Model 40 Serial Number _____ Software Version _____

NOTE: This manual covers circuit board 702-9201, software version 1.0.

Z E T R O N

MODEL 40 SYSTEM PATCH
INSTRUCTION MANUAL

#025-9136G

VA3KMC

HISTORY

OBSOLETE

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WARRANTY STATEMENT

Zetron, Inc. warrants that all equipment sold pursuant to any agreement is free from defects in material and workmanship at the time of shipment. The warranty extends from the date of shipment for one year and covers parts and labor. The buyer must provide written notice of any defect to Zetron within this warranty period.

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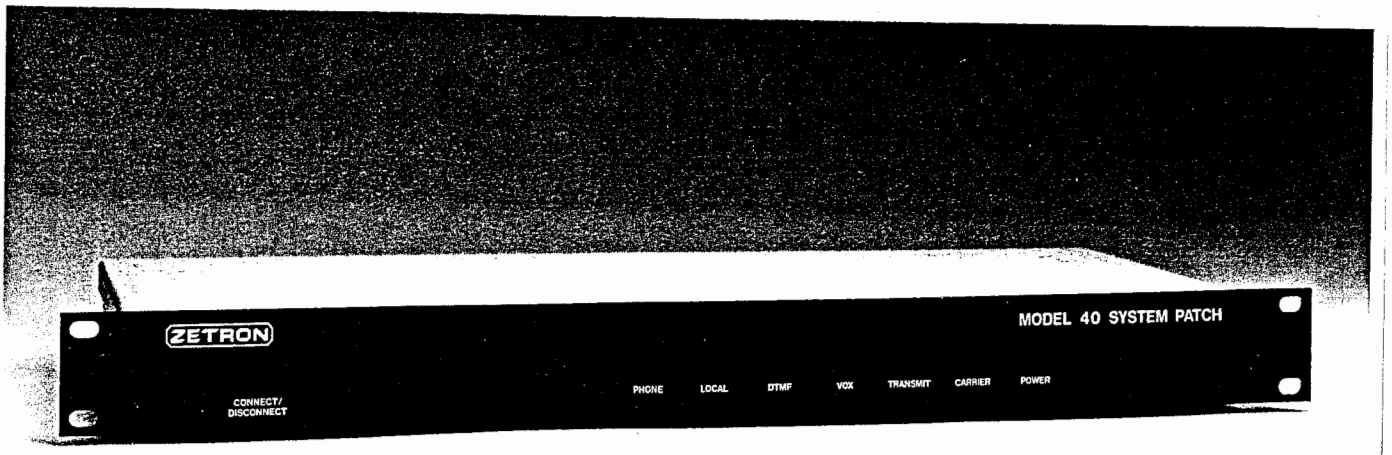
TRADEMARKS

1. INTRODUCTION



INTRODUCTION

The Zetron Model 40 is a flexible telephone interconnect that provides individualized telephone interconnect service for up to 99 different (DTMF ANI) customers. It's a complete interface between a transmitter, receiver and telephone line.

Selective calling options allow each mobile or handheld to be individually called by the telephone party or another mobile. Available formats include; DTMF, two-tone, five-tone, CTCSS and DCS.

Accounting information is accumulated by the Model 40 for later review or billing purposes. The total airtime used by each customer is accumulated in an "hours:minutes:seconds" format. Optional call detail information, or SMDR data, may be printed and stored in the Model 40. Call detail includes; date, time, mobile ID number, telephone number or mobile number dialed, call length, and call completion status.

The Model 40 may operate in simplex VOX mode to provide interconnect via a control station, or in simplex sampling mode for other simplex channel applications.

For duplex installations the Model 40 provides repeat audio processing and transmitter control. This may be used to convert a duplex station into a repeater, or to process mobile-to-mobile selective calls.

The Model 40 may be added to a community repeater to provide interconnect service for selected customers. When connected to a Zetron Model 38 or 39 tone panel, the Model 40 will communicate with the tone panel to provide smooth operation. Interconnect access may be offered to only certain CTCSS/DCS users since the tone panel provides decode information to the Model 40. An added benefit of this arrangement is the system operator may program or view the tone panel functions using the dial-up modem in the Model 40.

The Model 40 may be remotely controlled and programmed using DTMF over the air, DTMF over the telephone, or via an optional 300/1200 baud internal modem. Nearly all of the Model 40's functions can easily be customized for each of the 99 users.

SYSTEM FEATURES

System features

* One normal telephone line (B1), plus local telephone port
* 99-user DTMF ANI decode may be 1 to 8 digits per user
* Simplex VOX, simplex sampling, and half-duplex modes
* Optional digital voice delay for enhanced simplex
* Supports mobiles, pagers, tone+voice, talkback and direct channel access
* Selective calling via DTMF, 2-tone, 5-tone, CTCSS, or DCS (options)
* Interfaces to Zetron tone panels to provide CTCSS or DCS decode per user
* Mobile-to-telephone DTMF and dial pulse regeneration
* 10 autodial telephone numbers
* Repeat audio for mobile-to-mobile calls
* AGC for high quality telephone-to-mobile audio
* Morse ID
* Programmable via DTMF telephone, DTMF radio, RS232, or modem (option)
* Call progress and mobile ringout tone generation
* Call limit, extended call limit and mobile activity timers
* Telco overdial can be a user number, ANI, or autocall
* Intelligent dialing mode; including 911/1-800 and 1000 prefix table for non one plus dialing areas
* Full PBX support including hookflash
* Supervisor user, can answer and disconnect any call
* Device configuration upload and download via PC

PER USER: (99 users)

* 1- to 8-digit DTMF user ANI
* Equipment type; mobile, pager, tone+voice, talkback, direct channel
* Selective calling; DTMF, 2-tone, 5-tone (optional)
* CTCSS or DCS encode
* CTCSS tone or DCS code decode, requires a Zetron tone panel
* Call answer sequence; COR, "*", "*"+ANI
* Call disconnect sequence; "#", "#"+ANI
* Toll restrict type
* Security; repeat audio, or half-privacy masking tone
* Access privileges, mobile to mobile, mobile repeat, mobile to telephone
* Airtime accumulation per user
* Call limit normal or extended
* Log all calls, or long distance only

Intelligent Dialing
The Model 40 monitors telephone numbers as they are dialed and determines from the digits being dialed whether or not the call is a toll call, a call to the operator, an emergency call, or 1-800 call. Calls are considered toll calls when the prefix (first 3 digits of the telephone number) matches a restricted prefix in the toll prefix table, the call begins with a 1, the call begins with an area code, or the call is to the operator. There are three levels of toll restrict; toll restriction, 0+ restriction, and no restriction. Toll restriction disallows any toll call, 0+ allows credit card calls to be made, but not calls to the operator. The Model 40 knows when the dialing is finished from the syntax of the telephone number being dialed. PBX support is accomplished by allowing the system operator to install a list of starting digits required by the PBX to gain outside line access. Normal dialing commences after the PBX access digit has been entered and accepted by the Model 40.

Programming
Programming is accomplished using DTMF over the radio channel, over a telephone line or locally using a telephone on the local port. The Model 40 may also be programmed with a terminal or computer through the local serial port, or if the modem option is ordered, over the Model 40's telephone line using a 300 or 1200 baud modem. Programming is designed to be simple and usually will not require the use of this manual.

Supervisor User
The Supervisor User may answer or disconnect any calls on the system simply by using his or her ANI. If a Zetron tone panel is connected to the Model 40, the supervisor may also barge-in on a call by keying up on the appropriate CTCSS or DCS code. Barging-in on a call will allow the supervisor to hear both sides of the conversation to determine whether or not the call should be terminated.

Zetron Repeater Tone Panel Compatibility
The Model 40 and Model 38 or 39 tone panels may be connected via a serial cable to provide a better link between a tone panel and a telephone interconnect. Both data and audio are routed through the Model 40 for optimum system performance. Once the two are linked, the system operator may opt to have some users interconnect access validated with CTCSS or DCS decode to provide better interconnect security. This is done on a per user basis, with the ability to cross encode CTCSS and DCS.

The front panel keypad and display on a Model 39 may be used by the installer to observe the Model 40 operation, or perform setup tests.

INTERCONNECT OPTIONS

Internal 300/1200 Baud Modem (option)
The optional internal modem allows a Model 40 at a remote location to be programmed by a computer or terminal using a modem. System parameters may be uploaded or downloaded using the Zetron Communications Utility (ZCU).

Model 36 Phone-Link (option)
The Model 36 Phone-Link is a pair of radio to telephone interfaces that allows a telephone line to be extended, via two full-duplex radios, to nearly any location.

SMDR Billing (option)
The Model 40 may be equipped with an option that allows it to record and print call reports. The records that are stored may be retrieved with ZCU and billed with the ZEBRA billing software.

Other Options
Selective Signaling; DTMF, CTCSS/DCS, Two-tone, Five/Six-tone.

NOTE: The text of this manual assumes all options are installed.

2. SPECIFICATIONS

GENERAL SPECIFICATIONS

Power	100-130V AC, 60 Hz, 7 watts or 12-15V DC 600 mA.
Temperature	0 to 65 degrees Celsius.
Size	19" W x 7.25" D x 1.75" H. 19" rack-mount.
Weight	3.5 pounds.

INTERCONNECT CAPACITY

DTMF ANI codes	99
ANI length	1 to 8 digits per user
ANI speed	1 to 14 digits per second

SIGNALING SPECIFICATIONS

Frequency range	10 to 3500 Hz
Freq accuracy	0.1%
Freq stability	0.005%
Distortion	2% nominal
Two-tone sequential	Motorola/GE all tone groups, code plans, and capcodes.
DTMF	1 to 8 digits per subscriber
Five/Six-tone	EIA, ZVEI, CCIR single or dual address
CTCSS	50 tones
Digital Coded Squelch	Any code 000-777

TELEPHONE INTERFACE SPECIFICATIONS

	One end-to-end (B1) phone line, one local phone port for connection to desk set.
Connector	RJ11-C modular jack.
Call progress tones	Dial tone, ringing, double ring, busy, reorder.
End-to-End:	
Incoming call	Ring detection on tip-ring pair or dry contact closure to ground. Programmable number of rings to answer.
Call answer	Off-hook, tip-ring current draw.
Call disconnect	Busy tone, call limit, mobile activity timers.
Local Phone:	
Incoming call	Loop start or dry contact closure, immediate dial.
Call answer	Darlington output.
Call disconnect	Local phone on-hook.

RADIO INTERFACE SPECIFICATIONS

PTT	One Form-C relay closure, 100 mA max.
COR	Dual time constant noise detector or voltage change.
CTCSS/DCS output	-40 to +6 dBm. Hi/Lo selector. 600 ohm output.
Tx audio	-40 to +6 dBm. Hi/Lo selector. 1K ohm output.
Rx audio	-40 to +10 dBm. Hi/Lo selector. 50K ohm input. 25 mV to 6 V P-P.
Channel busy input	Closure input from secondary receiver COR.

ADDITIONAL SPECIFICATIONS

Modem	300 baud Bell 103J or 1200 baud Bell 212.
Indicators	Phone, Local, VOX, DTMF, Carrier, Transmit, Power.
Switch	Connect/Disconnect.
Station ID	Morse code, fixed 1200 Hz frequency and programmable call sign.
Radio-Equipment types	Tone-Only pager, Tone-and-Voice pager, Talkback pager, Mobile, Direct Channel Access.
Prompt tones	Progress tones, error tones and warning tones sent to phone or mobile.
Programming	Programmable via DTMF phone, DTMF mobile, RS-232 or optional 300/1200 baud modem.
Data retention	Battery backed for at least 5 years with no power applied.
Secondary protection	High voltage clamps with protective fusing elements.

3. OPERATION

MODEL 40 OPERATION

NOTE: *Programmable functions are in italics.*

Telephone to Mobile Calls

To place a telephone-to-mobile call, the caller must first dial the Model 40's telephone number. After the specified *rings to answer* have elapsed, the Model 40 will answer the telephone and respond with dial tone, indicating that it is waiting for either a user number or a user's ANI. The caller enters the ANI or user number of the mobile to be called. The Model 40 then keys the transmitter and sends any selective signaling required, followed by ringing on the channel. If the user is not enabled, error beeps are sent to the telephone caller, and the call is terminated. The mobile must answer the call before the *mobile answer time* expires or the call will be terminated. The Model 40 will ring on the channel, and to the telephone for the specified *number of ringouts to be sent to the mobile*. Depending on programming, the mobile may be required to answer with COR, *, or *+ANI. If the mobile does not answer, the call is terminated. Once the mobile has answered, the *call limit* or the *extended call limit* timer and the *mobile activity* timer begin running. Each time the mobile keys up, the *mobile activity* timer is reset. If at any time the *mobile activity* timer expires, the call is terminated. Single warning beeps are sent every 3 seconds starting 12 seconds before the *mobile activity* timer expires. The 3-minute *call limit* or *extended call limit* timer may not be reset since this controls the length of the call. Double warning beeps are sent every 3 seconds starting 15 seconds before the call is terminated. To terminate the call, the calling party enters '#', and the mobile must enter either '#' or '#+ANI'.

If an auto-call user has been programmed, the caller may wait for the message or dial tone to expire plus the *DTMF timeout* time to expire. Once this has happened, the Model 40 will automatically call the user number that is programmed.

Telephone-to-Tone-Only Pager Calls

To call a tone-only pager, the calling party follows the same procedure as for a telephone-to-mobile call. The difference is that the caller will hear one ring while the paging tones are going out over the channel, then the caller will hear a series of tones imitating the pagers alert tones. The call is then disconnected automatically.

Telephone-to-Tone-and-Voice Pager Calls

To call a tone-and-voice pager, the calling party follows the same procedure as calling a tone-only pager. Instead of sending "pager like" tones to the calling party, the Model 40 will send a "talk" beep to the caller. Once the beep is heard, the caller may begin speaking, and the message is transmitted over the air. The message may be up to the *pager talk time* in length or until VOX detection drops for 3 seconds. When the talk time has expired, the Model 40 sends two "stop" beeps to the caller and terminates the call.

Telephone-to-Talkback Pager Calls
The caller first gains access to the Model 40. Once the user number or ANI has been entered, the caller will hear one ring while the paging tones are being sent, followed by the "talk" beep. The caller's voice is transmitted over the radio channel, and the talkback pager must answer the call within the specified *mobile answer time*. The call then progresses as if the caller is calling a mobile.

Telephone-to-Direct Channel Access
The caller first gains access to the Model 40. Once the user number or ANI has been entered, the caller will hear a beep indicating he or she has accessed a channel. The call then progresses normally, provided the called mobile answers the call within the specified *mobile answer time*. Otherwise the call is terminated.

Mobile Originated Calls
Users may be allowed to make outgoing telephone calls, mobile-to-mobile calls, or repeat (dispatch) calls. If a mobile is only allowed to use one of these calling methods, the user simply keys the radio and enters '*' plus an ANI to gain access to the Model 40. If the mobile is allowed to choose any one of the three calling methods, the user must add a steering digit to the end of the sign-on sequence. The steering digits are as follows:

5 = access code for repeat (dispatch) mode
7 = mobile to mobile, pager, talkback, or direct channel calling
* or 9 = mobile to telephone

When entering digits, the ANI access speed must exceed 1 digit per second. In other words, each digit must be entered by the user within one second of the last digit, once the ANI entry sequence has been started.

In repeat mode, when the mobile unkeys, the Model 40 will transmit a short beep indicating that the mobile has obtained access to the repeater. The *mobile activity* timer and *call limit* or *extended call limit* timers take effect here and the call progresses until the mobile sends a disconnect sequence.

