Monicor Electronic Corporation

RADIO MODEM SYSTEMS

Point to Point System

Installation & Reference Manual

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Firmware Versions 1.0 - 2.8

Revision I

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INTRODUCTION

3"

This manual covers installation and reference information for Monicor point to point equipment, and will answer most questions regarding the use of this equipment. The introduction contains descriptions and important general information. This installation section tells how to set up a basic system.

OVERVIEW

Monicor radio modems provide RS-232 ASCII portable data communication over a single narrow-band UHF radio channel to eliminate data cables. Each radio modem has an intelligent communications port that can be configured for any type of equipment.

Link Operation

The point to point system acts virtually like an RS-232 extension cord. Data input at one end is sent out the other. This means that a radio link can be installed into a system with NO ADDED SOFTWARE.

The radios transfer information to each other via variable length synchronous packets of data, with full error detection and correction. Information is buffered at each full duplex communication port. Flow control (either CTS/DTR or XON/XOFF) can be selected.

Each radio modem is configured independently. Configuration parameters include Baud rate settings, interface profile: basic, edit, standard or transparent.

A point to point system consists of one Point "A" radio (P/N 6x2xx-xxx-xxx or 6x4xx-xxx-xxx) and one Point "B" radio (P/N 6x1xx-xxx-xxx or 6x3xx-xxx-xxx). Both radio's must be the same radio speed (2400 or 4800 bps) and on the same frequency. Both radios must have the same "Link Size".

UNPACKING INSTRUCTIONS

When you receive equipment, make sure the contents of the box agree with the original packing slip. If there is a discrepancy, notify the shipper immediately.

The packing slip contains the configuration (or set up) of the radio modems.

The following items are included as standard equipment:

IC-15 Type Radio Modem
Black Lexan case
Internal 7.5 volt NiCd battery
Stubby Antenna, BNC connector
Battery charger (9 volt @ 100 ma)

IC-100MES Type Radio Modem
Aluminum Case
Internal 7.5 volt NiMh batter
Stubby Antenna, BNC connector
Battery charger (9 volt @ 100 ma)

The radio modems with batteries *must* be charged before use. The power switch should be "off" before charging. Charge each radio fourteen (14) hours only with the Monicor charger supplied with it.

IC-15ME Type Radio Modem
IC-100ME Type Radio Modem
Aluminum Case
Stubby Antenna, BNC connector

FCC INFORMATION

The Monicor System 200 and its components comply with Federal Communications Commission (FCC) requirements which regulate Business Radio Service and other services within the 450 to 470 MHz range.

The Monicor system is specifically designed to operate in the 12.5 KHz UHF splinter channels as outlined in Part 90.267 of the FCC Rules and Regulations document 47 CFR.

The user must know and comply with all applicable parts of the FCC Rules and Regulations. A valid station license is required

before operating the radio modems. It is the user's responsibility to apply for and obtain an FCC radio license. Monicor will assist the user in submitting the application.

The following information is required for completing the license application.

1. Responsible equipment user or manufacturer company representative (officer of the company, QA manager, etc.) must be designated.

2. Site or company location: Address (No PO Box), City, State, ZIP code, County, Phone number.

3. Area of Operation: (Geographic radius is limited to 20 miles from site location).

WARRANTY

This equipment is warranted to be free from defects in both materials and workmanship. Should any part of this equipment be defective, (excluding holsters, external antenna's, cables and general accessories) it will be repaired or replaced, at option, free of charge (except incoming shipping charges) for a period of one year (365 days) from the date of original purchase. No charge will be made for parts or labor during this period. ***Please*** obtain a RETURN MATERIAL AUTHORIZATION for any material to be sent back to the factory.

This warranty is void if:

(a) the equipment has been damaged by negligence, accident or mishandling, or has not been operated in accordance with the procedures described in the operating instructions; or

(b) the equipment has been altered or repaired by other than Monicor Electronic Corporation, or adaptations or accessories other than on Monicor's approved price list have been made or attached to the equipment which, in the determination of Monicor shall have affected the performance, safety, or reliability of the equipment.

NO OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING MERCHANTABILITY, APPLIES TO THE EQUIPMENT, NOR IS ANY PERSON OR COMPANY AUTHORIZED TO ASSUME ANY OTHER WARRANTY. MONICOR DOES NOT ASSUME ANY RESPONSIBILITY FOR ANY CONSEQUENTIAL DAMAGES OCCASIONED BY THE EQUIPMENT, OR INCONVENIENCE OR INTERRUPTION IN OPERATION.

In case of unsatisfactory operation, the equipment should be sent directly (or through a factory authorized dealer) to Monicor Electronic Corporation with a description of the problem.

Extended Warranty

Monicor's extended service agreement provides warranty coverage on a yearly basis. It provides the same coverage as the original 1 year factory warranty, but does not include batteries, holster, external antenna's or cables. Warranty periods must remain continuous (no gaps between periods). If a warranty lapses, and a new warranty is desired, the unit may be subject to rechecking and restoring to a warranty state.

INSTALLATION

HOOKUP, CHECKOUT, AND SETUP OF RADIO MODEMS

This section describes how to:

Connect a radio modem to a Computer.
Control the radio modem.
Communicate through a second radio.
Configure the radio modems.

Connect to a Radio Modem.

The connection to the equipment is made via a female 9 pin D-shell RS-232 connector or an 8 pin RJ-45 connector.

If an optional Monicor supplied coil cable came with your radio modems, simply connect the DB-9 male connector to the radio, and the DB-9 or DB-25 connector to the COMM 1 port on your computer.

If you have an IC-15ME, IC-100ME or IC-20 type radio modem, your cable includes a power adapter that is wired into the cable, supplying power to the radio through the DB-9 connector.

If you need to build a customized cable the following are the pin definitions for the radio modems. The term "DTE" stands for Data Terminal Equipment, and refers to the signal at the terminal. For example, DTE RxD means the received signal line for the terminal, which would be the transmit signal for the radio modem.

All radio modems are defined to be DCE's (Data Communication Equipment).

Pin Description for IC-100ME, IC-15ME and IC-15 DB-9 Connectors:

PIN	Description
2	DTE Received Data (output) (RxD)
* 1 option	DTE power (input/output)

	3	DTE Transmitted
Data	(input)	(TxD)
	4	DTE Ready
	(input)	(DTR)
	5	Ground/Signal
Common	(GND)	
	6	DCE Ready
	(output)	(DSR)
	7	No Connection
	8	DTE CTS
	(output)	(CTS)
**	9	Audio out
	(output)	

* *Optional power output on IC-15 is switched from battery, intended for low-power external device only.* ***CAUTION!*** *Not regulated or fused. On the IC-15ME, this is the 12 volt input pin.*

** *Do not connect any wire. This pin can be connected to an external audio amplifier to detect on channel interference and other test data.*

Pin Description for IC-100MES RJ-45 Connector, P/N 60110-000-401, Regulated output voltage available:

PIN	Description Signal
1 (output)	Battery Voltage Power
2 (output)	DTE Received Data (RxD)
3 (common)(GND)	Ground
4 (input)	DTE Ready (DTR)
5 Data	DTE Transmitted (input) (TxD)
6 (output)	Regulated Voltage +5v
7 (output)	DTE CTS (CTS)
8	Audio out

Pin Description for IC-100MES RJ-45 Connector, P/N 60110-000-402, Battery output voltage available only.

PIN	Description Signal
1	Battery Voltage (output) Power
2	DTE Received Data (output) (RxD)
3	Ground (common)(GND)
4	DTE Ready (input) (DTR)
5	DTE Transmitted Data (input) (TxD)
6	N/C
7	DTE CTS (output) (CTS)
8	Audio out (output)

Data output Pin 2 from the radio modem must be connected to the data input of the terminal.

Likewise, data input to Pin 3 of the radio modem must be connected to the data output. If the host or terminal equipment appear as a DCE also, use a "**null-modem**" connector or alter the connector wiring.

