC4S03F	1
IC	IC14	TC74HC175F	1
IC	IC15,IC16	S-2939ARF10	2
IC	IC17	TC55257BFL-10	1
IC	IC18	TC74HC139F	1
IC	IC19	NJM2904M	1
CONNECTOR	I/O INTERFACE	TCS7580-01-201	1
JUMPER	JP1	RE-H022TD-1190	1

ITEM	PART NO.	DESCRIPTION	Q'TY
TRANSISTOR	Q1	2SC2712	1
RESISTOR	R1	5.1/1W	1
RESISTOR	R2	RK73K2A-4.7	1
RESISTOR	R3,R4	RK73K2A-3.3K	2
RESISTOR	R5,R22,R28,R29,R31,R35	RK73K2A-22K	6
RESISTOR	R6,R7,R8,R9,R10,R23,R41	RK73K2A-1K	7
RESISTOR	R11,R12,R13,R14,R15,R16,R18,R19, R20,R21,R32,R33,R37,R38,R39,R40, R42,R43	RK73K2A-10K	18
RESISTOR	R17,R30	RK73K2A-470	2
RESISTOR	R24,R25,R26,R27,R34	RK73K2A-100K	5
RESISTOR	R36	RK73K2A-4.7K	1
RESISTOR	R44	RK73K2A-1M	1
RELAY	RL1	EB2-5	1
TERMINAL	RS232	RDED-9S-LNA	1
SELECTOR	SEL1,SEL2	NON-PART	2
SWITCH	SW1	BB-16AH	1
VARIABLE	VR1	V6EK-PH(1S)10K	1
CRYSTAL	X1	HC-49S 7.3728MHz	1
CRYSTAL	X2	HC-49S 9.8304MHz	1

18: SPECIFICATIONS

*	COMMUNICATIONS METHOD	.....	TX.25 PACKET DATA PROTOCOL (TRDS) (partly modified from AX.25)
*	MODULATION	.....	MSK 1200bps (1200Hz and 1800Hz) 2400bps (1200Hz and 2400Hz)
*	COMMUNICATION SPEED	.....	2400bps/1200bps switchable
*	PROCESSOR	.....	Z80 software compatible
*	MEMORY	.....	RAM32K ROM32K
*	RS-232C	.....	1200bps (300bps to 9600bps selectable)
*	RS-232C DATA	.....	7 bit, 1 stop, even, X on
*	POWER REQUIREMENT	.....	DC13.8V +/- 15% or 4.8V 600mA ni-cad battery pack (option)
*	CURRENT CONSUMPTION	.....	40mA nominal
*	USABLE TEMPERATURE	.....	0 to +50 degree C
*	STORABLE TEMPERATURE	.....	-20 to +80 degree C (Do not store the unit in dewy conditions)
*	DIMENSIONS	.....	76(W) X 30(D) X 121(H)mm
*	WEIGHT	.....	200 grams (approximately)


DC.IN
D4 U18C44
IC9 IA78L06F
D9 U18C44
R1 5.1/1W
SW1
VCC
BB-16AH
C1 0.15
C31 0.15
C17 0.15
C20 0.15
DAII
C2 47uF/16V
IC5D PI5-523C
CP1 0.15
R18 10K
R19 10K
R20 10K
R21 10K
C8 33p
C9 33p
X2 9.8304MHz
IC10B IC74HC139F
CP2 0.15
IC4
CP3 0.15
IC5 S4256AF
IC5 S2570F-10
IC7 THPZ84C015BF-6
IC3H ID62083F
R41 1K
R25 100K
R26 100K
R27 100K
R14 10K
R15 10K
EMG SW BB-25AH
R2 4.7
C3 10uF
C4 10uF
C5 10uF
C6 10uF
C7 10uF
IC1 MAX232CWE
RS232 RDED-9S-LNA
R4 3.3K
R5 22K
R3 3.3K
R22 22K
IC2A IC74HC107F
IC10A IC74HC139F
CP14 0.15
RESET
ROTO
ASTB
BSTB
CTSB
RXDB
TXDB
RTSB
EV
IC11A IC74HC04AF
IC11B IC74HC04AF
IC11C IC74HC04AF
IC11D IC74HC04AF
IC11E IC74HC04AF
IC11F IC74HC04AF
R6 1K
R7 1K
R8 1K
R9 1K
R10 1K
R11 10K
CP12 0.15
CP13 0.15
IC20 IC74HC107F
IC12 IC7S04F
IC13 IC4530F
IC14 IC74HC175F
CP6 0.15
CP7 0.15
CP8 0.15
R34 100K
IC16 S-2919ARF
IC15 S-2919ARF
SEL1
SEL2
R38 10K
R39 10K
R40 10K
R37 10K
OPTION
C10 33p
X1 7.3728MHz
C11 33p
IC6 HSM6802-S GS-VK
CP9 0.15
CP16 10uF
C27 0.15
C26 472S
R35 22K
JP1
OPEN 2400bps
R44 1M
VR1 10K
R31 22K
C25 0.15
C12 0.15
R42 10K
R43 10K
R32 10K
R33 10K
CP10 0.15
IC19A NJM2904M
C20 0.15
C32 0.15
C23 0.15
R28 22K
R29 22K
R23 1K
C22 0.15
C24 0.15
D7 1S5196
D8 1S5196
D9 1S5196
D10 1S5196
D11 1S5196
R36 4.7K
R30 470
C13 10uF
NJM386S
IC8
R16 10K
C21 1025
C29 0.15
C30 10uF
C14 10uF
CP11 0.15
R17 470
Q1 2SC2712
RL1 EB2-5
BADIO
AFSK.OUT
GND
PTT
AFSK.IN
Title
(2400bps MSK MODEM)
Size C
Document Number 890403-4
By H.Y (14.70*19.50)
REV 3.6
Date March 24, 1992
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