In mobile to mobile/tone-only pager/tone-and-voice pager/talkback/channel access mode, the user enters a sign-on sequence and dial tone is heard. The user now enters the ANI or user number of the mobile to be called. The call now progresses exactly as though the mobile caller is a telephone caller.

In the mobile-to-telephone mode, the mobile user enters the sign-on sequence and the telephone is taken off-hook. Telephone audio is passed to the transmitter, and the mobile begins to dial. If a mobile doesn't have 'toll restrict' enabled, the user may dial any telephone number. If a mobile is toll restricted, the user may only call local, non-toll numbers (see section on toll restriction). If a mobile is '0+' toll restricted, the user may only dial local non-toll calls and '0+' credit card calls. If a mobile is not toll restricted, any DTMF received from the mobile will be regenerated by the Model 40. The mobile must key up before the *mobile activity* timer expires, or the call will be terminated. Single beeps every 3 seconds starting 12 seconds before the *mobile activity* timer expires will

be sent to both the mobile and the telco. The *call limit* or *extended call limit* timers CANNOT be reset. Once the timers expire, the call is terminated. Double beeps every 3 seconds starting 15 seconds before the timer expires will be sent to both the mobile and the telco. The call is terminated from the telco side using a '#', or from the mobile side using either a '#' or '#+ANI' depending on the user's disconnect sequence.

DISCONNECT TONES

In all cases, when the call is terminated, termination beeps are sent to both the telephone and mobile. The termination beeps are different depending on the type of termination that is executed. Most of the time, 5 short 50-millisecond beeps will be heard; this indicates that either the mobile disconnected the call, or one of the timers expired (either call limit or mobile activity). When the telephone party disconnects the call with a '#', a long single tone will be sent to the telephone and mobile. If the call is terminated by the Model 40 because it detects a busy signal, 3 fast busy tones are sent to the mobile. These diagnostic tones allow the user to determine the source of the disconnection.

Event	Tone sequence
Phone party disconnects call with #	Long tone
Mobile disconnects call	Five fast beeps
Mobile activity timer expires	Five fast beeps
Call limit timer expires	Five fast beeps
Busy tone terminates call	Three fast busy tones

HOW THE MODEL 40 KNOWS WHAT A MOBILE IS DIALING

The Model 40 pays close attention to the dialing digits received from the mobile. It knows that area codes must contain either a 0 or a 1 as a second digit, and that prefixes may not contain 0 or 1 as a second digit. Knowing this and looking at the first digit entered, the Model 40 can tell when a '1+' call, a '1 + area code' call, a '0+' call, or a '0 + area code' call is made. Any '1+' call is considered long distance. Any '0+' call requires the user to enter at least 10 digits as a credit card number within 30 seconds, or the call is terminated. Note that if pulse dialing is selected, credit card numbers are regenerated into the telephone line using DTMF, while the actual called phone number will be pulse dialed. If a user dials '0' (operator) they must enter more digits within the *DTMF timeout* time or it is assumed that the user is attempting to make a toll call. When '1+ area code' calls are detected, '1-800' is considered a non-toll call. When local calls (non 1+) are made, the system operator may opt to have the Model 40 look up the prefixes in a table. In some areas, toll calls may be made without first dialing a "1". The Model 40 has a 1000-number prefix table that keeps track of every possible prefix, and based on programming, it knows when a user is attempting to make a toll call. Emergency 911 calls are always allowed.

Once a call is in progress, the Model 40 will regenerate received DTMF. If the Model 40 detects a busy tone sequence during the first 20 seconds of the call, the call will be terminated.

PBX OPERATION

PBX operation is similar to normal dialing. Up to 4 digits may be entered as PBX outside line prefix digits. If the first digit dialed by the mobile matches one of these digits, the Model 40 regenerates that digit into the telephone line and starts watching the telephone number just as it does for standard lines. If the first digit does not match one of the PBX prefix digits, the Model 40 skips past the dialing (as if the user were finished dialing) and just allows regeneration. This permits internal calls to be placed.

NOTE: If a user has toll restriction enabled, he or she will NOT be able to dial a local extension on the PBX because DTMF regeneration is not allowed to toll restricted users.

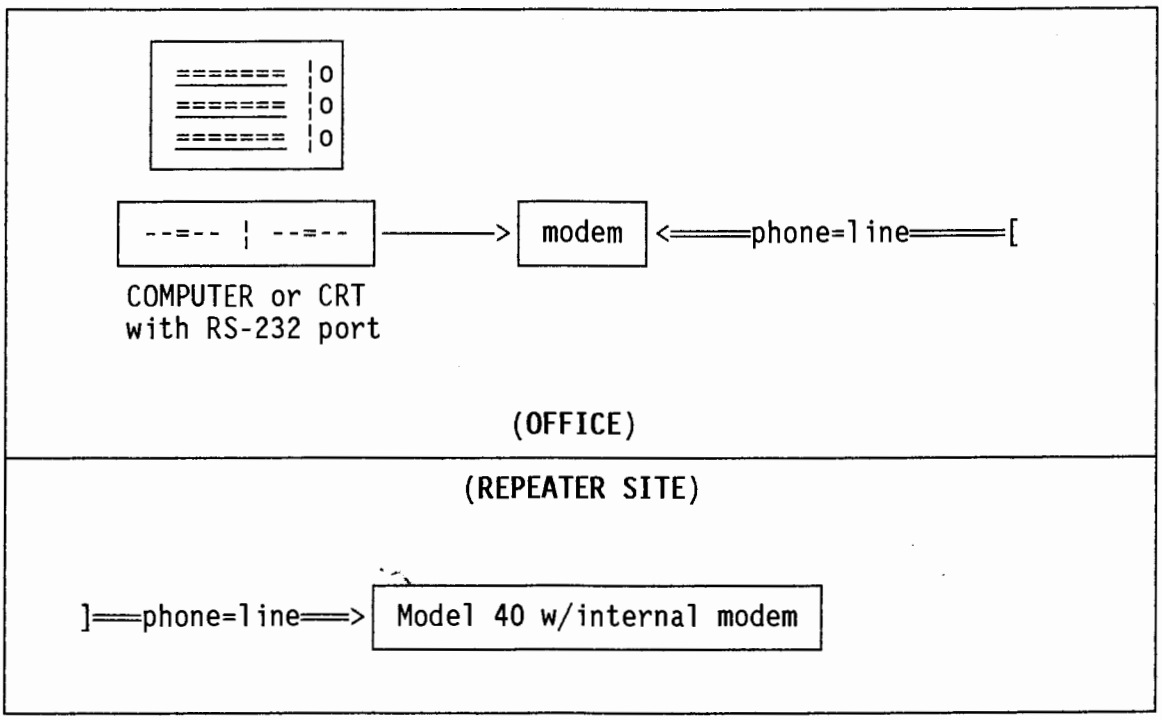
4. PROGRAMMING

PROGRAMMING THROUGH THE RS-232 PORT OR MODEM

RS-232 Programming Interface

The Model 40 RS-232 port is valuable for initial test and adjustment, as well as general purpose programming and monitoring. All programming is done with friendly menu driven prompts, all in plain English (or optionally Spanish). The programming is done with an RS-232 display terminal. Most any RS-232 terminal or computer running a communications program may be used. If using an IBM PC or compatible, Zetron can supply a communications disk to aid programming.

The Model 40 may be connected directly to an RS-232 terminal or computer when the equipment is co-located. When this is not possible, the Model 40's optional internal modem may be used.



See the Installation Section for further details on connections.

XON / XOFF Protocol

The Model 40 follows "XOFF/XON" protocol. This sequence prevents data from flowing too rapidly for the display device (printer/terminal) or host to assimilate. If the Model 40 receives an "XOFF" code (Control S), the data output will pause until an "XON" code (Control Q) is received.

RS-232 Buffer

The serial data port has a "type-ahead" buffer to allow the input to get ahead of the printout. This feature should be used with caution since the operator cannot see the results of an input command immediately. The buffer does allow faster programming once the operator becomes accustomed to it.

Serial Interface Connections

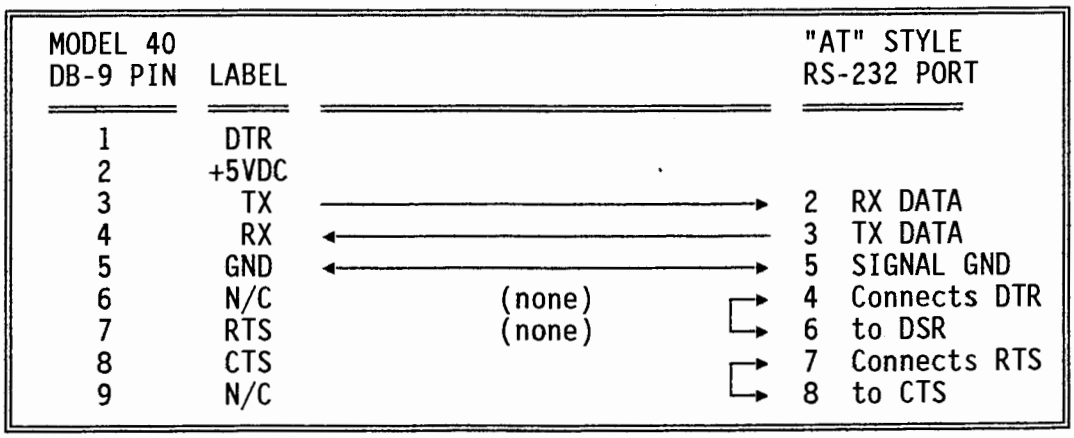
The computer/CRT port on the Model 40 is compatible with RS-232C signals and uses an asynchronous ASCII serial communications protocol. Only three wires need to be connected from your terminal to the Serial-I/O connector on the Model 40: Pin-3, (Txdata) Pin-4 (Rxdata) and Pin-5 (GND). Set the terminal for 8 bits per character, no parity bit, and 1 stop bit (see the reference manual for the terminal you are using). The Model 40 defaults to 4800 baud. To change the baud rate, use the DTMF programming commands (programming section). If nothing happens, try reversing pins 2 and 3 at the 25-pin connector on your terminal.

INTERNAL CIRCUITRY	PIN	LABEL / FUNCTION
Ground	1	Ground
Ground	2	Ground
——————————>	3	Txdata (transmit data)
<——————————	4	Rxdata (receive data)
Ground	5	Ground
+12VDC fused ——>	6	+12 VDC unreg supply for external use
M38/M39 CTCSS input	7	Gated M38/M39 CTCSS input
M38/M39 TX audio in	8	Gated M38/M39 Tx audio input
M38/M39 PTT input	9	Not used

Typical Connection to a CRT or Video Terminal

MODEL 40 DB-9 PIN	LABEL	CONNECTION	CRT TERMINAL DB-25 PIN
3	Txdata	———> to CRT "Rxdata"	3
4	Rxdata	<——— from CRT "Txdata"	2
5	Ground	<———> to CRT signal ground	7

Typical Model 40-to-computer (with 9-pin port) serial connections are shown below.



When programming using a dial-up telephone modem, either 300 or 1200 baud may be used. The Model 40 will automatically switch to the proper baud rate when it answers the call.

The Model 40 incorporates a menu structure, each menu containing groups of parameters that relate to each other. To locally enter the program mode, simply press ENTER. To remotely enter the program mode, instruct the terminal software on the PC to dial the Model 40 (for example, if the phone number is 1234567, using a Hayes modem, type 'ATDT 1234567;'). When you hear the dial tone (or voice prompt), instruct the terminal software to dial the access code (using a Hayes modem, type 'ATDT 0012123' or insert the new program access code). After a brief burst of tone, the modems will connect and the modem will respond with a 'CONNECT' message. Now press ENTER.

A list of statistics will appear, these will be described later in the diagnostics menu.

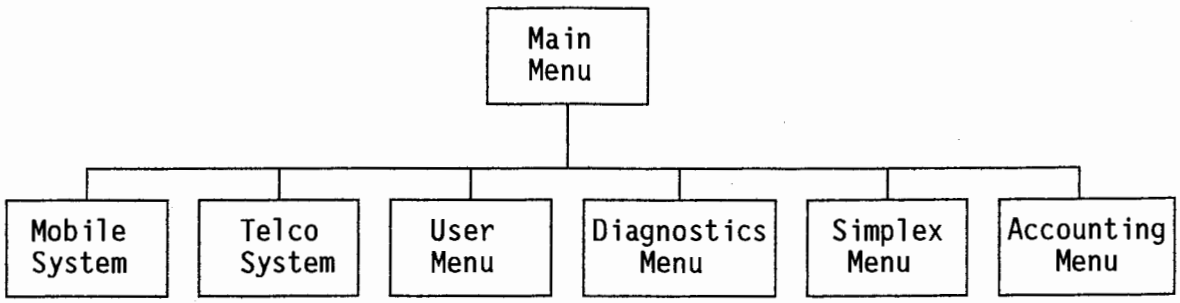
MAIN MENU

The following menu will appear:

```
        - M A I N   M E N U -

1 - Mobile system        4 - Diagnostics
2 - Telco system         5 - Simplex
3 - Users                6 - Accounting
E - Exit
```

The Model 40 has 7 menus; the Main Menu, and the 6 menus listed above. They are arranged as follows:



You may enter one of the lower menus by typing the associated number and pressing ENTER. To leave the menu and return to the Main Menu, type 'E' and press ENTER. Leaving the Main Menu exits the RS232/modem programming mode and returns the Model 40 to its normal operating mode where calls may be placed.

Each menu has related commands in it. For example, the User Menu has all of the commands associated with individually programming users, while the Mobile System Menu has all of the commands that affect the system as a whole.

Depending on the command that is executed, there are two ways that you can enter data into the Model 40; either directly entering the data (for string or numeric parameters) or by 'scrolling' options using any key and selecting using the ENTER key. The Model 40 will indicate what method it requires for entry.

When changing numerical (timing) parameters the Model 40 will indicate the range of values it will accept. If the entered data is out of range, the Model 40 will beep, erase the entered data and wait for new input. Pressing ENTER without entering any data will not change the current value. At any time, simply pressing ENTER will re-display the entire menu.

If you are programming via the local RS232 port, the Model 40 will reset and return to its normal operating mode if there is no keyboard activity for 10 minutes. This is a safety feature that keeps the Model 40 operating even if a mistake is made. When programming the Model 40 with a modem, loss of carrier will force the Model 40 to exit the programming mode and return to the normal operating mode.

PROGRAMMING USING DTMF

It is advised that the Model 40 be programmed using a modem or through the local RS232 port. If many users are added, DTMF programming has no way of easily programming a range of users, nor does it have the ability to display helpful information. DTMF programming should be used to make minor changes to the system quickly over the radio or over the telephone. Without the ability to communicate with the Model 40 via RS232 or a modem, you also have no way of backing up your user database and system programming. Therefore, if you have a problem (lightning strike, etc.) and have to install a new unit, or replace memory, you will lose ALL of your programming, and it will all have to be reprogrammed by hand using DTMF!

To program the Model 40, the program mode access code must first be entered. The code is a 7-digit sequence of which the first two digits are fixed (not user selectable). The code is 00nnnnn where nnnnn can be set by the user. The access code is 0012123 as shipped from the factory. You can enter the program access code over the radio channel or by calling the Model 40 and entering it when you hear dial tone.

If you have ordered the modem option and are programming the Model 40 using a telephone, after the access code has been entered a modem tone will be sent to the telephone line. During the modem carrier tone, you may skip modem programming by pressing a couple of DTMF digits. When the Model 40 detects the DTMF, it will halt the modem tones and allow DTMF programming.