Data Flow Control Signal Pins

The following signals are provided for hardware flow control and other control functions:

Pin 4	DTE Ready	(DTR)	an input
Pin 6	DCE Ready	(DSR)	an output
Pin 8	DTE CTS	(CTS)	an output

DCE Ready is "ON" when power is on, and is zero volts otherwise (not used for flow control).

The DTR signal is ignored by the default radio settings (configuration).

The CTS signal is OFF during the power-up self-test interval, and ON thereafter (with the default settings).

Voltage change for IC-20 (2 Watt) radio modems.

IC-20 radio modems will now operate at a lower input voltage. Previous models required 12 volts at 1 amp. New models will operate at 7.5 volts at 1.5 amps.

In order to insure that existing cables with 12 volt power supplies are not inadvertently connected to the new IC-20 radio modems, a change has been made on the input voltage pin (Pin 1). It has been exchanged with Pin 9. All other pins remain the same.

If a cable with a 12 volt 1 amp power supply is connected to a new IC-20, no damage will result, and visa versa, because of this pin change.

The radios will have a CAUTION label on the radio and new power supplies. Monicor will provide a new power adapter (7.5 volts @ 2 amp), part number 10000-392-007. The power supplies will also have a CAUTION label.

Radios will have the same basic part numbers, with the exception that the final 3 digits will be 201 rather than a 101.

Part numbers are shown below:

Point to Point Radios:

<4800bps - High Speed>

60305-000-201	IC-20-48ME "B"
60405-000-201	IC-20-48ME "A"

<2400bps - Standard Speed>

60105-000-201	IC-20ME "B"
60205-000-201	IC-20ME "A"

Control the Radio Modem

This section contains a procedure for establishing communications between a radio modem and a terminal. The terminal can be a PC running Monicor's HOST.COM program supplied on the demonstration diskette, or any standard ASCII terminal.

Default Configuration

The radio uses many parameters to choose from many different options for operation. The operating configuration is kept in RAM and is lost when the radio is powered off.

Radios are normally shipped from the factory with the Initial Configuration (EEROM, for power-up) set to the current factory default configuration (from firmware PROM). The EEROM is only changed by the "Write" commands.

The factory default configuration parameters are:

Profile Basic
Baud: 9600 baud, no parity, 8 bits per character, and one stop bit (9600,N,8,1)
Facilities Link Dynamic Mode: one (1)
Facilities Link Number: one (1)
Facilities Link Quota: one (1)
Facilities Link Size: 7 (128 character packet).
Flow Control: 1 (XON/XOFF)

Load the program HOST.COM from the diskette to a subdirectory in your computer. Connect the cable from the radio modem to serial COMM PORT 1. Execute the program by typing "HOST".

The program announcement contains a short help menu (help documentation supplied on the disk). Press the "F7" and "F9" function keys to turn off flow control checking. Two acknowledgments appear.

Connect the antenna. Turn on the radio modem. The radio modem will greet you with a sign-on message, a command list, and a prompt "*" character. After a short period of time, several short messages will appear, called PAD SERVICE SIGNALS. The modem is now in a local communications mode, called PAD COMMAND MODE.

If the radio modem has Lamp indicators, the red and green will both turn on when power is switched on. They will stay illuminated for about 2 seconds while the unit performs a power on test. Both Lamp's will turn off, then the green on will start a slow blinking. If the modem has only one Lamp (green), it will go through the same sequence.

If the red Lamp remains on, the battery is low, and requires charging. If no Lamp's glow, then the battery may be completely discharged, and the unit should be charged.

Verify that communication has been established by verifying the default configuration parameters.

Type a "p" for profile, followed by a <CR> (return). The response will indicate "Basic".

Verify other parameters and familiarize yourself with the menu. *Don't type the "w" command yet. This will be used to "write" new profiles into your radio modem.*

Type an "h <CR>" for help
Type an "f <CR>" for facilities.
Type a "b <CR>" for baud.
Type "SE <CR>" to verify flow control = 1
Type an "s <CR>" for status.

Adding a second radio

Since there is only one radio connected and turned on, the status will indicate that the opposite circuit is not on.

Leave the first radio on, disconnect the DB-9 connector from the radio, and connect it to the second radio.

Turn on the second radio modem.

Follow the same procedure as before to verify communications.

Verify that communication has been automatically established between the two radios by:

1. Observing that the green Lamp has stopped blinking.

2. Typing the "s" status command and verifying that the status now indicates two 0's (zero's) are under the heading of the Send and Receive queue.

The radio modems are communicating with the PC.

Communicate Point to Point

This section contains the procedure for testing operation of the two radio modems. This procedure requires a combination of the following equipment, interconnecting cables, and two terminals.

This test can be performed with two terminals (preferably) but can be also tested with a single terminal, using a loop-back technique.

Testing with Two Terminals

Connect the radios to the terminals as in the previous section. Establish communications by having the prompt character "*" appear on both terminals.

Type C <CR> (Communicate) on one terminal, then type C <CR> on the other terminal. A message will be returned, "01 <CR> COM <CR>" indicating that the corresponding unit is now in the "data transfer mode", and is "communicating" via circuit 01.

Messages typed on one terminal will be transmitted to the other. The green Lamp will blink briefly on the unit originating the message. Exiting from the data transfer mode is done with the following sequence:

<1 sec idle>+++<1 sec idle>.

This will force the radio modem to escape from the data transfer mode and enter the PAD command mode. Pad service signals, like the Command Menu, will be displayed.

Testing with One Terminal

This test uses one terminal to originate a message through one radio. The receiving radio will deliver the data out its RS-232 connector, and pass it back to the originating radio with a **"loop-back"** connector.

This loop back connector can be easily constructed, or purchased from Monicor. To construct the connector, make the following connections on a male DB-9 connector:

Loop-Back Connector
Connect Pin 2 to Pin 3
Connect Pin 4 to Pin 8

With both radios turned on, connect one radio to a PC using HOST.COM. Place the radio in the data transfer mode by typing C <CR> from the keyboard. Remove the DB-9 cable, and replace it with the loop-back connector. Connect the PC to the other radio, and place that radio in data transfer. Type a message, then <CR>. The message will be echoed back on the next line.

Configure the Radio Modems

Establish a communications session with a radio and a PC, as in the preceding example.

The radio modems can be configured two ways:

1. Temporarily (active configuration)
2. Permanently (power-up configuration)

Temporary Configuration

With the radio modem at the "*" prompt ,

change a parameter, then note that the change disappears when the radio is turned off, then back on.

Type "p" for profile, then <CR>. The result should be "Basic". The command, as all others, take parameters. Type "p", then "t", one of the profile options. Transparent will be echoed back. Then <CR>.

Type a "p" again to see that the profile has been changed to transparent.

Now, turn the radio OFF, then ON again. Type a "p" to verify that "Basic" is the current, power-on profile.

Permanent Configuration

To power up directly in data transfer, use the "SEt Mode = 0" command. Make the change permanent by using the "w" (Write) command. Type "w" then "p" (for profile), then <CR>. The modem asks if you really want to do this; type "y" (for yes) then <CR>.

Type "SEt Mode" <CR> to verify the Mode has been changed.

Now, turn the radio OFF, then ON again. When the radio is turned on again, the modem will automatically start in the data transfer state (no menu will appear).

Press the "F7" and "F9" function keys on the PC to **disable flow control checking**. Then wait one second, then type three plus signs "+++". After another second has passed, the modem will respond with a message "PAD COMMANDS" and a prompt.

Type "SEt Mode", to verify the mode is 0.

STATUS INDICATOR LAMP(S)

A red and a green lamp on the IC-15 indicate the status of the radio modem at power-on and during operation. The IC-15ME has a green lamp only.

Both lamp's illuminate at power-on to indicate self-testing, and turn off upon successful completion of the power-on test (about three seconds).

However, if the battery voltage is low at power-on, only the red lamp will glow, and the modem will not function until the battery is charged.

If the battery voltage becomes low during operation, the red lamp will begin blinking, indicating only several more minutes of operation remain. After continued operation, when the battery fails to supply the minimum operational voltage, the red lamp will illuminate steadily. The modem will not function, and the transmitter will be forced off.

The radio modems initiate automatic radio communications after successful power-on. Radio link Restart and Reset operations are indicated by a blinking green lamp until all circuits have been initialized.

A blinking green indicates data or reset conditions in the outgoing or incoming link buffers, link delivery pending to the remote radio modem or local terminal. The green lamp will always blink at least once when a packet or more of data is transmitted from the local terminal.

Note

When newer firmware is installed, the factory default configuration should be modified directly and written for all three areas instead of using any old "Initial" values.

CONFIGURATION PLUG

The default configuration plug is used to set all parameters to the factory default values for the installed firmware version (2.0 and higher). The "permanent" power-up configuration is not affected.

Use a male connector with the following two pairs of pins connected as a 'default configuration' plug:

	TxD to DSR	DTR to CTS
DB-9:	3 to 6	4 to 8

Plug the connector into the radio or into a "standard" cable connected to the radio.

Turn on the radio while watching the green lamp. The lamp will be on for about 3 seconds and then start flickering. The flickering will last for about 5 seconds.

The default-configuration plug must be removed during this 5 second period in order to force the radio to the default configuration. The green lamp may start flashing about twice a second, but that is easily distinguished from the very rapid flickering.

Connect the terminal to the radio ***after*** the flickering has stopped.

The terminal should receive the "Configuration Overrule" signal. (The radio now has all parameters set to the factory default values).

The power-up configuration can be activated for any of the three groups of parameters (baud, facilities, profile) by executing the command(s) Baud Initial, Facilities Initial, or Profile Initial.

Execute the appropriate command(s) in order to check or modify the power-up configuration. (Modify with "Write").

The IC-100ME Default Configuration Plug

A default plug is a convenient method for re-initializing a Monicor radio modem to the factory default settings.

The default configuration plug is used to set all parameters to the factory default values. The "permanent" power-up configuration is not affected.

Use a male connector with the following two pairs of pins connected as a 'default configuration' plug:

	Pin	Pin
DB-9:	3 to 6	4 to 8

Apply 8 volts to pins 3 and 6. This is done conveniently with a 9 volt power adapter connected to a voltage regulator located internally in the DB-9 housing.

Plug the connector into the radio or into a standard cable connected to the radio.

Turn on the radio while watching the green lamp. The lamp will be on for about 3 seconds and then start flickering. The flickering will last for about 5 seconds.

The default-configuration plug must be removed during this 5 second period in order to force the radio to the default configuration. The green lamp may start flashing about twice a second,

but that is easily distinguished from the very rapid flickering.

Connect the terminal to the radio after the flickering has stopped.

The radio now has all parameters set to the factory default values, and the radio issues the "configuration overrule" signal immediately after the flickering has stopped, but this will not show up on the terminal since it is not connected at that moment.

The power-up configuration can be activated for any of the three groups of parameters (baud, facilities, profile) by executing the command(s) Baud Initial, Facilities Initial, or Profile Initial.

Execute the appropriate command(s) in order to check or modify the power-up configuration. (Modify with "Write").

INTERFACE OPERATION

This section describes each type of operation in detail, and the commands for setup. The PAD commands are for control and configuration of Link operation with the PAD interface.

PAD Interface

The PAD (Packet Assembly/Disassembly) interface
provides a simple network connection for terminals or hosts using asynchronous RS-232 interfaces. The *assembly* is the process of grouping one or more characters of user data into a packet for error free transfer through a network.

The PAD interface is always in one of two modes: the "PAD Command Mode" or the Data Transfer Mode".

In the data transfer mode, data transmitted from a terminal or host goes to the radio and is forwarded to the remote terminal (or host).

In the command mode, terminal output is intercepted and interpreted as commands by the attached radio , and the terminal receives radio generated responses ("PAD Service Signals") instead of remote transmitted data. The terminal controls the active mode by sending certain commands.

Data Transfer Mode

In the data transfer mode, terminal output is collected in an *edit buffer* and assembled into packets when a forwarding condition is met. The packets are then sent to the remote terminal. Incoming packets from the remote terminal are disassembled into the original characters and transferred to the terminal as received data.

An *edit buffer* is a reserved space where transmit data is held until a forwarding condition occurs.

A *send queue* is a reserved space that can hold up to two packets for radio transmission. After a forwarding condition occurs, the send queue will grab data from the edit buffer as soon as there is an empty packet slot (less than two packets).

The amount grabbed will be as much as can be forwarded (for which one or more forwarding conditions apply), but no more than the *maximum packet size*, which depends on the *Link Size* parameter. (The edit buffer is always larger than the maximum packet size.)

This creates a new packet, which contains one or more characters of user data, and increases the free space in the edit buffer.

Packets received from the other radio are placed in the receive queue. This is an area of memory reserved and holds up to two packets pending delivery to the local terminal.

The terminal may force the radio modem to switch from the data transfer mode to the PAD command mode (escape from data transfer). The options for escape from the data transfer mode depend on several PAD parameters. One option allows ^P to be used as an escape command character. Another option allows use of the following sequence:

<1 sec idle>+++<1 sec idle>.

Escape from data transfer is a forwarding condition for the contents of the Edit Buffer of the circuit.

When a radio modem escapes from the data transfer mode to the PAD command mode, the opposite end of the circuit does not receive explicit indication. But since the command mode prevents received data delivery, the other end might see data backup after enough packets are sent, until delivery is resumed.

PAD Command Mode

In the PAD command mode, all data from the terminal is interpreted by the local modem as PAD commands, and all data from the modem to the terminal are local modem-generated responses (service signals). No data is exchanged with the circuit queues, although the queues can still exchange packets across the link. Service signals are generated in all profiles while in the PAD command mode. Depending on the profile, service signals may also be generated in the data transfer mode in response to modem or remotely generated events.

The "+" character (defined by the *PChr* parameter) is equivalent to <CR> in the PAD command mode. All unused control characters are echoed as BEL and ignored.

When a command or parameter is not acceptable, only the first unacceptable character is echoed. Each unacceptable character is echoed as the BEL character. When a command cannot be executed, "ERR" is returned, sometimes followed by additional information about the problem.

A command may be canceled at any point during entry before entering <CR> by entering a ^X or DEL character. A new prompt is returned.

Command Mode Editing

In the command mode, limited command-line editing is supported. This also applies to the data transfer mode only if "EDit" is enabled.

For some of the following details, note that the radio distinguishes certain characters delivered to the terminal as printing characters, and keeps track of the "current column" of the terminal display (assuming there is one) according to the delivery sequence of printing, non-printing, and certain control characters. Printing characters are those from 32 to 255, except for 127 (DEL). The BS (8) decreases the column by 1, and the CR (13) resets the column count to zero (the left). The radio also counts LF's delivered (for paging purposes).

In the command mode, deleting a character from the buffer when an error has been detected will also cause any other characters following and including the one causing the error to be deleted.

Note that when echo is on, only the first character upon entering an error is echoed, and each "error" character is echoed as a BEL character.

In the command mode, the radio will echo entire words as soon as entry is unambiguous. For very long commands using a high degree of abbreviation, it is possible that the echoed output will encounter the 255 character limit for command-echo. The unechoed command can still be valid, but the BEL cannot indicate an error after the limit is reached.

Flow Control

Flow control is used by each device on the RS-232 link to regulate the data being sent from the device at the other side of the RS-232 link. The terminal may exercise flow control of received data at any time as desired. Flow control is exerted by the modem according to the following two conditions.

In the PAD command mode, transmitted data is shut off only when more than 191 characters are received, but not yet processed.

The radio continuously processes (removes) data from the input buffer, but sometimes the processing is slower than the maximum transmit rate, especially at the higher baud rates.

Transmitted data is shut off in the data transfer mode when either the edit buffer for the circuit is nearly full (about 20 characters before overflow, depending on Facilities Protocol Full), the circuit is down, or the circuit is busy resetting.