The procedure for programming the Model 40 over the air is the same as for programming over the telephone.

There are two formats for entering commands. In either case, you will need to enter the command number followed by a '#'. The Model 40 will send you dual beeps indicating that it wants more data. If you are programming user information, you will need to specify the user number (1-99) followed by a '#'. The Model 40 will send back dual beeps again indicating that it is now ready for the data to program. Enter the data followed by '#'. The Model 40 will send back 5 beeps indicating it is finished and waiting for another command. If the data you entered was incorrect, the Model 40 will send back error tones (high/low sequence) and will abort the command.

Although you cannot program a range of users, you may program ALL users by entering '00' as the user number.

After 60 seconds of inactivity, the Model 40 will exit the DTMF programming mode and return to its normal mode of operation.

The Reference Section at the back of this manual contains an alphabetical listing of all of the commands, and a description of each including how to program it and what other features affect or are affected by this command. If you are unsure about what a command does, consult the Reference Section.

5. FEATURE SET REFERENCE

5. FEATURE SET REFERENCE
Features Organized by Menu

This section describes each feature the Model 40 in detail. The purpose of the feature, how it is used, and how to program it are included. The features are listed in alphabetical order for easy reference.

ADD/DELETE PREFIX

In some areas the telephone company has added 'non 1-plus' dialing. 'Non 1-plus' calls are toll calls that have normal 7-digit telephone numbers. For example, in most areas callers have to dial 1-820-6363 in order to make a long distance call within the area code, but in 'non 1-plus' areas, the call is placed just by dialing 820-6363. This means the only way to toll restrict a user, is to know all the telephone number prefixes which are toll calls. The Model 40 uses a 1000-prefix (all possible prefixes) table to determine which prefixes are long distance calls. It will not allow calls to restricted prefixes if the user is toll restricted.

The Model 40 has a table of restricted numbers, so you must add a prefix to restrict it from being dialed, or delete the prefix to allow it to be dialed. To make changes to the table by DTMF programming, you must tell the Model 40 what prefix you want to alter, and whether to add or delete it from the restricted table. In serial or modem programming, there are separate commands for adding and deleting prefixes.

The Model 40 defaults to 'no restricted prefixes' so you won't need to use this command unless you have the ability to make 'non 1-plus' toll calls.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 25# (beep beep)
Enter: [3-digit prefix to alter] # [0=delete, 1=add] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear.

To add a prefix, type '15' and press ENTER. You will be prompted to enter the prefix to add, do so and press ENTER. It will then prompt you again since it is likely you will need to restrict many prefixes. The Model 40 allows you to add prefixes in bulk. When you are finished adding prefixes, press ENTER.

To delete a prefix, type '16' and press ENTER. You will be prompted to enter the prefix to delete, do so and press ENTER. The Model 40 also allows you to delete prefixes in bulk. Keep entering prefixes to delete and press ENTER when you're finished.

During serial or modem programming, you may view the 'added' prefixes at any time by typing '17' followed by ENTER. The prefixes that are in the table (those that are restricted) will be displayed in columns.

ANI ACCESS CODE

Before a user may sign on using a mobile or portable, an ANI (Automatic Number Identification) access code must be assigned to the user. A user may sign on with only a * if the user's ANI access code is set to 0 - a short sign on. This code provides access to the interconnect. Without it, a user cannot make or receive calls.

When accessing the Model 40, a '*' must precede the ANI access code to alert the Model 40 of the forthcoming ANI access code. It isn't necessary (or possible) to program in a '*' when you are assigning an ANI access code. Since it is required of all users, the Model 40 programs it for you. Also, once the ANI access code has been sent to the Model 40 to gain access, the user may need to add an additional digit called the "steering digit". This extra digit is used to tell the Model 40 what function to perform; '*' or '9' for access to the telephone line, '7' for mobile-to-mobile calls, and '5' for mobile repeat.

If a user in the database only has the ability to perform one function (there are 3 questions regarding what a user may do) there is no need to enter a steering digit, just a '*' and the ANI access code will give the user access that function. For example, if a user has been assigned an ANI access code of '123', and that user only has the ability to make mobile-to-telephone calls, he would simply have to send '*123' to get access to the telephone line. If the same user has the ability to make mobile-to-telephone calls, and mobile-to-mobile calls, he must send '*1239' (or *123*) to get access to the telephone line, or '*1237' to make a mobile-to-mobile call.

If the 'answer type' for a user is set to '*+ANI', the user must send '*' and his ANI access code to answer a call. Likewise, if the 'disconnect type' is set to '#+ANI', the user must send '#' and his ANI access code to terminate a call. This may seem unnecessary, but by requiring the correct ANI access code for answering and disconnecting, only the correct user may answer a call or disconnect a call. On systems that only require COR or '*' to answer, any user may answer or terminate a call.

Application Note: When using a Model 38 or Model 39 Repeater Panel, a user's ANI access code may be required to be accompanied by a CTCSS or DCS code. Use the 'CTCSS/DCS decode' command to set the tone/code that must accompany the ANI access code. The decoded CTCSS/DCS validates the access, disconnect, and answer sequences. Note that even if a user is set to answer with COR, and a CTCSS/DCS code has been programmed, the correct CTCSS/DCS code must be decoded by the Model 38 or Model 39 or the mobile will not be allowed to answer.

How to program it:

When you enter an ANI access code, the Model 40 compares it to all of the others in the database. If there is a match, the Model 40 will give you an error signal (error tones if DTMF programming, a message if serial or modem programming). A match does not necessarily mean an exact match.

Subsets of ANI access codes are not allowed to be programmed into the Model 40. This means that if you have an ANI access code of 12345678, you

cannot have any of the following ANI access codes; 1, 12, 123, 1234, 12345, 123456, or 1234567. You can see from the above example, that when a mobile starts entering 12345678, after the first digit 1, there is already a match. So, whenever the users with 1, 12, 123, 1234, 12345, 123456 and 1234567 try to sign on, the user with the ANI access code of 1 will get billed for the calls. Also, that user's tone and selective signaling will apply to the others. To keep this from happening, the Model 40 will not allow you to enter all of those subset ANI access codes, it will give you an error signal instead.

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 51# (beep beep)
Enter: [user number] # (beep beep)
Enter: [up to 8 digits of ANI access code] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER, and the User Menu will appear. Select the correct menu item by typing '3' and pressing ENTER. The current ANI access code will appear along with a message instructing you to enter the new ANI access code. Enter the new ANI access code and press ENTER when you have finished.

By default, there are no ANI access codes in the user database.

ANSWER TYPE

When a call is placed, the Model 40 must have a way of knowing when the user has answered the call. This is set by the 'answer type' command. There are three ways the user may answer the call; carrier, '*', and '*+ANI'. When set to carrier, the user simply keys his radio to answer the call. When set to '*', the user must key his radio and press a DTMF '*' to answer the call. Using '*+ANI' requires the user to key his radio and send a '*' followed by his ANI access code to answer the call.

Application Note: When using a Model 38 or Model 39 Repeater Panel, the users may have 'CTCSS/DCS decode' enabled. This will require the proper CTCSS or DCS tone/code to be decoded before any type of answer is allowed. For example, if a user is set to answer with carrier and has a decode tone, the Model 40 won't answer with carrier only; the correct CTCSS must also be decoded by the Model 38 or Model 39. Using CTCSS or DCS adds additional security to your system.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 54# (beep beep)
Enter: [user number] # (beep beep)
Enter: [answer type] # (beep beep beep beep beep)

The answer type may be any of the following:

0 = carrier
1 = *
2 = *+ANI access code

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Type '6' followed by ENTER and the current 'answer type' will be shown along with a message instructing you to press any key to change the data, and ENTER to accept the data. Each time a key is pressed, the answer type changes. Once the answer type you desire is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to '0', carrier to answer, for all users.

AUTO-CALL USER

When the Model 40 answers the telephone, it generates dial tone and waits for the caller to enter a user number, a user ANI, or the program access code. The dial tone is generated for 4 seconds. During the dial tone, the caller may begin entering DTMF digits. As soon as a DTMF digit is received by the Model 40, it will stop generating dial tone, and wait an additional 2 seconds for a DTMF digit. Once the first DTMF digit is received, the Model 40 will allow the specified 'DTMF timeout' between digits before sending error tones to the caller.

The Model 40 can be programmed to automatically call a user even if the caller does not enter any DTMF digits. This is so inexperienced callers can call a user without having to know that they must enter a user number or ANI. They simply call the Model 40, and after the dial tone and 2 seconds of silence, they will hear ringing. The user that is automatically called is referred to as the 'auto-call user'. The auto-call user may be any user from 1 to 99, and entering 0 as the auto-call user will turn off the feature. When the auto-call feature is off, the Model 40 will terminate the call if no entry is made.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 22# (beep beep)
Enter: [user number for auto-call] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER and the Telco System Menu will appear. Select the correct menu item by typing '5' followed by ENTER and the current setting for the auto-call user will appear along with a message instructing you to enter the new value and a range of the values you may enter. Enter the new user number and press ENTER when you have finished.

The auto-call user defaults to 'off' (0), but may be programmed with any user number from 1 to 99.

AUTODIALS

When making a mobile-to-telephone call, the Model 40 will pick up the telephone and allow the dial tone to go out the transmitter. The user enters the telephone number he wishes to call, and the call proceeds. If however, the same telephone number is used frequently, it is convenient to shorten the entry of the number. This is what the 'autodials' do. The Model 40 can store 10 autodials of up to 16 digits each. Instead of entering the telephone number, the user simply enters a '*' and 0-9 for the desired autodial number. The Model 40 will send beeps to the user as it dials the telephone number.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 4x# (beep beep)
Enter: [up to 16 digits] # (beep beep beep beep beep)

Note that the autodials are numbered 0 through 9. The DTMF programming commands are 40 through 49 for programming them, so for the '4x' listed above, replace the 'x' with the autodial number you wish to program.

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER and the Telco System Menu will appear. Select the correct menu item by typing '1x' followed by ENTER, where 'x' is the autodial number from 0 to 9. The current telephone number will appear along with a message instructing you to enter the new telephone number. Enter the new telephone number, and press ENTER when you have finished.

Application Note: When you are programming the autodials from the modem or RS232 port, you can put any characters into the autodials that you wish. Only the numbers 0-9 will get dialed. This is useful for adding text to local telephone numbers (i.e. '820-6363 Zetron' could be entered). This is also useful for making the numbers look more like telephone numbers. For example, you can enter a telephone number as '1 (206) 820-6363' which is much easier to read than '12068206363'. Note that there are still only 16 characters of space per autodial, even with the extra text characters.

There are no autodials programmed from the factory.

BAUD RATE SELECT

When you want to program the Model 40 using the local serial port, you will need a terminal or a computer that is running communication software such as ZCU (Zetron Communication Utility). For the Model 40 and the computer or terminal to communicate you will need to specify to the Model 40 and the computer how to send and receive characters. Set the terminal or computer to communicate with 8 data bits, 1 stop bit and no parity (see your terminal or software manual). Once you have specified these communication parameters in the terminal or computer you must set the baud rate. The baud rate is the number of bits per second that the information is sent and received. There are 10 bits per character (a character is any number or letter that you can type on your keyboard) so 300 baud is about 30 characters per second and 4800 baud is about 480 characters per second. You can easily see the differences on your screen when you download SMDR records or system programming. We suggest you set the speed to the maximum value for your terminal or computer.

Once the baud rate of the terminal or computer is set, the same baud rate must be specified in the Model 40 using the 'baud rate select' command. The Model 40 is capable of communicating at 300, 1200, 2400, 4800, 9600 and 19200 baud.

NOTE: The baud rate only affects local programming through the RS232 port (DB-9 on the back), it DOES NOT change the operating speed of the modem. The Model 40's modem will operate at 300 or 1200 baud only, and it will automatically determine the speed at which to operate when you call it from another modem.

Application Note: If you connect a Model 38 or Model 39 Repeater Panel to the Model 40, you must also specify the correct baud rate in the Model 38 or Model 39, because the Model 38 or Model 39 sends the decoded CTCSS or DCS to the Model 40 through the RS232 port. If you are having problems with the Model 40 allowing access and you have users programmed with CTCSS or DCS decode, double check the Model 38 or Model 39's baud rate.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 26# (beep beep)
Enter: [new baud rate] # (beep beep beep beep beep)

The baud rate is set by entering one of the following numbers:

0 = 300 baud	3 = 4800 baud
1 = 1200 baud	4 = 9600 baud
2 = 2400 baud	5 = 19200 baud

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER to get the Mobile System Menu. Once in the Mobile System Menu, item 12 is the 'Local port speed' (baud rate). Type '12' and press ENTER, and the current local port speed will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the baud rate changes. Once the desired baud rate is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default local port speed or baud rate is set at 4800 baud.

CALL CODE

Systems that have many users require a method for selectively calling a single user. Also, systems with pagers that share a channel require selective signaling to set off the pagers. The Model 40 can selectively signal using DTMF, 2-tone or 5-tone signaling. Each is different and each requires a different type of decoder. You may use more than one format in the system (some users could have 2-tone while others have DTMF). The 'call code' indicates to the Model 40 how to send the proper tones to call a particular user. The type of signaling is set with the 'call format' command (i.e. DTMF, 2-tone, 5-tone) and the call code or cap code is set using the 'call code' command described here.

DTMF Signaling

DTMF call codes are entered just the way they are to be sent. For example, to send 12345, simply enter 12345 into the call code. The signaling speed is fixed to 10 digits per second.

Two-tone Signaling

Two-tone call codes are a little more complicated since you must specify the timing, the code plan, the tone block, and the tones to send. The format for entering a 2-tone call code is:

```
TCCABCX:    T = Timing (1-8 Appendix, page 10-3)
            CC = Codeplan (1-24 Appendix, page 10-2)
            A = Tone block (0-9 Appendix, page 10-2)
            B = Tone A (actual first tone sent)
            C = Tone B (actual second tone sent)
            X = 0=Group, 1=Diagonal A, 2=Diagonal B
```

The timing is determined from the 'Two-Tone Timing' table in the Appendix and specifies the timing for the particular type of signaling. The codeplan is from the 'Two-Tone Codeplans' table, and determines the column in which the tone set is located. The tone block is the actual entry (row) in the codeplan column to determine the sets of tones to be used for Tone A and Tone B. Tone A and Tone B are the actual tones in the 'Two-tone Tone Groups' table.

For example, let's say you had a pager that you knew was set up for standard timing (1 second "A" tone, 0 gap, 3 second "B" tone, and 8 second group calls), and had an "A" tone of 953.7 Hz followed by a "B" tone of 767.4 Hz.

We can find the timing in the table in the Appendix and it is "1". Finding the tone numbers is a little less direct. First we look up the tones themselves in the table on page 10-1 of the Appendix, and we find that 953.7 Hz is tone number 5 in group number 3, and 767.4 Hz is tone number 6 in group number 5. We now know that we want to send our "A" tone from group 3 and our "B" tone from group 5. The next step is to look in the Codeplans table on the next page and find a codeplan that has a block in which group 3 is followed by group 5. If you look in code plan 11 (column marked MOT N) and scan down to the 800 block (the horizontal row marked 8xx), you will see the notation "3+5" at the intersection, so the 8xx block of codeplan 11 suits our needs. We can now

construct the call code consisting of timing, codeplan, block within a codeplan, and tone numbers. That is: 1 + 11 + 8 + 5 + 6 .

The 'X' in the call code is used when the two tones are the same. You can see that if you were to use a cap code of 106333 the codeplan is 3+3 (column 06, row 3 of the 'Two-tone Codeplans' table) and that both tone A and tone B use row 3 in the 'Two-tone Tone Groups' table which is 304.7 Hz. This creates a problem because the Model 40 would send out two of the same tones and, without a gap, would appear to be a single long tone. There are three ways to remedy this situation; make it a group call, replace tone A with the diagonal tone, or replace tone B with the diagonal tone. By entering 0 for 'X', the call will be made a group call and will use the 'Group Call' timing from the 'Two-Tone' Timing table (in this case 8 seconds). If you don't want a group call, you can select the diagonal tone (which is found at the bottom of the 'Two-tone Tone Groups' table) to replace tone A or tone B.

For example, a cap code of 106333 presents such a problem. We can make it a group call by adding a 0 to the end of it (1063330). But if we want to call a pager, we must check to see in which place the pager expects to find the diagonal tone (either tone A or tone B). If it requires it to be in tone position A, then we would add a 1 to our call code (1063331) and the tones going out would be 569.1 Hz (diagonal from column 3) and 304.7 Hz. By putting a 2 after the call code, we can elect to have the diagonal go in the tone position B. Then 304.7 Hz would go out followed by the diagonal 569.1 Hz. The 'X' digit is only required when the codeplan numbers 'x+x' are the same, and the tone A and tone B digits are the same.

Five-tone Signaling

The five-tone formats are easier to use than the Two-tone format. The format for a five-tone call code is:

P12345X: P = Preamble (optional)
1-5 = Capcode (digits 0-9)
X = Second address (1=No address, 2=2nd address)

The Model 40 supports 3 five-tone formats, EIA, CCIR and ZVEI. The tones and timing are different for each; refer to the Appendix for a list of the individual tones and timings. Programming the call code is identical however.

Some pagers have battery-saving modes from which they need to be "waken up". The pagers "sleep" for some period of time and then wake-up and look for a tone. If the tone is not present, the pager goes to sleep again. If the tone is there, the pager stays alert and listens for signaling tones to appear. The preamble is the "wake-up" tone and is always 690 milliseconds long with a 65 millisecond gap between it and the signaling tones. Once the preamble has been transmitted, all pagers will be listening. The preamble is optional because not all systems require it, including mobiles equipped with decoders.

The actual cap code is programmed using 5 digits, each of which is a number from 0 to 9, and each represents one tone (in the 5-tone format). Simply enter the call code of the mobile or pager. Normally with five-tone, there

is a repeat tone that is used when the call code requires two or more digits in a row that are the same. For example, the call code 13356 would send what appears to be 4 tones because the second and third tones (33) are the same. To compensate for this, the repeat tone is used in place of the duplicated digit. So, with a call code of 13356, and the EIA format, the following tones will be sent: 741, 1023, 459, 1305, 1446. If you are looking at the 'Five-tone Groups/Timing' table, you will notice that there is no way of entering the repeat tone. This is because the Model 40 knows that the call code has duplicated numbers in it and when it pages, it will substitute the repeat tone automatically. For example, on a call code of 33333, the following tones will be sent by the Model 40: 1023, 459, 1023, 459, 1023, but you only enter 33333 and the Model 40 will substitute the repeat tone.

You must however, notify the Model 40 of the 'X' tone. You instruct it either not to call the second address (1) or to call the second address (2). This is used for 2 address pagers, and when the second address is specified, the 'X' tone will be sent as a sixth tone. The Model 40 uses the number of digits in the call code to determine whether or not a preamble is sent. If there are 6 digits in the call code, it knows there is no preamble. Seven digits indicate that there is a preamble. This is why you must always enter the last digit.

Note that if you use 2-tone or 5-tone signaling, and you enter an invalid call code, the Model 40 will not send the signaling, but skip to ringing. So if you put in a user with selective signaling, and the Model 40 does not signal that user, check the call code and the selective call format to make sure you have entered a valid combination.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 52# (beep beep)
Enter: [user number] # (beep beep)
Enter: [call code] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER and the User Menu will appear. Select the correct menu item by typing '5' followed by ENTER. The current call code will appear along with a message instructing you to enter the new call code. Enter the new call code and press ENTER when you have finished.

By default, none of the users have call codes.

CALL FORMAT

The 'call format' is used to specify the type of selective signaling to be used when calling a particular user. The Model 40 supports DTMF, two-tone, and five-tone signaling. The call format command also specifies the timing and tone set for five-tone signaling, but not for DTMF or two-tone. DTMF timing is fixed at 10 digits per second, and the two-tone tones and timing are set using the call code command.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 53# (beep beep)
Enter: [user number] # (beep beep)
Enter: [call format] # (beep beep beep beep beep)

The call format may be any of the following:

0 = No selective signaling
1 = 2 tone
2 = DTMF
3 = EIA five-tone
4 = CCIR five-tone
5 = ZVEI five-tone

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Type '4' followed by ENTER and the current call format will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the call format changes. Once the call format you desire is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will 'wrap' around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to 0, no selective signaling, for all users.

CLEAR ALL USERS' ACCUMULATED AIRTIME

The Model 40 keeps track of each user's accumulated airtime. It is displayed at the bottom of the User Menu and can be cleared with the 'clear all users' accumulated airtime' command. This command can only be executed from the RS232 or modem programming; if you cannot see the airtime, there is no point in being able to clear it. This command is different from the 'reset airtime accumulation' in the User Menu in that this command will clear everyone's airtime accumulation, and the 'reset airtime accumulation' will only clear the current user's airtime.

Note that for users with tone-only or tone-and-voice pagers, the accumulated time is not 'time', but rather 'number of pages'. This command clears the number of pages also.

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER and the Accounting Menu will appear. Type '2' followed by ENTER and the Model 40 will prompt you for confirmation. Type 'Y' followed by ENTER and all users' airtime will be cleared.

CLEAR CALL DETAIL STORAGE (SMDR)

The 'call detail storage' will only hold 999 records and must be downloaded before it is filled. If the SMDR records are not downloaded, additional calls after record 999 will be lost. Once you have downloaded the SMDR records, you need to clear the call detail storage. Use this command to clear the SMDR storage. You must enter '54321#' to confirm that you really want to clear the SMDR storage. If by chance you do clear the 'call detail storage' in error, you can use the 'SMDR oops!' command to undo the erasure. The 'SMDR oops!' command will only work if there haven't been any entries into the call detail storage between the time you cleared it and the time you are attempting to restore it.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 120# (beep beep)
Enter: [54321] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER to get the Accounting Menu. Type '4' followed by ENTER and the Model 40 will prompt you to confirm you want to clear the call detail storage. Type 'Y' and press ENTER to clear the call detail storage.

COR HOLD TIME

The 'COR hold time' controls the sensitivity of the carrier detector and affects all of the simplex modes. This setting determines how quickly the Model 40 will flip to the telephone side of the conversation after seeing carrier drop. Setting the COR hold time longer, desensitizes the carrier detector and makes the Model 40 wait longer before checking the telephone line for voice. Setting the COR hold time shorter makes the carrier detector more sensitive and causes the Model 40 to switch over to the telephone sooner.

If the COR hold time is set too long, the conversation will slow down because it takes longer to switch to the telephone caller. If it is set too short, then the audio will be broken up when the mobile picket-fences or fades.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 32# (beep beep)
Enter: [new COR hold time 0-99] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '5' and press ENTER and the Simplex Menu will appear. Select the correct menu item by typing '3' followed by ENTER. The current setting for the COR hold time will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default is no COR hold time and may be set from 0 seconds to 0.99 seconds in 10-millisecond increments.

CORDLESS TELEPHONE MODE

'Cordless telephone mode' allows the Model 40 to selectively signal and ringout to a user that has been programmed, without answering the telephone. This makes the Model 40 act like a high-performance cordless telephone. When the Model 40 detects ringing, it begins counting the rings. Once the number of rings exceeds the specified 'rings to answer', the Model 40 keys up, sends the selective signaling (if programmed) and begins ringing on the channel, even though it has not answered the telephone. The telephone caller still hears ringing just as if he called another telephone. If the mobile answers the call, the telephone line is answered and the call progresses until someone hangs up.

If after 12 rings on the channel, the mobile still has not answered, the Model 40 will answer the call and allow normal operation such as programming, calling a mobile, etc. If the mobile does not answer, you will not be able to program it if it has been previously programmed for cordless telephone mode.

Application Note: The ability to operate in the cordless telephone mode is really quite useful. Using the cordless telephone mode, the Model 40 can share a telephone line like an answering machine does. You can set the 'rings before answer' to 4 rings for example, and if you are in the office you can pick up the telephone and answer the call. If you are not in the office, the Model 40 will ring out to the mobile.

To put the Model 40 into cordless telephone mode, you must specify which user's programming to use when calling the mobile. By entering a user number of 0, you turn off the cordless telephone mode. No matter how the Model 40 is programmed, it treats the cordless telephone mode user as a mobile. You can't call a pager (for example) because the pager can't answer to tell the Model 40 to pickup the ringing telephone line.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 19# (beep beep)
Enter: [user number for cordless telephone mode] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER, and the Telco System Menu will appear. Select the correct menu item by typing '4' followed by ENTER. The current setting for the cordless telephone mode will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new mode (user number) and press ENTER when you have finished.

The default for the cordless telephone mode is 'off', and may be programmed with a user number from 1 to 99.

COURTESY TONE

A courtesy tone is a tone that is sent when the mobile unkeys during a conversation to prompt the telephone caller to begin speaking. The courtesy tone is a 1kHz tone with a duration of 50 milliseconds. It is enabled or disabled on a per user basis.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 64# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=off, 1=on] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main menu is on the screen, type '3' and press ENTER to get to the User Menu. Type '17' followed by ENTER and the current courtesy tone status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the courtesy tone status changes. Once the courtesy tone status you desire is displayed, press ENTER to set it. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to 0, courtesy tone 'off', for all users.

CTCSS/DCS DECODE

This command is only used when a Model 38 or Model 39 Repeater Panel is connected to the Model 40. Since any CTCSS/DCS tone/code may be assigned to any user number, the Model 38 or Model 39 must give the Model 40 the user number of the tone or code being decoded. The Model 40 compares this to the 'CTCSS/DCS decode' for the user that it is watching, and if they are the same, the Model 40 will allow the user to connect, disconnect and answer calls. Note that the number that is entered as a CTCSS/DCS decode is not a CTCSS tone or DCS code, but a number from the Model 38 or Model 39.

For example, if the CTCSS/DCS decode is set to 18, the CTCSS tone 123.0 must be decoded by the Model 38 or Model 39 for the Model 40 to allow connecting, disconnecting or answering of any call.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 57# (beep beep)
Enter: [user number] # (beep beep)
Enter: [CTCSS/DCS decode] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main menu is on the screen, type '3' and press ENTER and the User Menu will appear. Select the correct menu item by typing '9' followed by ENTER and the current setting for the 'CTCSS/DCS decode user' will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new CTCSS/DCS decode user number and press ENTER when you have finished.

By default, none of the users have 'CTCSS/DCS decode' enabled.

CTCSS/DCS ENCODE

The Model 40 has the ability to encode CTCSS or DCS during a call. The encode will be sent during the selective signaling and ringing. If the 'tone drop mode' is off, the CTCSS/DCS encode will continue to encode for the duration of the call. If the 'tone drop mode' is on, the CTCSS/DCS encode will cease when the mobile answers the call.

To program the CTCSS for encode, it is not necessary to enter the decimal point (i.e. enter 67 for 67.0 Hz, or 118 for 118.8 Hz), though you may if you wish. When programming DCS encode, start the code with a 9 and then enter the actual DCS code (i.e. 9023 for 023).

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 58# (beep beep)
Enter: [user number] # (beep beep)
Enter: [CTCSS/DCS encode] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER and the User Menu will appear. Select the correct menu item by typing '10' followed by ENTER. The current setting for the CTCSS/DCS encode will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new CTCSS/DCS encode and press ENTER when you have finished.

By default, none of the users have CTCSS/DCS encode enabled.

DISCONNECT TYPE

Once a call is in progress, the Model 40 must know when the user wants to terminate the call. The way the call is disconnected is determined by the 'disconnect type' command. There are two ways the user may disconnect the call; '#', and '#+ANI'. When set to '#', the user must key his radio, and press a DTMF '#' to disconnect the call. Using '#+ANI' requires the user to key his radio and send a '#' followed by his ANI access code to disconnect the call.

Application Note: When using a Model 38 or Model 39 Repeater Panel, the users may have CTCSS/DCS decode enabled. This will require the proper CTCSS or DCS to be decoded before any type of disconnect is allowed. For example, if a user is set to disconnect with '#' and has a decode tone, the Model 40 won't disconnect with a '#' unless the correct CTCSS is also being decoded by the Model 38 or Model 39. This insures that only the correct user will be able to disconnect the call.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 55# (beep beep)
Enter: [user number] # (beep beep)
Enter: [disconnect type] # (beep beep beep beep beep)

The disconnect type may be any of the following:

0 = #
1 = #+ANI access code

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Type '7' followed by ENTER, and the current disconnect type will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the disconnect type changes. Once the desired disconnect type is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to 0, '#' to disconnect, for all users.

DTMF TIMEOUT

There are two instances that the 'DTMF timeout' setting has an effect; when a mobile is dialing a telephone number, or, when either a mobile or a telephone caller is entering an ANI or user number to call a mobile. This is not to say that the DTMF timeout timer controls the speed that the mobile must sign-on with an ANI (that is controlled by a fixed 1-second timer), but rather the amount of time between digits when a mobile is already signed-on and making a mobile-to-mobile call. The reason for the DTMF timeout is to leave a path for the Model 40 to take in the event the user quits entering digits during telephone dialing or during ANI or user number entry.

Each time a new digit is pressed, the DTMF timeout timer is reset. The DTMF timeout timer sets the minimum speed that the digits must be entered. It is not the time to enter all of the digits, just the maximum amount of time between digits that is allowed without the call being terminated.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 09# (beep beep)
Enter: [new DTMF timeout 2-10] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '8' followed by ENTER. The current setting for the DTMF timeout will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default for the DTMF timeout is 4 seconds and may be programmed anywhere from 2 to 10 seconds.

EQUIPMENT TYPE

Because of the Model 40's flexibility, many types of equipment can be used on the same system. The Model 40 allows five 'equipment types'; mobile, tone-only pager, tone-and-voice pager, talkback pager (portable), and direct channel access.

Mobile
A mobile is simply a mobile radio the can receive and transmit. This is the most common equipment type used. When the Model 40 is called, the caller enters the user number or ANI, and then hears ringing until the mobile answers.

Tone-Only Pager
This is a pager that beeps when the correct sequence of tones are sent to it. It does not have the ability to transmit, or to receive audio. When the Model 40 is called, the caller enters the user number or ANI and hears simulated beeper tones indicating to the caller that the page has been sent.

Tone-and-Voice Pager
This is a pager that beeps when the correct sequence of tones are received and unsquelches to allow a voice message to be received. It does not have the ability to transmit. When the Model 40 is called, the caller enters the user number or ANI and hears a single beep indicating that he can speak his voice message. When the talk time expires, or the caller quits talking, double beeps are sent to the caller indicating that his time is up, and the Model 40 hangs up.

Talkback Pager
This is a portable radio that functions just like a tone-and-voice pager, but also allows the user to transmit to 'talk back' to the calling party. The caller enters the user number or ANI and hears a single beep indicating that he may speak. The user has the 'mobile activity time' to answer before the call is terminated.