Two primary methods of flow control with the radio modems are software and hardware flow control.

With software flow control, the characters XON and XOFF (^Q and ^S) are inserted in the outgoing data stream to indicate control of the incoming data stream. The modem interprets these characters to start or stop the flow of received data to the terminal and deletes them from both the forwarded data stream and the echoed data. The terminal should perform a similar function for transmitted data by sensing XON and XOFF in the received data stream. XON and XOFF can be transmitted regardless of whether flow control from the modem for TxD is on or off.

Hardware flow control utilizes the control signals DTR (pin 4) and CTS (pin 8) within the DB-9 connectors. The DTR signal controls the modem's output of received data, and CTS is intended to control the terminals output of transmitted data.

Using either software or hardware flow control, OFF means flow is to be discontinued, and ON means flow can be resumed (in the applicable direction)

If input buffer overrun is detected in the command mode or with service signals enabled, the following service signal is issued:

<prefix> ERR: TxD Buffer Overflow <suffix>

Adaptive Dynamic Access (ADAP)

The following compares Monicor's new (Ver 2.2 and higher) adaptive dynamic access protocol (ADAP) to the regular access protocol (RAP), and the aspects which can be varied, so that you can determine the best configuration for a given system.

This is the protocol between radios, not at the RS-232 port. The use of ADAP vs RAP (with or without conserve) has no affect on the user interface except to the extent that throughput and response time are affected.

All radios must be configured for either RAP or ADAP -- a mixture cannot be used on a given network.

In ADAP, the Point "A" radio determines if the link is inactive and reduces (and then eliminates) the overhead wasted on it.

ADAP Configuration

The ADAP link operation is enabled and controlled by several new "facilities" commands, under "Facilities Link".

The ADAP default parameter values are optimized for most general installations, and should not have to be changed.

For more details on ADAP, see "Facil Link Conserve" and "Facil Link Dynamic Mode" under "Facilities" in the "PAD Command Syntax" section.

Data Transfer Timing

The forwarding and reception of formatted messages over the radio link is virtually transparent. As data is input to a remote radio from the terminal, the messages are formatted internally into individual packets. The packets are transmitted along with routing information.

The destination unit stores and forwards each packet. Received packets are then checked for errors. When an error is detected, the packet is repeated as necessary.

Information packets may be of variable length, up to a maximum of 128 bytes of data. If a packet contains only a few bytes, it will take a shorter time to send the packet.

If the remote radio is taken out of range, and a packet is then queued for sending in the remote radio, the remote radio will accumulate messages in its buffer until it is nearly full. At that point, the remote radio will issue a flow control signal at the RS-232 port, inhibiting additional information until it has more space in its buffer. When the remote radio has re-established contact, packet flow will continue, and there will be no loss of data.

Link Operation for 4800 bps radios.

link size:	4	5	6	7		
maximum packet:	16	32		6		4 128
minimum edit buffer size:		31		6		3 127 255
max throughput:		266		3	6	9 457 518 (char/sec)

Performance for 2400 bps radios is almost exactly half of that of the 4800 bps radios.

PAD COMMANDS

Below is a list of valid commands (in the command mode) to configure the radios to your specific environment and operating conditions.

Baud	show primary UART parameters
Communicate	go to data-transfer mode
Default values	set all parameters to default
Facilities	show primary values
Help	show basic command list
Identify	show version, options
Profile	show value
RESTart	reset all circuits
Reset	reset current circuit
SEt	show flow-control value
Status	show current circuit status
Write	write power-up values

The question mark command is useful at any point where you cannot remember the exact command name or syntax. Spaces, tabs, and line-feeds are generally insignificant except to separate items where desired. Commands are limited to 191 characters, including the terminating carriage-return or plus character.

The minimum command word letters are echoed in the same case as entered. Remaining letters are echoed before entry, usually in lower case.

If an error was encountered during command entry and the last command character is deleted, all other characters back to and including the one causing the error are deleted from the command buffer at the same time.

Commands either display information or set parameters or both. Where not shown below, commands issued without the final parameter will display the current value of the parameter without changing it. Note that many Facilities commands which set parameters may cause circuits to be reset. Also, many commands which affect the PAD Profile can cause the serial input to be briefly turned off. If another command is issued immediately following the one affecting the profile, one or more characters may overrun the UART while serial input is disabled (TxD). To prevent this loss, the following command should wait for the response and prompt following the preceding command.

IMPORTANT

If the baud setting of the serial port is changed, the response and prompt will be at the original baud setting, and should be waited for before issuing additional commands. The additional commands need to be issued at the new setting.

The numbers shown in the command syntax are generally the maximum allowed parameter value. The value in parentheses is the default value (from firmware). All command words may be abbreviated, the upper-case portion is the minimum abbreviation.

Indented under some of the commands below are detailed lists of the meaning of the parameter values.

3"

Baud

The Baud command sets the RS-232 baud rate and interface parameters of the radio modem for the current session. The change can become the power-on default with the Write Baud command.

The command is executed by typing B (Baud), then the first two digits (minimum) of the new baud rate, then the parity (one of the following characters: N/S/M/E/O), then the number of data bits (7 or 8), then the number of stop bits (1 or 2) followed by <CR>.

The following are valid baud rates:

50
75
100
110
134.5
150
200
300
600
1200
2400
4800
9600
19200

For example, to set the Baud at 9600, No parity, 8 data bits and 1 stop bit, type:

B 96 N 8 1 <CR>

The baud rate will change after the <CR>.

(Remember to change the Terminal baud rate after changing it on the radio modem.

Valid settings of parity, for data bits and stop bits combinations are:

Data Bits	7	7	8	8
Stop Bits	1	2	1	2
Parity: None	x	o	o	o
Odd		o	o	o x
Even	o	o	o	o x
Mark	o	o	o	o x
Space	o	o	o	o x

o = valid
x = invalid

Baud Initial

Baud Initial changes the baud settings to the original power-up baud values.

Baud Rxdbrkmod

If enabled, the radio will generate shorter breaks on RxD than normal, ranging from 215 to 35 milliseconds (± 5 milliseconds) for different baud rates, and the break "stop" time will be 20 milliseconds. The default is disabled, generating a 245 millisecond (± 5 milliseconds) break with a 100 millisecond stop (idle).

Baud Txdbrkmod

If the "txdbrkmod" function is enabled, the radio will recognize breaks as short as the normal character time plus 20 milliseconds. Version 2.2 will also detect breaks as short as 10 bit-intervals if the baud settings specify 10-bit characters (e.g. 1 start + 8 data + 1 stop) instead of 11-bit characters.

The default is not enabled, and a break must be 210 milliseconds or more to be recognized. If a break is not recognized as such, it will be interpreted as an ASCII "NUL" character.

Baud Xtrastop

If Xtrastop is enabled and the baud is 600 bits per second or less, the radio adds one extra stop bit to RxD (output) characters in addition to other stop bits specified.

TxD (input) character recognition is not affected.

Communicate

The Communicate command places the modem in the data transfer mode. Commands to enter the data transfer mode are:

"C <CR>"

At power-on, the current circuit is 01. When C <CR> is entered, data transfer begins for link number one (01).

A portable radio only has one circuit (01). If a remote is asked to communicate on any other circuit, transmit data will be discarded, and receive data will be blocked.

Default

This command sets all parameters to the factory default values for the installed firmware version. This is the same result as using a default configuration plug at power-up.

This does not affect the power-up values. If the radio is not already at the default factory baud, the terminal baud will need to be changed to

9600 N 8 1

after executing "default".

Facilities

The facilities commands control and enable various aspects of network operation.

The three parameters Link Size, Protocol Buffer, and Protocol Full interact when set. The Link Size is fixed by command, and never modified due to changes to the other parameters.

Facilities Green

When 0, the green lamp will blink when circuit data or reset commands are present in the radio. The radio will blink a minimum of one time for each message sent. When the queues are empty (flushed), the lamp will not blink.

When 1, the lamp is tied directly to the transmitter "Send" control. Whenever the transmitter is on, the green lamp is on.

Facility Initial

Facility Initial changes all the Facilities settings to the current power-up values.

Facility Link

This shows some of the link parameter values.

Facilities Link Conserve

Conserve, when set to "1", allows the receiver to

be powered off for short periods of time while nothing useful can be received by the radio. This will save some battery power, the amount depending on the amount and kind of network activity on other circuits. Using conserve with RAP, the least power is saved during upload, more is saved in idle, and the most is saved in download transactions by other circuits. Using conserve with ADAP, even more is saved during network idle.

Facilities Link Dynamic Mode

ADAP is enabled when the Dynamic Mode value is "1". (Factory default)

Facilities Link Dynamic Drop

The Point "A" radio drops a circuit from active status after the circuit is inactive for the specified Point "A" radio drop interval. In addition, the Point "B" radio will volunteer to the Point "A" radio to be dropped after being idle for the specified Point "B" radio drop interval. The Point "B" drop time should be much shorter than the Point "A" drop time.

Facilities Link Dynamic Latency

The first packet a Point "B" radio uploads (after being dropped) will encounter an extra delay, which is affected by the Point "A" radio latency value. The extra delay may actually be more or less than the latency value. The delay is for the Point "B" radio to signal the Point "A" radio to activate the link. The latency value influences the rate that signaling by the inactive radio is allowed.

The latency value specifies a time with 10 milliseconds units (multiply the number by ten milliseconds). The Point "B" latency should be set to the same value as the Point "A" radio , since it is used for conserve timing during link idle. The factory default value is 100 milliseconds (1/10th second).

Facilities Link Dynamic Retry

Data packets are usually retransmitted if needed until the other end of the link acknowledges error-free reception. But dynamic polling will only retransmit data packets a limited number of times before sending a special request, which must be acknowledged before the data packet can be retransmitted. This parameter limits the number of times the packet is first sent. It also affects the Point "A" radio drop-timer start. The retries are not counted past seven.

Facilities Link Dynamic Skip

Skip allows the Point "A" radio to skip polls every so often once the retry count is exceeded. A poll will then only occur on the 2^N poll cycle, where N is the retry number minus the retry parameter, limited to a maximum of the skip parameter. (However, it is also limited by the radio not counting retries past seven). For example, the factory default value of two provides a minimum of one poll every four poll cycles (until the circuit is dropped from the poll cycle). So a Point "B" radio might have to wait up to four poll cycles to get an upload started, even though the link hasn't been dropped.

Facilities Link Dynamic Test

The Point "B" radio initiates a link test periodically while it is inactive. This puts the link back into the poll cycle if it was dropped while out of range and data needs to be transferred. The Point "A" radio does not initiate a test. The test result does not affect the status of the circuit.

Log-Time Conversion

The dynamic drop and dynamic test parameter values choose a time by using a number between 0 and 255. Use the table below to find the value which most closely represents the desired time in seconds. The maximum parameter value of 255 represents about 2.8 hours.

Value	Time	Value	Time	Value	Time	Value	Time	Value	Time
0	0.16	30	0.60	60	2.24	90	8.32	120	30.7
1	0.17	31	0.62	61	2.32	91	8.64	121	32.0
2	0.18	32	0.64	62	2.40	92	8.96	122	33.3
3	0.19	33	0.68	63	2.48	93	9.28	123	34.6
4	0.20	34	0.72	64	2.56	94	9.60	124	35.8
5	0.21	35	0.76	65	2.72	95	9.92	125	37.1
6	0.22	36	0.80	66	2.88	96	10.2	126	38.4
7	0.23	37	0.84	67	3.04	97	10.9	127	39.7
8	0.24	38	0.88	68	3.20	98	11.5	128	41.0
9	0.25	39	0.92	69	3.36	99	12.2	129	43.5
10	0.26	40	0.96	70	3.52	100	12.8	130	46.1
11	0.27	41	1.00	71	3.68	101	13.4	131	48.6
12	0.28	42	1.04	72	3.84	102	14.1	132	51.2
13	0.29	43	1.08	73	4.00	103	14.7	133	53.8
14	0.30	44	1.12	74	4.16	104	15.4	134	56.3
15	0.31	45	1.16	75	4.32	105	16.0	135	58.9
16	0.32	46	1.20	76	4.48	106	16.6	136	61.4
17	0.34	47	1.24	77	4.64	107	17.3	137	64.0
18	0.36	48	1.28	78	4.80	108	17.9	138	66.6
19	0.38	49	1.36	79	4.96	109	18.6	139	69.1
20	0.40	50	1.44	80	5.12	110	19.2	140	71.7
21	0.42	51	1.52	81	5.44	111	19.8	141	74.2
22	0.44	52	1.60	82	5.76	112	20.5	142	76.8
23	0.46	53	1.68	83	6.08	113	21.8	143	79.4
24	0.48	54	1.76	84	6.40	114	23.0	144	81.9
25	0.50	55	1.84	85	6.72	115	24.3	145	87.0
26	0.52	56	1.92	86	7.04	116	25.6	146	92.2
27	0.54	57	2.00	87	7.36	117	26.9	147	97.3
28	0.56	58	2.08	88	7.68	118	28.2	148	102.
29	0.58	59	2.16	89	8.00	119	29.4	149	108.

150	113.	190	614.	230	3,604.
151	118.	191	635.	231	3,768.
152	123.	192	655.	232	3,932.
153	128.	193	696.	233	4,096.
154	133.	194	737.	234	4,260.
155	138.	195	778.	235	4,424.
156	143.	196	819.	236	4,588.
157	148.	197	860.	237	4,751.
158	154.	198	901.	238	4,915.
159	159.	199	942.	239	5,079.
160	164.	200	983.	240	5,243.
161	174.	201	1,024.	241	5,571.
162	184.	202	1,065.	242	5,898.
163	195.	203	1,106.	243	6,226.
164	205.	204	1,147.	244	6,554.
165	215.	205	1,188.	245	6,881.
166	225.	206	1,229.	246	7,209.
167	236.	207	1,270.	247	7,537.
168	246.	208	1,311.	248	7,864.
169	256.	209	1,393.	249	8,192.
170	266.	210	1,475.	250	8,520.
171	276.	211	1,556.	251	8,847.
172	287.	212	1,638.	252	9,175.
173	297.	213	1,720.	253	9,503.
174	307.	214	1,802.	254	9,830.
175	317.	215	1,884.	255	10,158.
176	328.	216	1,966.		
177	348.	217	2,048.		
178	369.	218	2,130.		
179	389.	219	2,212.		
180	410.	220	2,294.		
181	430.	221	2,376.		
182	451.	222	2,458.		
183	471.	223	2,540.		
184	492.	224	2,621.		
185	512.	225	2,785.		
186	532.	226	2,949.		
187	553.	227	3,113.		
188	573.	228	3,277.		
189	594.	229	3,441.		

3"

Facility Link Size

This command sets the maximum packet size for radio transmission. It also establishes the packet size for the send and receive queues, along with the edit buffers. The factory default is 5, which is 32 characters. The edit buffer size can be set independently of the link size.

When messages are transferred over the radio, a longer packet has a higher probability of being detected with an error than a shorter packet. Consequently, the radio will have a slightly shorter area of coverage with a link size of 7 than that of a link size of 4 or 5.

The size is the logarithm-base-two of the maximum packet size, resulting in valid values of 4, 5, 6, or 7. Any change in the maximum packet size causes a restart. Note that all radios on a network must be set to the same maximum packet size or the corresponding circuits will probably become jammed (stuck).

Facility Protocol

This command indicates the current radio interface and operation type.

Facility Protocol Buffer

This command sets or displays the current size of the edit buffer(s). The size is 2^N-1, e.g. size 6 is 63 characters for each buffer.

Facility Protocol Full

This command sets the flow control off/on threshold (high-water mark). Flow control will go off when the specified free space (or less) exists in the current edit buffer (in the data transfer mode). This does not apply if the flow control type is set to 4 or more, but the protocol full will still affect related status results.