Direct Channel Access
This is actually a mode, rather than an equipment type. When a user is called with direct channel access specified as his equipment type, the caller hears a beep, and an audio patch is automatically established so the caller can verbally alert the user. The caller has the 'mobile answer time' for a mobile to answer before the call is terminated.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 56# (beep beep)
Enter: [user number] # (beep beep)
Enter: [equipment type] # (beep beep beep beep beep)

The equipment type may be any of the following:

0 = Mobile
1 = Tone-Only Pager
2 = Tone-and-Voice Pager
3 = Talkback Pager
4 = Direct Channel Access

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Type '8' followed by ENTER and the current equipment type will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the equipment type changes. Once the equipment type you desire is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to '0', mobile equipment type, for all users.

EXTENDED CALL LIMIT TIMER

The Model 40 has two timers for determining the length of any telephone-to-mobile, mobile-to-telephone or mobile-to-mobile (not repeat, but mobile-to-mobile) call. There is the 'call limit timer' which is set to 3 minutes and cannot be changed. There is also a programmable timer called the 'extended call limit timer'. Each user may be programmed to use either the call limit timer or the extended call limit timer. If the extended call limit timer is enabled for a user, then it will be used, otherwise the call limit timer will be used.

Application Note: The extended call limit timer does not necessarily have to be set longer than the call limit timer. If you wish to restrict some users to less than the 3-minute call limit time, you can set the extended call limit timer to 1 or 2 minutes and turn it on for the users you wish to restrict.

Remember, this option sets the actual time that will be allowed to users with the extended call limit timer set to yes. This command does not enable it for all users.

When the call limit timer or the extended call limit timer expires, the call is terminated and 5 short beeps are sent to the telephone user and to the mobile user. To inform the users that the call is about to be terminated, the Model 40 will issue dual warning beeps every 3 seconds starting 15 seconds before the call is terminated. There is no way of extending the call.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 02# (beep beep)
Enter: [new extended call limit time 1-60] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '1' followed by ENTER. The current setting for the extended call limit timer will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default for the extended call limit timer is 6 minutes and may be programmed anywhere from 1 to 60 minutes.

To enable or disable it for a particular user:

1) Using DTMF either over the air, on the telephone line, or through the

local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 62# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=off, 1=on] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Type '15' followed by ENTER, and the current extended call limit status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the extended call limit status changes. Once the extended call limit status you desire is displayed, press ENTER to set it. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

For all users, the default for the extended call limit is set to 'off'.

INTERCONNECT SECURITY

When the Model 40 is connected to a repeater, it can provide the users with added security. Since the repeater is capable of full duplex conversation, you have the option of repeating the mobile's audio, or blocking it and sending out a sequence of tones. The blocking provides the security since listeners on the channel will hear only half of the conversation (the telephone caller).

If the 'supervisor user' barges in, the privacy is turned off so that he or she may listen to the call to determine whether or not the call should be terminated. The privacy is only suspended until the call is over.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 61# (beep beep)
Enter: [user number] # (beep beep)
Enter: [interconnect security] # (beep beep beep beep beep)

The interconnect security may be one of the following:

0 = Repeat
2 = Privacy

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main menu is on the screen, type '3' and press ENTER to get the User Menu. Type '14' followed by ENTER, and the current interconnect security will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the interconnect security changes. Once the desired interconnect security status is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to '0', repeat the mobile's audio, for all users.

INVERT DCS TX

When DCS is received, it may be inverted depending on the number of inverting amplifiers in the mobile's receiver and in the transmitting mobile's transmitter. Inverting refers to switching the polarity of the 1's and 0's that make up the DCS pattern. For example 023 becomes 047 when inverted. To make sure your mobiles receive the correct code, the Model 40 has the ability to invert the signal it transmits (change all the 1's to 0's, and change all of the 0's to 1's). This is achieved with the 'invert DCS tx' command. Try transmitting to a mobile without inversion, if it decodes, leave the 'invert DCS tx' as it is. If not, change the 'invert DCS tx' to inverted (yes).

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 103# (beep beep)
Enter: [0=no inversion, 1=inversion] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '4' and press ENTER to get the Diagnostics Menu. Type '10' followed by ENTER, and the current DCS inversion status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the DCS inversion changes. Once the DCS inversion you desire is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default is set to '0', no DCS inversion.

LIST ENABLED USERS ACCUMULATED AIRTIME

For system evaluation, and billing, you may list the accumulated airtime for all users that are enabled. The Model 40 will display a list in numerical order (by user number) showing the user and the total accumulated airtime, or the number of pages, depending on the specified equipment type for the user. This command can only be executed from the RS232 or modem programming.

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER, and the Accounting Menu will appear. Type '1' followed by ENTER, and the Model 40 will list all enabled users, and their airtime or number of pages.

If you are using ZCU, you may 'capture to disk' the list that the Model 40 sends you. Once you have done this, you may print the list.

LIST SMDR RECORDS

The Model 40 can list the SMDR records that it is storing internally. You can use this feature to evaluate the activity on your system without having to download all of the records. The records are listed in a 'first in first out' order, in other words, the first call since the last time the SDMR buffer was cleared is listed first and the most recently placed call is listed last. You may terminate the listing at any time with a CTRL-C (press and hold the 'CTRL' key while you press 'C'). Using ZCU, you may capture the SMDR records to disk for later evaluation or billing. Remember that the call detail storage is only capable of storing 999 records.

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER and the Accounting Menu will appear. Type '3' followed by ENTER and the Model 40 will list all SMDR records.

LIST USERS

This command is found in the User Menu and will display the important parameters for each user in the 'user range'. Note that when you first enter the program mode on a Model 40, the user range is set to start at 1 and end at 1 ('user range: 1'). Using the 'list users' command will only display one user until the user range is changed.

The report generated by this command contains the user number, the enable status, the sign-on ANI, the disconnect sequence, the answer sequence and the encode and decode tones or codes.

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER, and the User Menu will appear. Type '22' followed by ENTER, and the Model 40 will display a shortened parameter list for all of the users in the user range.

MEMORY SETUP

This command will totally reset all system and user parameters back to the factory defaults, and test the memory of the Model 40. ***THIS COMMAND IS IRREVERSIBLE! IT CANNOT BE UNDONE ONCE YOU HAVE EXECUTED IT! BE CAREFUL WHEN USING THIS COMMAND, AND MAKE SURE YOU REALLY WANT TO CLEAR OUT THE MEMORY!***

To affirm you really want to clear out the memory, the Model 40 requires you to acknowledge the command. When programming via DTMF over the telephone or over the air, enter 12345# to confirm the command. Answer the question 'Y' when programming via a modem or locally via RS232 to confirm it.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 110# (beep beep)
Enter: [12345] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '4' and press ENTER to get the Diagnostics Menu. Type '1' followed by ENTER and the Model 40 will ask you if you are sure; type 'Y' and press ENTER to confirm it.

Note: The memory setup command does not erase every variable in memory. The following items remain as they are: the power up/program entry stats, the SMDR counter and memory, the time of day in the clock (but not in the calendar), and the local serial port baud rate. If, after resetting the memory, you have trouble communicating via the serial port, enter the DTMF program mode and use the DTMF command 26# to set the baud rate for the serial port to match your terminal. See page 5-8 for further information about setting the baud rate.

MOBILE ACTIVITY TIME

During a telephone-to-mobile call, or a mobile-to-telephone call, the mobile is supposed to be in control of the interconnect at all times (i.e. the mobile must be able to terminate the call). In order to insure that the mobile is in full control of the interconnect, the mobile activity timer guards against the mobile getting out of range. If the mobile activity timer expires, the call is terminated since it is assumed that the mobile no longer has control over the interconnected call.

Single warning beeps are sent every 3 seconds starting 12 seconds before the mobile activity timer expires to warn the mobile that the call is about to be terminated. The mobile simply needs to key up to reset the mobile activity timer, thus keeping the conversation alive. When the timer expires, 5 short beeps are sent to the telephone user and to the mobile user indicating that the call is over.

Application Note: If the Model 40 is being used with a Model 38 or Model 39 Repeater Panel, and the user placing or receiving the call has been programmed with a decode tone or code, the mobile activity timer may only be reset with the correct CTCSS tone or DCS code accompanying the carrier.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 03# (beep beep)
Enter: [new mobile activity time 15-150] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' followed by ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '2' followed by ENTER and the current setting for the mobile activity timer will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default for the mobile activity timer is 30 seconds and may be programmed anywhere from 15 seconds to 150 seconds.

MOBILE ANSWER TIME

When a mobile-to-mobile or telephone-to-mobile call is placed, the 'mobile answer time' determines how long the mobile has to answer the call. Regardless of the number of ringouts, the mobile has the mobile answer time to answer the call before it is terminated. So, if the number of ringouts is set to a large value, and the mobile answer time is set to a short value, not all of the rings will be sent to the mobile.

Each ring on the channel takes about 6 seconds; 2 seconds of ring, and 4 seconds of silence, so 6 rings takes about 36 seconds. If you look at the defaults for the ringouts and answer time, you will notice that the number of ringouts = 6 which is 36 seconds of ringing, but the mobile answer time default is set to only 15 seconds. This means that only about 3 rings (18 seconds) go out to the mobile before the call is terminated. In this case, by setting the number of ringouts to something greater than the mobile answer time, you are assured that ringing occurs until the mobile answers or until the mobile answer time expires. Separate control over these two functions may seem a little confusing but it provides flexibility. For example, with separate controls, you can make the Model 40 ring on the channel one time and wait 60 seconds for a mobile to answer. You do this by setting the number of ringouts to 1, and the mobile answer time to 60 seconds. Note that the transmitter will remain keyed during the answer time (in a half duplex system) to keep the channel busy until the mobile answers the call. If the mobile does not answer, 5 short beeps will be sent to the telephone caller indicating that the call is being terminated, and the Model 40 will hang up. If the mobile doesn't answer the call, the SMDR storage will contain a note indicating that there was no answer.

Application Note: When calling a mobile, if the channel is busy, broken ringing (fast double ringing) is sent to the telephone indicating to the caller that the channel is in use, and if he stays on the line, ringing will commence as soon as the channel is free. The Model 40 will allow the caller to stay on the line for the mobile answer time before hanging up.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 07# (beep beep)
Enter: [new mobile answer time 1-60] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER, and the Mobile System Menu will appear. Select the correct menu item by typing '6' followed by ENTER and the current setting for the mobile answer time will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default for the mobile answer time is 15 seconds and may be programmed anywhere from 1 second to 60 seconds.

MOBILE DIAL-OUT MODE

When making a mobile-to-telephone call, the Model 40 can dial the telephone number using either Touch-Tone (DTMF) or Pulse dialing. There are two speeds for dialing in either mode. Normally the slow speed is used; 10 digits or pulses per second. In some cases depending on your telephone company, the Model 40 may use the fast speed which is 20 digits or pulses per second. Note that pulses per second and digits per second are NOT the same. The digit 5 for example would take 1/10 of a second using the slow DTMF dialing whereas using the slow pulse dialing it would take 1/2 second to dial (5 pulses / 10 pulses per second, to dial the digit 5).

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 01# (beep beep)
Enter: [type and speed of dialing] # (beep beep beep beep beep)

The type and speed are as follows:

0 = Slow DTMF (Touch Tone @ 10 digits/second)
1 = Fast DTMF (Touch Tone @ 20 digits/second)
2 = Slow Pulse (10 pulses per second)
3 = Fast Pulse (20 pulses per second)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER to get the Telco System Menu. Once in the Telco System Menu, item 1 is the 'dial-out mode' setting. Type '1' followed by ENTER, and the dial-out mode will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the dial-out mode changes. Once the desired dial-out mode is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default dial-out mode is slow DTMF.

MOBILE-TO-MOBILE OPERATION

To make a mobile-to-mobile call the user keys his mobile, enters a '*' and his ANI access code. If the user has the ability to perform more than one function (mobile-to-mobile, mobile-to-telephone, or mobile repeat) then the Model 40 requires an additional digit called the steering digit that tells it what the user wants to do. If the user only has the ability to perform one function, the Model 40 will automatically take care of it without the steering digit.

Mobile-to-mobile is the ability to call another mobile through the interconnect using selective signaling. When a user signs on, he will get dial tone from the Model 40. Depending on how the user dial-in mode is set, the user must either enter the other user's ANI, or the other user's user number. The Model 40 will selectively signal and ring on the channel. When the proper mobile answer is received, the Model 40 allows repeat operation through it. The call limit timer and mobile activity timers will be running, and may terminate the call. Either user may terminate the call with his disconnect code.

Application Note: When using a Model 38 or Model 39, if the users have CTCSS/DCS decode set, the Model 40 will generate the CTCSS/DCS encode tone or code of the user that is not talking. For example, if user 1 has an encode and decode of 118.8 Hz, and user 2 has an encode and decode of DCS code 023, when 118.8 Hz is decoded, the Model 40 will generate the DCS code 023, and when the DCS code 023 is decoded, the Model 40 will generate 118.8 Hz. The CTCSS/DCS encode and CTCSS/DCS decode don't have to be the same, the Model 40 will always generate the CTCSS/DCS encode of the opposite user.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 66# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=no, 1=yes] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Once in the User Menu, item 18 is the mobile-to-mobile operation setting. Type '18' followed by ENTER and the mobile-to-mobile operation status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the mobile-mobile operation status changes. Once the mobile-to-mobile operation status you desire is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will

return to the first one).

Every user in the system defaults to 'yes' for the mobile-to-mobile operation.

MOBILE-TO-TELEPHONE OPERATION

One of the functions that a user can perform is making mobile-to-mobile calls. The user keys his mobile, enters a '*' and his ANI access code. If the user has the ability to perform more than one function (mobile-to-mobile, mobile-to-telephone, or mobile repeat) then the Model 40 requires an additional digit called the steering digit that tells it what the user wants to do. If the user only has been given the ability to perform one function, the Model 40 will automatically take care of it without the steering digit.

The mobile-to-telephone function allows the user to place and receive telephone calls. Note that there is only one command for making and receiving telephone calls.

Application Note: If a Model 38 or Model 39 is being used with the Model 40, a CTCSS/DCS decode tone or code can be programmed for the user, and the telephone caller will only hear receive audio when the correct CTCSS tone or DCS code is decoded. This will keep others from interrupting the conversation. However, remember that the supervisor user can barge in on any call and that the interconnect security will be returned to repeat during the call if it is interrupted.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 67# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=no, 1=yes] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Once in the User Menu, item 19 is the mobile-to-telephone operation setting. Type '19' and press ENTER and the mobile-to-telephone operation status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the mobile-telephone operation status changes. Once the mobile-to-telephone operation status you desire is displayed, press ENTER to set the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

Every user in the system defaults to 'yes' for the mobile-to-telephone operation.

MOBILE REPEAT OPERATION

One of the functions that a user can perform is making mobile-to-mobile calls. The user keys his mobile, enters a '*' and his ANI access code. If the user has the ability to perform more than one function (mobile-to-mobile, mobile-to-telephone, or mobile repeat) then the Model 40 requires an additional digit called the steering digit that tells it what the user wants to do. If the user only has been given the ability to perform one function, the Model 40 will automatically take care of it without the steering digit.

The mobile repeat function is used to force the Model 40 to drop into the repeat mode similar to the mobile-to-mobile function. The difference is that the mobile repeat function will not signal, and does not require the user to enter a user number or ANI. The call limit and mobile activity timers will be in effect and can terminate the call. The call may be terminated with the disconnect code from the calling party.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 68# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=no, 1=yes] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Once in the User Menu, item 20 is the mobile repeat operation setting. Type '20' followed by ENTER and the mobile repeat operation status will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the mobile repeat operation status changes. Once the mobile repeat operation status you desire is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

Every user in the system defaults to 'yes' for the mobile repeat operation.

MORSE ID CALL SIGN

The Morse ID call sign will be sent at the end of a call when the Morse ID interval has been set to something other than zero and has expired, or at the end of every call if the Morse ID interval is set to zero. For example, if the Morse ID interval is set to 15 minutes, then the Morse ID call sign won't be sent again until the 15 minutes have passed, regardless of the number of calls made during the 15 minutes. Once the 15 minutes have passed, the Morse ID call sign will be sent at the end of the next call. If the Morse ID interval is set to 0 minutes, the Morse ID call sign will be sent at the end of every call.

When the ID is sent out, it is sent out at 25 wpm at 30% deviation and meets FCC Part 90 regulations. The ID tone frequency is fixed at 1200 Hz and is not programmable.

This command will set the Morse ID call sign to be sent. Use the Morse ID interval to set the rate at which the ID is sent. Note that if no ID is entered, no ID will be sent.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

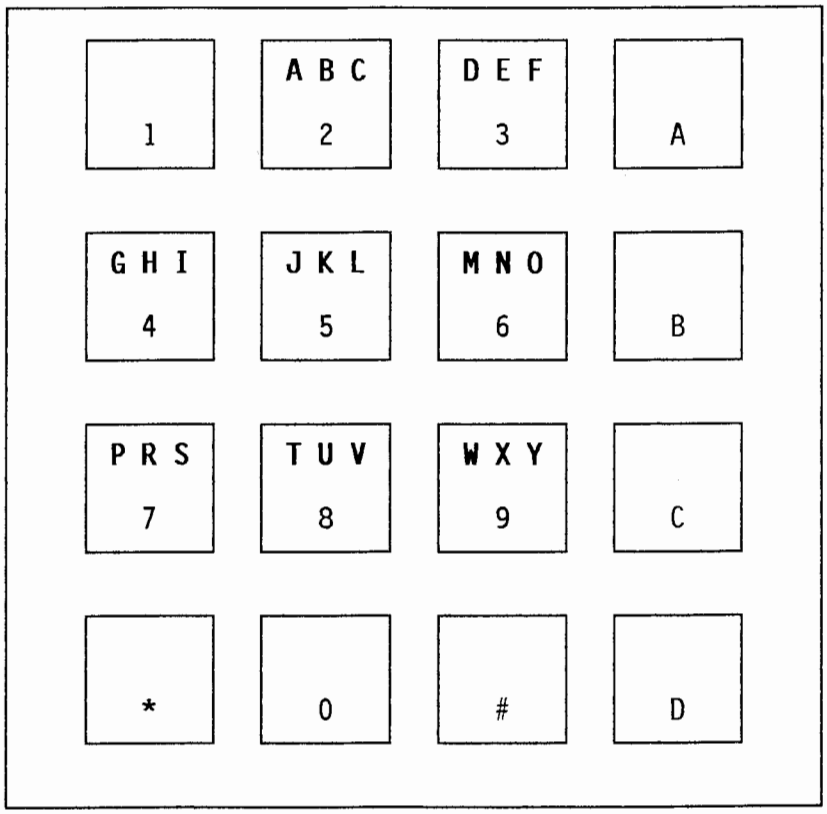
Enter the program mode using the program access code (default is 0012123).

Enter: 04# (beep beep)
Enter: [ID string in pairs (see chart)] # (beep beep beep beep beep)

Looking at the tone pad chart on the next page, notice the first digit of a letter code is selected from the top row of digits (1, 2 or 3). This is a "shift" key. Now notice the letters above each key. By using the "shift" key plus a letter key, the code is complete. The only letters not represented are Q and Z. Numbers are entered directly in pairs (i.e. 01, 02, 03, etc.). End your entry with a "#" key.

MORSE ID CALL SIGN (cont'd)

Digits	Letter	Code	Digits	Letter	Code	Digits	Letter	Code
00	0	_ _ _ _ _	12	A	. _	26	N	_ .
01	1	. _ _ _ _	22	B	_ . . .	36	O	_ _ _
02	2	. . _ _ _	32	C	_ . _ .	17	P	. _ _ .
03	3	. . . _ _	13	D	_ . .	10	Q	_ _ . _
04	4	. . . . _	23	E	.	27	R	. _ .
05	5	. . . . .	33	F	. . _ .	37	S	. . .
06	6	_	14	G	_ _ .	18	T	_
07	7	_ _ . . .	24	H	. . . .	28	U	. . _
08	8	_ _ _ . .	34	I	. .	38	V	. . . _
09	9	_ _ _ _ .	15	J	. _ _ _	19	W	. _ _
			25	K	_ . _	29	X	_ . . _
			35	L	. _ . .	39	Y	_ . _ _
			16	M	_ _	20	Z	_ _ . .
						#	(done)	



Example:
Set call sign WNCR-414:
Enter DTMF --> 04# 19 26 32 27 04 01 04 #
Comments --> ID# W N C R 4 1 4 done

MORSE ID CALL SIGN (cont'd)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER to get the Telco System Menu. Once in the Telco System Menu, item 3 is the Morse ID call sign. Type '3' followed by ENTER and the current Morse ID call sign will be displayed along with a prompt to enter a new ID. Type in the ID just as it appears (don't worry about upper/lower case) and press ENTER. For example, type 'WNCR414' and press ENTER to enter WNCR414 as the call sign. Spaces aren't sent out, only the numbers 0-9 and the letters A-Z.

The default is 'no ID'. Up to 8 digits may be entered as an ID.

MORSE ID INTERVAL

The Morse ID interval determines how often the station ID is sent. When the Morse ID call sign is sent, the Morse ID interval timer is reset. At the end of every call, the Morse ID interval timer is checked to see if it has expired, if so, the Morse ID call sign will be sent out over the channel at 25 wpm and at 30% deviation. The tone frequency is fixed at 1200 Hz and may not be programmed. If the Morse ID interval is set to zero, the Morse ID call sign will be sent at the end of every call.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 05# (beep beep)
Enter: [new Morse ID interval 0-99] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '4' followed by ENTER, and the current setting for the Morse ID interval will appear along with a message to enter the new value and the range of values you may enter. Enter the new interval and press ENTER when you have finished.

The default for the Morse ID interval is 15 minutes and may be programmed anywhere from 0 minutes to 99 minutes.

NUMBER OF RINGOUTS SENT TO MOBILE

When a mobile-to-mobile or telephone-to-mobile call is placed there is a specified number of ringouts to the mobile. Regardless of the number of ringouts, the mobile has the mobile answer time to answer before the call is terminated. So, if the number of ringouts is set to a large value, and the mobile answer time is set to a short value, not all of the rings will be sent to the mobile.

Each ring on the channel takes about 6 seconds; 2 seconds of ring, and 4 seconds of silence, so 6 rings takes about 36 seconds. If you look at the defaults for the ringouts and answer time, you will notice that the number of ringouts = 6 which is 36 seconds of ringing, but the mobile answer time default is set to only 15 seconds. This means that only about 3 rings (18 seconds) go out to the mobile before the call is terminated. In this case, by setting the number of ringouts to something greater than the mobile answer time, you are assured that ringing occurs until the mobile answers or until the mobile answer time expires. Separate control over these two functions may seem a little confusing but it provides flexibility. For example, with separate controls, you can make the Model 40 ring on the channel one time and wait 60 seconds for a mobile to answer. You do this by setting the number of ringouts to 1, and the mobile answer time to 60 seconds. Note that the transmitter will remain keyed during the answer time (in a half duplex system) to keep the channel busy until the mobile answers the call. If the mobile does not answer, 5 short beeps will be sent to the telephone caller indicating that the call is being terminated, and the Model 40 will hang up. If the mobile doesn't answer the call, the SMDR storage will contain a note indicating that there was no answer.

Application Note: When calling a mobile, if the channel is busy, broken ringing (fast double ringing) will be sent to the telephone indicating to the caller that the channel is in use, and that if he stays on the line, ringing will commence as soon as the channel is free. The Model 40 will allow the caller to stay on the line for the mobile answer time before hanging up. Since this caller is the first in line, he is put on hold in effect until the channel is free, or until he decides to hang up.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 06# (beep beep)
Enter: [new number of ringouts 1-16] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '5' followed by ENTER. The current setting for the number of ringouts sent to mobile will appear along with a message

instructing you to enter the new value and the range of values you may enter. Enter the new number of ringouts and press ENTER when you have finished.

The default for the number of ringouts sent to mobile is 6 rings and may be programmed anywhere from 1 ring to 16 rings.

PAGER TALK TIME

When making a call to tone-and-voice pager, the Model 40 will send the paging tones over the channel that will unsquelch the pager. The Model 40 will send a single beep to the telephone caller indicating that he may begin speaking, and allow the telephone audio to the transmitter. The caller may talk for the maximum time of 'pager talk time', after which the Model 40 will send dual beeps to the caller and terminate the call. During the pager talk time, if the VOX indication drops for 3 seconds, it is assumed that the caller is finished talking, and the call is terminated. This function is only applicable when calling a tone-and-voice pager, so it has no function when calling any other type of equipment.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 08# (beep beep)
Enter: [new pager talk time 5-60] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '7' followed by ENTER. The current setting for the pager talk time will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default for the pager talk time is 10 seconds and may be programmed anywhere from 5 seconds to 60 seconds.

PBX OUTSIDE LINE PREFIX

This command accommodates the Model 40's operation on a PBX. The Model 40 monitors what is being dialed and knows when the dialing is finished based on guidelines about dialing (area codes, etc.). A PBX requires a preceding digit (such as 8 or 9) to gain access to an outside telephone line when placing a call.

The 'PBX outside line prefix' allows you to tell the Model 40 what digits may be used to gain access to the outside line. You are allowed to enter up to 4 digits, and by entering digits you also tell the Model 40 that it is connected to a PBX. When a mobile-to-telephone call is made, the Model 40 waits for the first digit. Once the first digit of the telephone number comes in, the Model 40 compares it to the digits in the 'PBX outside line prefix' to see if it's a PBX outside bound call. If not, the Model 40 drops into conversation mode where the user may overdial a PBX extension (the Model 40 regenerates all DTMF that it decodes). If the first digit dialed matches a digit in the 'PBX outside line prefix', the Model 40 begins watching the digits just as if the first digit never appeared, and the call progresses.

If you're not adding the Model 40 to a PBX then you don't need to worry about this command.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 18# (beep beep)
Enter: [up to 4 prefix digits] # (beep beep beep beep beep)

For example: if either 8 or 9 gain access to an outside telephone line, enter 89# when the Model 40 is expecting the prefix digits. Note, the Model 40 will not add digits you are entering to the ones it already has. You must re-enter all of the digits that gain access to an outside line each time you execute this command.

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER, and the Telco System Menu will appear. Select the correct menu item by typing '3' followed by ENTER. The current 'PBX outside line prefix' will appear along with a message instructing you to enter the new digits. Enter the digits that gain access to an outside line and press ENTER when you have finished.

The 'PBX outside line prefix' is defaulted to 'no PBX' (no digits entered).

PBX OUTSIDE LINE PREFIX

This command accommodates the Model 40's operation on a PBX. The Model 40 monitors what is being dialed and knows when the dialing is finished based on guidelines about dialing (area codes, etc.). A PBX requires a preceding digit (such as 8 or 9) to gain access to an outside telephone line when placing a call.

The 'PBX outside line prefix' allows you to tell the Model 40 what digits may be used to gain access to the outside line. You are allowed to enter up to 4 digits, and by entering digits you also tell the Model 40 that it is connected to a PBX. When a mobile-to-telephone call is made, the Model 40 waits for the first digit. Once the first digit of the telephone number comes in, the Model 40 compares it to the digits in the 'PBX outside line prefix' to see if it's a PBX outside bound call. If not, the Model 40 drops into conversation mode where the user may overdial a PBX extension (the Model 40 regenerates all DTMF that it decodes). If the first digit dialed matches a digit in the 'PBX outside line prefix', the Model 40 begins watching the digits just as if the first digit never appeared, and the call progresses.

If you're not adding the Model 40 to a PBX then you don't need to worry about this command.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 18# (beep beep)
Enter: [up to 4 prefix digits] # (beep beep beep beep beep)

For example: if either 8 or 9 gain access to an outside telephone line, enter 89# when the Model 40 is expecting the prefix digits. Note, the Model 40 will not add digits you are entering to the ones it already has. You must re-enter all of the digits that gain access to an outside line each time you execute this command.

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER, and the Telco System Menu will appear. Select the correct menu item by typing '3' followed by ENTER. The current 'PBX outside line prefix' will appear along with a message instructing you to enter the new digits. Enter the digits that gain access to an outside line and press ENTER when you have finished.

The 'PBX outside line prefix' is defaulted to 'no PBX' (no digits entered).

PROGRAM ALL PARAMETERS

One of the great assets of the Model 40 is its ease of programming, which is made possible in part by the 'program all parameters' command. When you are adding users via the modem or RS232 programming, you will typically want to execute each command in the User Menu. This can be a lengthy process, but the way around this is to use the 'program all parameters' command. This command will start with command #2 and will execute each command (through 20) for you. All you have to do is answer the questions about the user you are adding as they come up. When you are finished, you may go onto the next user by changing the user range. Note that this command will only program the current user (the one currently on the screen, which is the first user in the range) regardless of the user range.

RECORD ERRORS IN SMDR STORAGE

When the SMDR storage option has been ordered, the Model 40 will log calls including time and date, duration of the call, user who placed or received the call, and telephone number dialed. The Model 40 will also log errors in user input such as invalid user number, or toll call attempt when toll restricted, etc. The Model 40 has the ability to store 999 SMDR records (once full, additional records or calls are lost), which may not be very much for busy applications. To avoid losing records, system operators may have to download the SMDR storage every couple of days. To help alleviate this problem, the 'record errors in SMDR storage' command has been added. This command allows you to keep the Model 40 from logging space-consuming errors, thus reducing the number of times the SMDR storage must be downloaded. In addition to blocking errors, the Model 40 has the ability to log nothing, everything, or toll calls only, on a per user basis (see "SMDR track mode").

Note that this is a system wide command, not a per user command; when you enable the 'record errors in SMDR storage' function, you are enabling it for everybody on the system.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 27# (beep beep)
Enter: [0 = NO / 1 = YES] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER to get the Accounting Menu. Select the correct menu item by typing '6' followed by ENTER and the 'record errors in SMDR storage' state will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the option changes. Once you have enabled or disabled the record errors function, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The Model 40 defaults to 'record errors' (yes).

REPEAT ENABLE

When the Model 40 has the 'repeat enable' turned on, the 'repeat transmit hold time' is also enabled. When repeat is enabled, the Model 40 keys up immediately when it sees carrier and begins repeating. To save the transmitter from keying and unkeying during mobile fading and regular conversation, the repeater transmit hold time holds the transmitter up for a programmed period of time after carrier is lost. If carrier is detected again during the hold time, the transmitter will remain keyed until the carrier goes away and the repeater transmit hold time expires.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 13# (beep beep)
Enter: [0 = NO / 1 = YES] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER to get the Mobile System Menu. Select the correct menu item by typing '11' followed by ENTER. The 'repeat enable' state will be shown along with a message instructing you to press any key to change the data, and ENTER to accept the data. Each time a key is pressed, the option changes. Once you have enabled or disabled the repeat function, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The Model 40 defaults to 'repeat disabled' (no).

REPEATER TRANSMIT HOLD TIME

When the Model 40 has the 'repeat enable' turned on, the 'repeat transmit hold time' is also enabled. When repeat is enabled, the Model 40 keys up immediately when it sees carrier and begins repeating. To save the transmitter from keying and unkeying during mobile fading and regular conversation, the repeater transmit hold time holds the transmitter up for a programmed period of time after carrier is lost. If carrier is detected again during the hold time, the transmitter will remain keyed until the carrier goes away and the repeater transmit hold time expires.