Facility Red

When set to 0, the red lamp blinks about twice a second when the battery is low.

When set to 1, the red lamp also "blips" every couple of seconds to indicate that the power is on.

Help

The Help menu is available in the PAD command mode. Typing H <CR> will give the following response:

Baud
Communicate
Default
Facilities
Help ?
Identify
Profile
Reset
RESTart
SEt
Status
Write
*

Typing a ? at the command level will give the following response:

*<?> baud communicate default facilities help identify profile reset restart set status write <CR>

The "?" character can be entered at any point during command entry to obtain a list of the valid possibilities for the next element of the command (context-sensitive help). The list is followed by a repeat of the current command entry (similar to the DC2 editing function). The question-mark is discarded. If a portion of a command word is entered which is ambiguous (more than one choice in the "?" list start with those same letters) then the last compatible choice is assumed. This is why the list is not always in alphabetic order. Whitespace (spaces,

tabs, linefeeds) are allowed anywhere except within words or numbers. The "?" command forces the default word if the current entry is ambiguous. Therefore, the "?" may assume a current entry word and show the resulting next options whereas the next character(s) entered invalidate the default assumed for the former entry (and of course the resulting next options). For example, "S?" will assume "Status" and display the status subcommands, but if the next character entered is "E" then "SEt" will be taken as the first command word.

As many successive letters as match a command word are taken as representing that word. For example, the following entries are equivalent:

Identify

Identify provides version information, type of radio, and optionally, serial number and frequency.

Profile

The "Profile" command sets or shows the current PAD profile.

The "Profile" refers collectively to the settings of all of the PAD "SEt" parameters. The Basic, Editing, Standard, and Transparent profiles each support a different general requirement. A fifth profile, "Initial", is the set of customer configured parameters at power-on.

The profiles are simply a starting point for selecting the "SEt" parameter values, and any profile can be modified to any degree. *See the SEt command.*

The general characteristics of the four PAD parameter profiles reflect the interface needs of four typical applications.

The *editing profile* is useful for supporting a conversational mode between two "dumb" terminals.

The *standard profile* is useful where a simple interface providing echo is needed.

The *transparent profile* is most widely used and is preferred for communications requiring that no characters are filtered, added, or echoed.

The *Basic profile* is a subset of the transparent profile.

Editing Profile

With the *editing* parameter values, limited editing is provided for a number of characters or until entry of a <CR>. The number of characters is determined by the flow control threshold, which also determines the size-based forwarding condition. All terminal output is echoed back to the terminal. XON/XOFF (default) flow control is active. A <CR> automatically adds a <LF> for both echo and transmission to the remote terminal. The reception of <LF> causes an extra <CR> to be automatically inserted.

When received data switches between incoming, and outgoing-echoed, an extra <CR><LF> is inserted in the received data.

When more than 80 characters are received or echoed without a <CR><LF>, then a <CR><LF> is inserted in the received data stream (line folding).

The editing functions provided are:
1) previous character deletion using <BS>;
2) buffer (line) delete using <^X>;
3) buffer re-display using <^R>.

The Edit buffer contents are forwarded to the remote terminal on receipt of a <CR> from the terminal. No forwarding idle time-out is applied, so a partially full buffer without a <CR> will remain indefinitely, without being forwarded to the remote terminal. Control-P (^P) escapes from data transfer, as well as <1 sec idle>+++<1 sec idle>.

Standard Profile

The Standard profile parameter values are similar to the editing values, providing echo and flow control, but omitting all editing functions and CR/LF insertion. All control characters are forwarding characters, as well as <CR>. There is no forwarding idle time. Escape from data transfer is the same as for the editing profile.

Transparent Profile

Transparent profile parameter values allow all characters to be sent, (with the exception of circuit switches and escape sequences) facilitating the transfer of non-text data. There is no echo, no forwarding characters, or XON/XOFF flow control (unless modified), and all PAD service signals are suppressed. Also, the

<1 sec idle>+++<1 sec idle>

escape command is the only means enabled to escape from the data transfer mode. Flow control is provided by the DTR/CTS interface

signals, and the forwarding idle timer is set to 10 milliseconds, so data is forwarded either when a full packet of data is buffered (32 characters for Link Size 5) or when the idle timer expires (transmitted data is idle for at least 10 milliseconds). If "transparent" is the initial profile, the radio interface will immediately go to the data transfer mode at power-on.

The Transparent Profile allows service signals enabled with a custom prefix and suffix string added. This allows for the explicit detection of a circuit reset.

The Transparent Profile allows specially marked delivery of packets received from any and all circuits while the current circuit is any circuit.

1**Basic Profile**

The Basic Profile disables the circuit switch command, uses software flow control, and powers up in the command mode. The power-up mode is usually the only modification to the profile you will need.

The abbreviated commands to set Edit, Initial, Standard, Transparent and Basic are:

P E<CR> (Sets profile to Edit),
P I<CR> (Sets profile to Initial),
P S<CR> (Sets profile to Standard),
P T<CR> (Sets profile to Transparent).
P B<CR> (Sets profile to Basic).

Initial Profile

The Initial profile is defined as the power-on profile, and can be one of the four pre-defined profiles: Basic, Edit, Standard, Transparent, or any modification of these. Any parameter values can be put in the initial profile by performing the Write Profile command while the desired settings are active.

Reset

The Reset command resets the circuit.

Restart

The Reset command resets the circuit.

SEt

PAD Parameters

The SEt command shows and/or sets the values of one or more of the PAD profile parameters.

All of the PAD parameters are controlled individually. These are the components of the profile. A profile is a complete set of PAD parameter values. The active profile is the set containing each value currently in use for each PAD parameter. To "SEt" a parameter is to modify the current profile. Writing the profile forces the Initial Profile to be the same as the active profile.

In other words, "write profile" sets the initial value of all of the PAD parameters to the value currently set. "Profile Initial" sets all the PAD parameters to their current power up values.

The PAD parameters are either standard (CCITT X.3) or non-standard (Monicor-defined). The standard parameters are numbered from 1 through 22, and the non-standard parameters are numbered from 101 through 109. A parameter can be referred to by either its number or its name. Many "standard" parameters have been modified slightly (from the X.3 specification).

Multiple parameters can be set or read by a single SEt command. If a value is set more than once in the same command, the last value prevails.

If more than one parameter is being shown and/or set, the parameter names (or numbers) are separated by commas. The command response will also have as many commas.

To set a parameter, the parameter name (or

number) is followed by the assignment operator (= or : or ;) and a value. The value of any parameters not being set are shown in the command response (in the corresponding position).

The response format is one or more commas, if two or more parameters are referenced, followed by a CRLF. If a parameter value is being assigned, no value is displayed in the corresponding position of the response.

For example (starting with Profile Edit):

command: SE P,E,FO=2,6,FOL,15=1<CR>

response: 16,1,,23,80,,<CRLF>

If any part of the command is invalid, no parameters are changed.

The following PAD "SEt" parameters make up the content of the PAD profile. A parameter can be referred to by either its number or name (word).