Note that during repeat operation, the Model 40 will gate audio based on carrier, and that the repeater transmit hold time has absolutely nothing to do with when audio is allowed to be repeated, it simply keeps the transmitter from dropping prematurely.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 11# (beep beep)
Enter: [new repeater tx hold time 0-99] # (beep beep beep beep beep)

Note that the repeater transmit hold time is adjustable in 100 millisecond (0.1 second) increments, so programming a hold time of 3.5 seconds requires that you enter 35 (3.5 seconds = 35 x 100 milliseconds).

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '9' followed by ENTER. The current setting for the repeater tx hold time will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished. Note that when the time is displayed, it is shown in actual time, not the value you entered. For example, if you program the repeater tx hold time to 3.5 seconds by entering 35, the menu will show 3500 milliseconds. Viewing the actual time will have more significance to you than the numerical data entered. (i.e. 3500 milliseconds is more meaningful than the number 35).

The default for the repeater transmit hold time is 2 seconds and may be programmed anywhere from 0 to 9.9 seconds in increments of 100 milliseconds (0.1 seconds).

RESET AIRTIME ACCUMULATION

The Model 40 keeps track of each user's accumulated airtime. It is displayed at the bottom of the User Menu. You can clear this time by using this command. This command can only be executed from the RS232 or modem programming; if you cannot see the airtime, there is no point in being able to clear it.

Note that for users with an equipment type of tone-only pager or tone-and-voice pager, the accumulated time is not time, but rather number of pages. This command clears the number of pages also.

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER, and the User Menu will appear. Type '24' followed by ENTER and the Model 40 will indicate that the airtime has been cleared.

RINGS BEFORE ANSWER

When the Model 40 detects ringing, it will count the rings. Once the number of rings has exceeded the specified 'rings before answer', the Model 40 will answer the telephone and allow the caller to enter a mobile ANI, mobile user number or program access code.

If the Model 40 has been programmed to operate in cordless telephone mode, 'rings before answer' has a different meaning. In the cordless telephone mode, the Model 40 will ring on the channel when it detects the telephone ringing, and will not answer the telephone until the called mobile answers the call. The 'rings before answer' determines the number of rings before the Model 40 will key up and send ringing on the channel. With the default set to 2, assuming the Model 40 has the cordless telephone mode turned on (you turn it on by assigning it a user number for it to call when the telephone rings) the Model 40 will key up and begin ringing on the channel after the second ring (starting with the third ring).

Application Note: The ability to operate in the cordless telephone mode is really quite useful. Using the cordless telephone mode, the Model 40 can share a telephone line similar to an answering machine. You can set the 'rings before answer' to 4 rings for example, and if you are in the office you can pick the telephone up and answer the call. If you are not in the office, the Model 40 will ring out to the mobile.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 10# (beep beep)
Enter: [new rings before answer 1-9] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '2' and press ENTER and the Telco System Menu will appear. Select the correct menu item by typing '2' followed by ENTER. The current setting for the 'rings before answer' will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new value and press ENTER when you have finished.

The default for 'rings before answer' is 2 rings and may be programmed anywhere from 1 to 9 rings.

SAMPLE RATE

When using one of the simplex sampling modes, this timer sets the rate at which the Model 40 will sample for carrier. In other words, this setting adjusts the amount of time between samples. If the sample rate time is set too short (high sample rate), the telephone audio will be too chopped up to be discernible. If the sample rate time is too long, it will take too much time for a mobile to gain access to the interconnect.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 33# (beep beep)
Enter: [new sample rate 1-250] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '5' and press ENTER, and the Simplex Menu will appear. Select the correct menu item by typing '4' followed by ENTER. The current setting for the sample rate will appear along with a message to instructing you to enter the new value and the range of values you may enter. Enter the new rate and press ENTER when you have finished.

The default for the sample rate is 2 seconds and may be programmed anywhere from 10 milliseconds to 2.5 seconds.

SAMPLE WIDTH

The sample width is the amount of time the Model 40 stays unkeyed to check for carrier when functioning in one of the simplex sampling modes. Its function is a little different when using the intelligent simplex mode. When using the intelligent simplex mode, the sample width also determines when the Model 40 samples (based on gaps in the telephone party's audio).

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 34# (beep beep)
Enter: [new sample width 1-999] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '5' and press ENTER and the Simplex Menu will appear. Select the correct menu item by typing '5' followed by ENTER. The current setting for the sample width will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new width and press ENTER when you have finished.

The default for sample width is 200 milliseconds and may be programmed anywhere from 1 to 999 milliseconds (0.999 seconds).

SET CALENDAR/CLOCK

These commands allow you to set the real time clock/calendar to the current time and date at the radio site in order to support the SMDR billing option.

NOTE: Even if the SMDR option bit is set in the unit's firmware, if the clock/calendar/battery socket is not installed in the socket U29 of the Model 40 motherboard, these programming items will NOT show up in the Mobile System menu. If your unit is supposed to have SDMR and these commands are absent, then it is time to call Zetron.

How to program it:

1) Using DTMF: Not Applicable.

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type "1" followed by Enter and the Mobile System Menu will appear. Select "18"

followed by Enter and the calendar set prompt will appear. The entry is in the following format: (YYMMDDW) , where YY=year, MM=month, DD=day of the month, and W=day of the week. For example December 4, 1991, Wednesday, would be entered: 9112044 and press Enter.

To set the clock, select menu item "19" followed by Enter. This command expects the time to be entered in the 24 hour format. For example, to set the time to 2:35 PM, you type 1435 followed by Enter. The Model 40 does not need (or accept) colons when entering the time.

SIMPLEX MODE

Half-duplex and full-duplex radio systems are systems that have different transmit and receive frequencies. A full-duplex system allows the mobile to transmit and receive at the same time using two antennas or duplexers in the mobile and in the repeater. A half-duplex system is similar but half-duplex mobiles don't have duplexers, nor do they have the ability to receive and transmit at the same time because some of the circuitry is shared by both the receiver and the transmitter to reduce the cost of the radios. Typical use would be mobiles and/or bases talking through a repeater. Simplex, on the other hand, transmits and receives on the same frequency, therefore, when you are transmitting, you cannot simultaneously receive. Typical use would be a mobile or base talking to each other, each having to wait until the other party is finished. The Model 40 may be configured to operate in either the simplex mode or the half-duplex mode, but since the simplex mode does not have the ability to receive and transmit at the same time (and therefore cannot detect carrier when transmitting) there are several simplex modes to fit your needs when installing a system.

The Model 40 has one half-duplex mode and six simplex modes. The 6 simplex modes are: simplex VOX, simplex VOX with voice delay, simplex VOX with pre-key, simplex sampling, simplex sampling with VOX to extend sample interval, and the intelligent simplex mode.

Note: In any of the simplex operating modes, the CTCSS encode is forced into drop mode and terminates the encoding of tone after the page.

Simplex VOX

This is one of the easiest types of simplex operation to use. When a telephone-to-mobile call is initially placed, the Model 40 doesn't do anything but wait either for a carrier indication, or a VOX indication (VOX is a method of detecting speech from the telephone). When the Model 40 detects carrier, it ignores the VOX indication from the telephone and allows receive audio to the telephone line until the carrier detection goes away (the mobile is allowed to talk to the telephone caller). When the Model 40 is waiting for carrier or VOX, and it detects VOX, it keys the transmitter, and allows the telephone audio to go out the transmitter (the telephone caller is allowed to talk to the mobile). The Model 40 ignores the carrier indication because it is unknown when a simplex station is transmitting and waits for VOX to drop. Once VOX drops, the Model 40 goes back to waiting.

Only two of the simplex settings affect the operation of this mode; 'VOX hold time' and 'COR hold time'. The VOX hold time adjusts the amount of time between the time the VOX drops and the time the Model 40 drops the transmitter. If this value is set too long, the conversation will slow down because the mobile cannot talk until the transmitter drops. If this value is set too low, the transmitter will drop out too soon (between words and during pauses) and have to be re-keyed. Each time the transmitter is keyed some of the telephone audio is lost because of the time that is required to bring the transmitter up to full power and (if using it) the decode time of the CTCSS/DCS decoder in the mobile. The default 'VOX hold time' is 2 seconds which in most cases works well. The 'COR hold time' is an identical function but is used for the mobile end. This sets the time that the Model 40 waits after seeing carrier drop until it allows the telephone audio to the transmitter (assuming VOX is present, otherwise the Model 40 will wait for VOX or carrier). Once again, if the COR hold time is set too long, it will take too long before the telephone caller will be able to talk to the mobile. If it is set too short, when the mobile fades or picket fences, the audio to the telephone will be chopped up.

Simplex VOX with Voice Delay
This mode is almost identical to the simplex VOX mode. In the simplex VOX mode, when the telephone caller talks, the VOX circuit detects the voice and keys the transmitter. Keying the transmitter takes some time because the transmitter will not come up to full power immediately. In addition to this delay, if you are using CTCSS or DCS decoding, there is decode time that must be added to the transmitter reaching full power. This total time can reach 300 to 500 milliseconds (0.3 to 0.5 seconds) in which case that much of the telephone audio is lost. The optional VOX delay card resolves this problem. The VOX delay card adds 500 milliseconds of delay between the telephone and the transmitter, so when the caller speaks, his audio will go out the transmitter 500 milliseconds after he begins speaking. This simplex mode is not available unless you have purchased the VOX delay card.

Simplex VOX with Pre-key
This mode is also nearly identical to the simplex VOX mode. Once again, dealing with the lost audio at the beginning of the voice detection is where this mode differs. Because most conversations go back and forth continually with very few pauses, we can use this to our advantage. When carrier drops, and the COR hold time expires, the Model 40 will normally drop back to waiting for something to happen. Instead, it assumes that the telephone caller is going to talk, and keys the transmitter and allows audio to pass from the telephone to the transmitter. After which, it watches for the VOX detector to confirm that there really is audio present; if not, after the VOX hold time elapses, the Model 40 will shut down the transmitter and begin waiting again for VOX or carrier detection.

Simplex Sampling
The simplex VOX modes will not work on telephone lines that are noisy because the VOX will always indicate that there is audio on the telephone line. When a telephone-to-mobile call is placed, the transmitter is keyed, and the telephone audio is sent to the transmitter. Periodically, the transmitter is dropped and the Model 40 looks for carrier. If carrier is present, the mobile takes over, and the mobile audio is sent to the telephone. If carrier is not present, the transmitter is re-keyed and the

telephone audio is once again routed to the transmitter. Remember that the transmitter MUST be dropped in order to check for carrier, since the mobile's carrier indicator is invalid during transmit.

There are three simplex commands that affect this simplex mode; COR hold time, sample rate, and sample width. The sample rate determines how often the Model 40 will drop the transmitter to sample for carrier. The sample rate default is 2 seconds, so the Model 40 will drop the transmitter and sample for carrier every 2 seconds. The longer the sample rate, the more difficult it is for the mobile to talk back since the Model 40 is no longer monitoring the VOX indicator; the mobile must wait until the Model 40 samples again. If the time is set too short, then the telephone caller's audio ends up broken up (say the sample rate is 1/4 second, it would always be dropping to check for carrier and the telephone caller's audio would never make it out the transmitter).

When the Model 40 drops the transmitter, there is some time before the radio can switch from transmit to receive, so the Model 40 must leave the transmitter off for at least the amount of time it takes the radio to flip from transmit to receive, and then enough extra to detect carrier. This amount of time is set using the sample width setting. A longer sample width results in longer gaps in the telephone caller's audio. If the sample width is set too short, the radio won't have time to switch from transmit to receive and to check for carrier, therefore, the mobile will never be able to talk to the caller. The sample width should be set as short as possible. To help achieve this, the Model 40 has an automatic setup mode that will allow it to set this value for you based on the radio it is hooked up to.

The COR hold time functions just like the simplex VOX modes. When carrier drops, the Model 40 will wait to switch to the telephone side until the COR hold time has expired.

Simplex Sampling with VOX to Extend Sample Interval
This mode is similar to the simplex sampling mode except it includes monitoring the VOX detector. When the Model 40 detects VOX it will multiply the sample rate time by 4. When VOX is detected there really is no reason to check for carrier, so the Model 40 will sample 4 times less often. If the sample rate is set to 2 seconds, the Model 40 will sample every 2 seconds until VOX is detected and then the sample rate will be extended to 8 seconds. When you use this mode, you may want to reduce the sample rate time so when the telephone caller stops speaking, it won't take as long for the mobile to get control of the interconnect.

Intelligent Simplex Mode
This mode requires the VOX delay card. The intelligent simplex mode uses the sample width timer, the VOX and the audio delay to perform almost as well as a half-duplex interconnect system. As long as VOX is detected, the transmitter is keyed and audio is passed from the telephone caller to the transmitter. The telephone caller's audio is delayed as it comes in from the telephone and goes out to the transmitter. When VOX drops, the Model 40 times the gap in the audio (the time the VOX is absent), and when a gap in the telephone caller's audio exceeds the sample width time, the Model 40 then 'watches' the gap pass through the delay. When the gap just starts exiting the delay, the transmitter is dropped, and the Model 40

looks for carrier. Just before the end of the gap goes out the transmitter, the Model 40 re-keys the transmitter so that no audio is lost. The mobile can break in at almost any time and there is no sampling when audio is present on the telephone line to disrupt the telephone caller's audio.

The COR hold time functions just like it does in the other modes, delaying the loss of carrier. The sample width in this case adjusts the size of the gap in the telephone caller's voice that is required to unkey the transmitter. If this is set too long, the mobile will never get a chance to get in because there is a reduced chance of seeing a gap long enough to force the Model 40 to sample for carrier. If this setting is set too short, then the radio may not have time to detect carrier.

You can use the automatic window setting feature in the Model 40 to automatically set the transmit to receive time. This will insure that the sample time is set at the absolute minimum to detect carrier.

As mentioned previously, a noisy line will render the VOX modes useless. The same is true for the intelligent sampling mode. The intelligent sampling mode can switch modes when it detects this is happening. If at the beginning of the call, the Model 40 sees the VOX detecting something constantly for the entire mobile activity time, it will switch over to the simplex sampling mode for the remainder of the call. By doing this, the Model 40 can still function in the intelligent sampling mode as long as the telephone line quality is adequate.

Applications for the above modes: Why use one mode over another?

Half Duplex
This is the preferred mode of operation. This mode requires half-duplex or full duplex mobiles, bases and repeaters. There is no system degradation caused by steps required to detect who's talking. If you are going to add an interconnect to a repeater (shared or private) that has access to telephone lines, this is the mode you will want to use.

Simplex VOX
Simplex VOX is preferred to sampling because it doesn't interrupt the telephone caller's speech with sample windows. One drawback to this mode is that if the telephone lines are poor, the VOX will have a hard time distinguishing between noise and voice audio. If it does, the interconnect won't perform very well. Another problem is that the first syllable or two are lost from the telephone caller's audio. This mode can be used when you want to connect an interconnect to a mobile or base. You may also wish to have the mobile or base talk through a repeater to extend the range. This effectively 'remotes' the telephone line and can be used when telephone lines are not available at the repeater site. When using this mode through a repeater, more of the telephone caller's audio will be lost because of two decode times; one in the repeater, and one in the receiving mobile.

Simplex VOX with Voice Delay
This mode has the same benefits and disadvantages as the simplex VOX mode, but with the VOX delay card, the syllables at the beginning of the telephone caller's audio are not lost. When used through a repeater, the

delay card delays the audio long enough so that the repeater's decoder and the mobile's decoder will have started decoding. This is the preferred simplex VOX mode of operation.