Number	Name	Max	Profile	Description
1	Pad =	255	(16,16,0,0)	PAD escape char
2	Echo =	1	(1,1,0,0)	local echo enable
3	FOrw =	255	(2,126,0,0)	packet forwarding on certain char's
4	Idle =	255	(0,0,1,1)	packet forwarding on idle-timer
5	Tflo =	7	(1,1,3,1)	TxD data flow control
6	Sigs =	255	(23,23,22,22)	service signals
7	Brk =	255	(0,0,0,0)	response to break
8	TOss =	1	(0,0,0,0)	discard data
9	CR =	255	(0,0,0,0)	CR padding in char-intervals
10	FOLd =	255	(80,0,0,0)	line folding (insertion of CRLF)
11	BAud =	15	(,,,)	Serial data bit rate (read only)
12	Rflo =	3	(1,1,3,0)	RxD data flow control
13	Auto =	255	(22,0,0,0)	auto LF insert
14	LF =	255	(0,0,0,0)	LF padding in char-intervals
15	EDit =	1	(1,0,0,0)	editing enable
16	CDel =	255	(127,127,127,127)	char delete char
17	LDel =	255	(24,24,24,24)	line delete char
18	DIsp =	255	(18,18,18,18)	line display char
19	TYpe =	255	(2,2,2,2)	editing service-signals.
20	MAsk =	255	(0,0,0,0)	echo mask
21	PARi =	1	(1,1,1,1)	check parity (else ignore parity)
22	Wait =	255	(0,0,0,0)	page wait
101	PPp =	1	(1,1,1,1)	PAD-recall w/ +++ enabled
102	Circ =	1	(1,1,1,0)	circuit switch command enable.
103	Mode =	1	(1,1,0,1)	power-up mode
104	INtr =	3	(1,0,0,0)	receive intrudes echo

105 PChr = 255 (43,43,43,43) value of char treated as "plus" char
106 DLim = 255 (35,35,35,35) circuit switch delimiter char.
107 Gard = 255 (0,0,25,25) guard-time (40 ms units, 25 = 1 sec)
108 SUb = 255 (26,26,26,26) Substitute character
109 DEad = 7 (0,0,0,0) Dead-command test
Flow-control = 7 (1,1,3,1) both Rflo & Tflo (Rflo is modulo 4)

The four values in parentheses are the Editing, Standard, Transparent, and Basic profile values, in that order.

SEt Auto

This parameter controls whether the radio inserts extra <CR> or <LF> characters into the receive data stream when <CR> or <LF> is recognized in the transmit and/or receive data.

SEt Brk

This parameter controls the response of the radio when a break is recognized on the RS-232 TxD line. An extra option allows the radio to send a break on the RxD line when a reset signal occurs.

The radio can detect and generate short (modified) break signals if the corresponding Baud options are enabled. Otherwise, the transmission of a short break to a radio is interpreted as a NUL character (with a framing error).

If the value contains 128, then anytime a reset indication occurs (or would occur if "Sigs" set for suppression), the radio sends a break to the terminal on the RxD line.

SEt CDel

This parameter determines which character performs character-delete editing.

SEt Circ

This parameter enables or disables recognition of the circuit switch command.

SEt CR

This parameter allows the radio to create a desired idle time (padding) following any CR delivered on the RxD line. This is mostly used only by teleprinters which do not have buffered input and flow control.

SEt DIsp

This parameter determines which character performs line display for editing purposes. Line display echoes the editable content of the current edit/command buffer.

SEt DLim

This parameter determines which character is recognized as the circuit switch delimiter.

SEt Echo

This parameter controls whether local echo is enabled or disabled in the data transfer mode. Local echo in the command mode is controlled by the Sigs parameter. Echo also changes the meaning of the INtr parameter.

SEt EDit

This parameter controls whether editing is enabled or disabled in the data transfer mode. Editing is always enabled in the command mode. With editing on, a full packet in the edit buffer is not a forwarding condition. Instead, the edit buffer is able to be forwarded when it fills to the point where flow control shuts off (or would shut off if Tflo was not 4 or more). Editing also disables the idle timer.

SEt Flow Control

The "Flow-control" parameter is actually shorthand for two different parameters, one for TxD flow control and one for RxD flow control. The Tflo parameter is set to the new value, while the Rflo parameter is set to the new value modulo four.

If "Rflo" (# 12) is not equal to "Tflo" (# 5) modulo 4, then "Flow-control" will indicate "Mixed" instead of a number.

The default flow control for the Basic Edit and Standard profiles is software, and for Transparent profile is hardware.

Although the DTR signal is not used for flow control when the flow control is software, it is used to disable or enable the RS-232 interface.

Rflo RxD meaning

0 (Tflo not 0): same as 1, except DTR disables serial interface while OFF.
(Tflo is 0): RTS/CTS flow control (RTS controls CTS/RxD, CTS may drop as needed to limit TxD).

1 XON/XOFF received on TxD enables / disables RxD, DTR ignored.

2 XON/XOFF received on TxD enables/disables RxD, DTR signals DTE-Down while OFF (the current circuit is reset).

3 DTR enables/disables RxD while ON/OFF.

Tflo TxD meaning

0 (Rflo not 0): same as 1, except CTS is always OFF.
(Rflo is 0): RTS/CTS flow control (DTR enables / disables RxD and CTS, CTS will also go OFF as input buffer exceeds 191 characters, or the current edit buffer crosses the "full" mark, or the current circuit status is not operational.

1 XON/XOFF sent on RxD as input buffer exceeds 191 characters, or the current edit buffer crosses the "full" high-water mark (assuming the entire input will go to the current edit buffer), or the current circuit status changes, CTS is always ON (after power-up testing completed).

2 same as 1, except CTS reflects circuit Up/Down: CTS is OFF in data transfer mode during reset or remote-DTE-down, when the current circuit is not operational.

3 CTS changes as the input buffer exceeds 191 characters, or the current edit buffer crosses the "full" high-water mark (assuming the entire input will go to the current edit buffer), or the current circuit status changes, XON/XOFF is treated the same as any other data.

4 same as 0, except edit buffer and "full" mark are ignored.

5 same as 1, except edit buffer and "full" mark are ignored.

6 same as 2, except edit buffer and "full" mark are ignored.

7 same as 3, except edit buffer and "full" mark are ignored.

SEt Rflo, SEt Tflo

These commands show or set the flow control options for the RxD and TxD data lines.

Note that Tflo between 4 and 7 permits the prevention of overflow at the input buffer, but will permit undetected data overflow at the edit buffer, so the host/terminal must know that the edit buffer has room for what is sent to a circuit to prevent possible data loss.

Also note that auto-insertion of CR/LF can affect flow control slightly by virtue of any extra characters added to the edit buffer (inserted).

See the following table for RxD and TxD flow control options.

SEt FOld

If non zero, this parameter causes a <CRLF> to be inserted into the radio RxD output stream when the next character is a "printing" character, and the specified number of printing characters have already been output since the last <CR> was output on the RxD line.

SEt FOrw

This parameter enables the transmission of the specified sets of characters to constitute a forwarding condition for all characters transmitted on the TxD line so far.

SEt Gard

This parameter controls the guard time interval for the plus-plus-plus and circuit switch commands.

SEt Idle

This parameter sets or disables the idle timer interval for idle based forwarding of data. The idle timer is disabled if the interval is set to zero or EDit is enabled.

SEt LDel

This parameter determines which character performs the line delete (or "cancel command") editing function.

SEt LF

Similar to CR, except applies to delivery of LF characters.

SEt MAsk

This parameter selects groups of characters which are not to be echoed when local echo is on.

SEt Mode

This parameter determines which mode is active at power up.

SEt Pad

This parameter selects the character (or selects "none") which is recognized as a PAD escape from data transfer mode command.

SEt PARi

This parameter determines whether parity is checked or ignored. (See the SUb parameter).

SEt PChr

This parameter selects the "plus" character for the plus-plus-plus escape command, and the command terminator equivalent to <CR> in the command mode.

SEt PPp

This parameter enables or disables recognition of th plus-plus-plus escape command.

SEt Sigs

This parameter selects among several service signal options, including "suppressed". It also enables or disables local echo in the command mode.

SEt SUb

This parameter selects the character to be substituted for a TxD parity error, or disables substitution.

SEt TOss

This parameter enables or disables the discarding of all received data. If you enable TOSs, you never receive any data.

SEt Type

This parameter selects the type of editing service

signals generated, or disables them. The correct value depends on the type of terminal or emulation being used.

SEt Wait

This parameter selects the page size for (or disables) the page wait function. This function allows a user to prevent more than one screen full of data from being delivered (and scrolling off of the display) until the user is finished with it.

3"

Status

Status Commands (Subcommands)

The status command provides an indication of current packet and edit buffer input and output activity. These commands are available both in the command mode and in the data-transfer mode on circuit zero.

Battery	show battery status
Events	show event counters
Incoming	show incoming list
Outgoing	show outgoing list
Timer	show power-on timer

Status Battery

This command displays 'Down' if the battery is low enough for the red lamp to flash, or 'Okay' otherwise. The response is six characters including a CRLF.

Status Events

The Events subcommand indicates the values of several internal event counters (such as character errors), and followed by a CRLF. The event counters reset to 65280 on the next count after reaching a maximum of 65535. The counts, in the order displayed, are:

1st input (TxD) parity error, replaced w/ SUB (param #108)

2nd input buffer overrun error (discarded characters)

3rd input interrupt lost characters (UART

buffer overrun, discarded)
4th detected character framing errors (missing stop bits)
5th received radio false start (modulation error before 1st char)
6th received radio frame failures (format errors, etc.)
7th received radio modulation error before end of frame
8th received radio frame too long for current link size
9th radio transmitted possible errors (correctable)
10th edit buffer overrun (discarded characters)
11th TxD frame overrun error
12th received radio frame w/ bad CRC
13th dynamic poll lost

Note that counters 1, 2, 3, 4, and 10 count errors which are NOT corrected by the radio.

Status Incoming

Display a list of any circuits having data or signals for local delivery. The numbers are separated by commas, or is a '-' if none, and followed by a CRLF.

Status Outgoing

Display a list of any circuits having data or signals to be transmitted to or acknowledged by the other end of the circuit. The numbers are separated by commas, or is a "-" if none, and followed by a CRLF.

Status Timer

The Timer subcommand indicates the number of seconds the radio has been operating (to two decimal places). At about 4/3 year the timer is reset to 1/3 year. This may be used as an alternate way to detect undesired power cycling of a radio (which causes circuit resets).

Write

Parameters that have been changed during the session can be permanently stored and used as the default power-on condition when the unit is turned on again.

Enter the first letter of Baud, Facilities, or Profile, then type <CR>. This command requires a confirmation. Type Y for yes, any other character to abort the command. The command sequence is:

Write Baud

Writes the current Baud setting as the power-on default.

Write Facilities

Writes the current Facilities values as the power-on default.

Write Profile

Writes the current Profile of "PAD" parameters as the Initial Profile.

The Monicor Radio-Modem EEROM

If you don't need any whys and wherefores, skip to the seven-step recovery.

Monicor radio-modems use memory components known as EEROM to keep all of the configuration settings, which allows you to customize each radio as needed.

EEROM does not lose data while power is removed, and is read when the radio is powered-on to obtain and "load" all of the initial settings.

As a precaution, the EEROM has extra "checksum" values which serve to prevent the radio from ever starting with any bogus settings.

A possible EEROM error is indicated by the following "service signals" (internally-generated text output strings) from a radio serial port:

1. "X-error-X"
2. "Factory Data Failure" + BEL + CR + LF
3. "Configuration Failure" + BEL + CR + LF

The next service signal does not imply failure, but simply indicates recognition of the default-configuration-plug power-up procedure, by which you force the radio to load the standard factory-default settings and ignore the initial-configuration in the EEROM:

4. "Configuration Overrule"+ BEL+ CR +LF

The first three signals normally indicate the following conditions:

EEROM checksum fails the power-up testing.

1. One or more bits failed the comparison test, the final step of each "write" command.

2. The EEROM has not been preset at the factory. This should only occur within the factory prior to final shipment setup & test. However, if it occurs outside the factory, and any write command is then executed, then the EEROM checksum will also be corrupted.

3. The EEROM data has a checksum error, usually due to all three areas of the EEROM not being written for the first time prior to final shipment setup. Note that the radio will start with the factory-default configuration if the

However, the "possible EEROM error" could be caused by an actual EEROM component failure, or by corruption of data within it, e.g. by interruption of a write from loss of power before it completed.

Since it is usually difficult to determine the cause of an error in a deployed-application scenario, it usually easier to try (once) rewriting the EEROM and assuming some innocuous cause if the problem never reappears.

Seven-Step EEROM Recovery

The following procedure addresses the above types of EEROM data failure. If this is not successful, then assume the radio has a hardware failure, which requires repair by Monicor.

1. Connect the proper RS-232 serial cable between the terminal and radio.

2. Turn on terminal power (or start terminal emulation). Set the terminal RS-232 com-port to 9600 baud, no-parity, 8-data bits, and one-stop bit, unless already set.

3. Turn on the radio power, verify that:
--> red & green lamps are on for about 3 seconds, except red if absent,
--> the terminal indicates "Monicor <model>, Version #.#",
--> the cursor follows a "*" prompt.

4. If no factory-data-failure message was received, skip to step 5. Otherwise the factory-data-failure condition must be cleared as follows:

--> Erase the EEPROM: To get the "ERR:" prompt, hit the following 16 keys: f a e r b t s t ctrl-X ~ l a x t ~ ctrl-X

--> Then, key in at ERR:
e 1 . to erase all in point-to-point radios.

--> Confirm the "<verified>" response.

--> Turn the radio power off and on to verify the factory-fail status has cleared.

Note that you must use lowercase to get the ERR: prompt, ignore beeps during entry. Also, the radio will "fail" with both lamps on if you "e" a radio which did not have a factory-data failure. Then you have to power off and back on and do it right.

5. If there is a configuration-failure message, you must have (or get) a valid configuration and then correct the EEROM checksum per step 6. If you don't care to see or keep any previous configuration settings, then skip to step 6 now. But if you want to keep or read the previous settings then read this step carefully. It is easy to simply write the factory-default configuration in step 6 and set the proper desired configuration later, if you know exactly what it should be. When the configuration-failure signal is sent, the radio has already loaded the factory default settings to start with.

However, if you do not want to lose the current initial settings in a particular area(s) (baud, facilities, profile), you must not write the factory defaults. Instead, load the current EEROM initial values by using the "Initial" option of the Baud/Facilities/Profile command(s). Be aware that at this point, you don't know if the "failure" was in one or more of the settings, or just in the checksum itself. Either now or later you should make a thorough check of each area you want to retain, or at least try out the settings in the actual application.

You may want to load the initial settings just to read them manually. In that case, issue the initial command(s), issue the appropriate commands to see the desired settings, then issue the default command before proceeding to step 6.

The "Default" command always loads the factory-default configuration, which is a common starting point from which to make all of the desired changes. Use the following keystrokes to load factory defaults:

d CR

Enter these three commands to entirely retrieve whatever is in the EEROM. You may check it or assume it is correct for now.

b i CR
f i CR
p i CR

If the initial baud settings are different, you will need to change the terminal baud to match

the radio after issuing "Baud Initial".

Warning: It is possible to force an EEROM-error-caused configuration error, which was detected and ignored up to now, to be forced into use by loading it and writing it. And any unknown wrong settings have the potential to "disable" the radio with regard to a specific application. You might even be forced to use the default-plug power-up procedure to regain control of the radio.

6. If you did not get a configuration-failure message, skip to step 7. Once all three areas have known settings, then clear the configuration failure with by writing all three areas (in any order). Hit the keys:

w b CR y CR(will probably still indicate X-error-X)
w f CR y CR(will probably still indicate X-error-X)
w p CR y CR(must indicate <verified>)

7. Turn power off and on and verify that no failure messages are issued. (Ignore Restart and Reset messages). If the radio is using the factory default settings, then modify and write the proper initial settings as needed.

Lightning Arrester Kits

Note: Each Lightning arrester kit includes the lightning arrester, a 10 ft coax cable with UHF antenna connectors, and coax wrap.

Determine a suitable location for the antenna on the roof. The 10 foot feed cable connect the antenna to one end of the lightning arrester. The lightning arrester must be located near a lightning ground object (strap or whatever), and the ground connection from the arrester to the ground object should be as short as possible. Connect the 30 feed cable from the other end of the lightning arrester to the radio. Use the coax wrap (gooey substance) to wrap around the connectors of the antenna and lightning arrester to prevent water seepage.