Simplex VOX with Pre-key
Once again, this mode has the same benefits and disadvantages as the simplex VOX mode, but with the pre-key, some of the lost syllables are retained. This mode can be used when the Model 40 is connected to a mobile or base, but it cannot be used through a repeater. If it were to be used through a repeater the Model 40 would key up, the repeater would come up and everything would be okay. When the Model 40 unkeyed, the repeater would still be up (for the transmit hold time) and the Model 40 would detect carrier. When the repeater dropped its transmitter, because of the pre-key, the Model 40 would re-key its transmitter, and the cycle would continue. The result would be two transmitters oscillating (flipping on and off) which prevents the interconnect from functioning correctly.

Simplex Sampling
This mode, like the simplex VOX modes can be used when the Model 40 is connected to a mobile or base. Because of the sampling that has to occur, this mode cannot be used through a repeater. The repeater will be transmitting during the sample window and the Model 40 will see carrier every time it samples. Even if this could be resolved, the decode times of the repeater and base (or mobile) would stretch the sample window out so far that the telephone caller's audio would be unintelligible. However, this mode is excellent when the telephone line quality is less than perfect because it has no reliance on the VOX detector which is sensitive to noise.

Simplex Sampling with VOX to Extend Sample Interval
This mode is one step better than the above mode because it adds the advantages of the VOX modes to the sampling. Because of this, this mode can determine when the telephone caller is actually talking and thus reduce the rate at which it samples. This mode won't work over a repeater for the same reasons the simplex sampling mode won't work over a repeater. In addition, this mode (like the simplex VOX modes) doesn't work well with noisy telephone lines because is has some dependence on the VOX.

Intelligent Simplex
For simplex operation, this is easily the best mode to choose. It has the ability to switch to sampling if the telephone line is too noisy, and it doesn't sample during speech. If it's being used to talk through a repeater, the sample width can be set so the delay through the repeater does not hamper the performance.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 30# (beep beep)
Enter: [new simplex mode 0-6] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '5' and press ENTER to get the Simplex Menu. Select the correct menu item by typing '1' followed by ENTER. The simplex mode will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the option changes. Once you have enabled or disabled the repeat function, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The Model 40 defaults to duplex operation (0).

SMDR OOPS!

The 'call detail storage' will only hold 999 records and must be downloaded before it reaches capacity. If the SMDR records are not downloaded, additional calls after record 999 will be lost. Once you have downloaded the SMDR records, you need to clear the call detail storage. Use this command to clear the SMDR storage. You must enter '54321#' to confirm that you really want to clear the SMDR storage. If by chance you do clear the 'call detail storage', you can use the 'SMDR oops!' command to undo the erasure. The 'SMDR oops!' command will only work if there haven't been any entries into the 'call detail storage' between the time you cleared it and the time you are attempting to restore it.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 121# (beep beep)
Enter: [0=don't restore, 1=restore] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '6' and press ENTER to get the Accounting Menu. Type '5' and press ENTER, and the Model 40 will prompt you to confirm that you want to restore the call detail storage. Type 'Y' and press ENTER to confirm.

SMDR TRACK MODE

When the SMDR storage option has been ordered, the Model 40 will log calls including time and date, duration of the call, user who placed or received the call, and telephone number dialed. The Model 40 will also log errors in user input such as invalid user number, or a toll call attempt when toll restricted, etc. The Model 40 has the ability to store 999 SMDR records (once full, additional records or calls are lost), which may not be very much for busy applications. Because records in excess of 999 will be lost, system operators must download the SMDR storage every couple of days (or more frequently if required). To help minimize this problem, the Model 40 allows you to control what records are stored.

On a per user basis, you can select one of three modes of storage; store nothing for a given user, store everything for a given user, or only store toll calls made by a user. If you are only concerned about collecting on toll calls, you can set every user to 'store only toll calls', and your 999 records will go a long way. If you have some troublemakers on the system, you can opt to record everything they do. If you have users that aren't allowed to make toll calls, and you aren't going to bill them for time, you can keep the Model 40 from recording anything they do.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 65# (beep beep)
Enter: [user number] # (beep beep)
Enter: [SMDR track mode 0-2] # (beep beep beep beep beep)

The SMDR track mode may be one of the following:

0 = No SMDR storage for this user
1 = Store all calls for this user
2 = Store only long distance calls for this user

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Select the correct menu item by typing '12' followed by ENTER and the SMDR track mode will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the SMDR track mode changes. Once you reach the SMDR track mode you desire, press ENTER to accept it. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

For all users, the Model 40 defaults to '1', track everything.

SUPERVISOR USER

The 'supervisor user' is a very powerful feature and should be used carefully. When a user is programmed as the supervisor, that user has many advantages over the other users. When telephone-to-mobile, or mobile-to-mobile calls are being placed, the supervisor user may answer any call, or disconnect any call, even if it is not for him! When the supervisor user answers a call, the SMDR storage will indicate that a supervisor override took place on that particular call. However, allowing someone to be the supervisor user does not give them unrestricted access to the interconnect, it simply gives them the ability to control the conversation.

When a Model 38 or Model 39 Repeater Tone Panel is connected to the Model 40, and the supervisor user has a CTCSS or DCS decode programmed, in addition to being able to answer and disconnect calls, he may also listen in on a private call. When a mobile makes a call and has the interconnect security set to privacy, people listening on the radio channel will only hear the telephone side of the conversation because the repeated audio (mobile) is masked and a privacy tone is transmitted instead. If the supervisor user believes the conversation contains improper language (for example), he may simply key up when he hears the telephone caller's voice, so he can capture the receiver, and the Model 40 will kick the conversation out of privacy mode until the call is over. Once the conversation is out of the privacy mode, the supervisor user may listen to both sides and determine if the conversation is improper, if so, he may terminate the call. Also, if the calling mobile has a CTCSS or DCS decode programmed, the Model 40 will only allow audio to pass from the receiver to the telephone when the proper CTCSS or DCS is decoded. The Model 40 will always allow the supervisor's audio to pass when his CTCSS or DCS is decoded. This is referred to as 'barge-in' because the supervisor user has the ability to enter the conversation whenever he wants to.

The supervisor user can answer and disconnect calls just like he would his own calls; there aren't any special codes required for him to remember.

Entering a user number of '0' turns off the supervisor function.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 23# (beep beep)
Enter: [new supervisor user 1-99] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER and the Mobile System Menu will appear. Select the correct menu item by typing '13' followed by ENTER and the current setting for the supervisor user will appear along with a message to enter the new value and

the range of values you may enter. Enter the new user number and press ENTER when you have finished.

The default setup is no supervisor user (set to 0), but the supervisor user may be set to any user from 1 to 99.

TOLL RESTRICT TYPE

The Model 40 has several things that it considers a "toll" call. They are: '1+' calls where a call is made within the same area code, '1+area code' where a long distance call is made to a different area code, operator calls, '0+' calls where a credit card number is expected, and 'non 1-plus' calls where a long distance call is made within the area code, but the preceding 1 is not required (available only in some areas). The Model 40 has the ability to selectively toll restrict users. There are three different toll restrict types; no toll restrict, '0+' restriction, and total toll restriction.

No toll restriction
There are absolutely no restrictions on what a user with 'no toll restriction' may dial.

Total toll restriction
A toll restricted user cannot dial any of the following:

'1+' telephone numbers
'1+area code' telephone numbers
'0+' telephone numbers
Operator calls
'Non 1-plus' calls

'0+' Restriction
A '0+' restricted user is the same as a toll restricted user, but may also make '0+' calls where a credit card is required. Once a '0+' call is made, the user must enter 12 DTMF digits within 20 seconds or the call is terminated. This is done to keep toll calls from being made by restricted users.

Note that 911 and 1-800 calls are never restricted. Emergency 911 calls also don't have the call limit timer running.

Prefixes are added or deleted for the 'non 1-plus' toll restriction using the 'add/delete prefix' command.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 60# (beep beep)
Enter: [user number] # (beep beep)
Enter: [new toll restrict mode 0-2] # (beep beep beep beep beep)

The toll restrict mode may be one of the following:

0 = No toll restriction
1 = 0+ toll restriction
2 = Total toll restriction

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER to get the User Menu. Select the correct menu item by typing '13' followed by ENTER and the toll restrict mode will be shown along with a message instructing you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the toll restrict mode changes. Once you have enabled or disabled the repeat function, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

By default, all of the users are programmed with 0, no toll restriction.

TONE DROP MODE

When a call has come into the Model 40, and the caller has selected a user to call, the Model 40 generates CTCSS or DCS (depending on the CTCSS/DCS encode) and sends out the selective signaling, and then the ringing. If the tone drop mode is turned on, CTCSS or DCS will be dropped when the mobile answers. If it is turned off, the encode will continue for the duration of the call.

If the system has a fleet of mobiles that are on the same tone, you will want the tone to drop when the correct mobile answers, otherwise everyone else in the fleet will have to listen to the call. If the system has a tone per user, leave the tone drop mode off (no) so that the mobile won't have to hear additional channel traffic.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 59# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0=no, 1=yes] (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER and the User Menu will appear. Select the correct menu item by typing '11' followed by ENTER and the current tone drop mode will appear along with a message instructing you to press any key to change the data and to press ENTER to accept the data. Each time a key is pressed, the tone drop mode changes. Once the tone drop mode you desire is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

By default, none of the users have the tone drop mode turned on (yes).

USER DIAL-IN MODE

When referring to a user, there are two ways to tell the Model 40 which user you want to call; you may use the user's ANI, or you may use the user number. The 'user dial-in mode' lets you select the method of referring to the users in the system when calling them. The user number is simply the slot in the user database that is taken by that user's programming, and is a number between 1 and 99. The ANI (automatic number identification) is a programmable 'tag' that you can assign to a user and can be any length from 1 to 8 digits. You still can only enter 99 user definitions, but each may be referenced with a unique ANI.

Both the local line and line 1 may have separate methods for calling users. The user dial-in mode command allows you to set it for each line with a single command.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 12# (beep beep)
Enter: [new user dial-in mode 1-4] # (beep beep beep beep beep)

The selections for user dial-in mode are:

Mode 1:	Local telephone requires user number. Telco requires user number.
Mode 2:	Local telephone requires user number. Telco requires ANI.
Mode 3:	Local telephone requires ANI. Telco requires user number.
Mode 4:	Local telephone requires ANI. Telco requires ANI.

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '1' and press ENTER to get the Mobile System Menu. Once in the Mobile System Menu, item 10 is the 'user dial-in mode' setting. Type '1' followed by ENTER and the user dial-in mode will be shown along with a message that instructs you to press any key to change the data, and to press ENTER to accept the data. Each time a key is pressed, the user dial-in mode changes. Once the user dial-in mode you desire is displayed, press ENTER to set the new value. If you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

The default user dial-in mode is 'mode 1'; local requires user number / telco requires user number.

USER ENABLE

The 'user enable' command is used to turn users on and off. Regardless of how the user has been programmed, access will be totally denied to the interconnect until the user is enabled.

Application Note: Customers that have delinquent accounts can be disabled using this command and enabled later. By doing this, you don't have to reprogram the user's parameters, you simply re-enable the user when the account is settled.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 50# (beep beep)
Enter: [user number] # (beep beep)
Enter: [0 = disabled, 1 = enabled] (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '3' and press ENTER and the User Menu will appear. Select the correct menu item by typing '2' followed by ENTER and the enable/disable status for the current user will appear along with a message instructing you to press any key to change the data and to press ENTER to accept the data. Each time a key is pressed, the user status changes. Once the desired status is displayed, press ENTER to accept the new value. Note that if you accidentally pass the setting that you want, keep pressing a key and the Model 40 will wrap around (i.e. when the last choice is displayed, it will return to the first one).

By default, none of the users are enabled, so you must enable at least one before you may make any calls.

USER RANGE

It is likely you will want a large number of users programmed the same with regard to things like mobile-to-mobile operation, or courtesy tone, etc. To accommodate this likelihood, during modem or RS232 programming with a terminal or computer, the Model 40 has the ability to program a range of users.

The user range may be set to anything, as long as the starting and ending users are within 1 to 99, and the starting user number is lower than the ending user number. To program a single user, set both the starting and ending user number to the user number you want to program. For example, a range could be 5-50 to program a group of users, or it could be 1-1 (displayed simply as 1) to program a single user. Note that when the range is set to a single user, the Model 40 will only display the user range as a single number. Also note that the list users command will only list users in the user range and if the user range is set to a single user, list users will only display that one user.

When you execute one of the programming commands from the User Menu, and there is a user range specified, the Model 40 will prompt you as to whether you want to program all of them (in the user range) in one keystroke, or if you would like to review and alter each of them individually. If you elect to let the Model 40 program them all without reviewing them, it will change all of the users in the user range and give you a prompt when it is finished. If you would like to program a certain parameter for a range of users, but you want them to be different, the Model 40 will show you each user one-at-a-time and allow you to change each independently from the other users. If you decide you don't want to continue, press CTRL-C to abort.

Some of the commands in the User Menu are not allowed to be programmed over a range. Such items include ANI access code, call format, call code, program all parameters, and reset airtime accumulation. These should be programmed individually because there can't be more than one user with any of the above parameters programmed identically.

The user that is displayed is the first user in the range. This user is called the 'current user'. If you execute a command that can only be programmed one user at a time (see above), only the current user will be changed. The 'program all parameters' command will also only change the current user.

DTMF programming has a similar function, although it will only allow you to program all of the users, not a range. To program all of the users in DTMF programming, enter 00 as the user number. The Model 40 will program all of the users with the data you give it.

VOX HOLD TIME

The VOX hold time controls the sensitivity of the VOX detector and only affects the simplex modes that use the VOX detector. This setting determines how quickly the Model 40 will flip to the mobile side of the conversation after seeing the VOX drop. Setting the VOX hold time longer, desensitizes the VOX detector and makes the Model 40 wait longer before switching to the mobile. Setting the VOX hold time shorter makes the VOX detector more sensitive and causes the Model 40 to switch over to the mobile sooner.

If the VOX hold time is set too long, the conversation will slow down because it takes longer to switch to the mobile. If it is set too short, then the Model 40 will sample too often and the conversation will be disrupted.

How to program it:

1) Using DTMF either over the air, on the telephone line, or through the local telephone port:

Enter the program mode using the program access code (default is 0012123).

Enter: 31# (beep beep)
Enter: [new VOX hold time 0-25] # (beep beep beep beep beep)

2) Programming via a computer or terminal either connected directly to the Model 40 or connected to the Model 40 through its optional modem and a modem connected to your PC:

Once connected to the Model 40 and the Main Menu is on the screen, type '5' and press ENTER and the Simplex Menu will appear. Select the correct menu item by typing '2' followed by ENTER. The current setting for the VOX hold time will appear along with a message instructing you to enter the new value and the range of values you may enter. Enter the new time and press ENTER when you have finished.

The default is 20 (2 seconds) and may be set from 0 seconds to 2.5 seconds in 100-millisecond increments.

6. ZETRON ZCU/ZEBRA

SYSTEM REQUIREMENTS FOR ZCU/ZEBRA

Zetron offers two PC software packages for billing and device configuration retrieval; Zetron Communications Utility (ZCU) and ZEBRA. ZCU provides the following functions:

Terminal emulator to dial and program the Model 40
Downloading airtime totals to disk
Downloading SMDR call detail records to disk
Downloading of Model 40 configuration data to disk
Uploading of configuration data to the Model 40

The device configuration is a back-up on disk of how the Model 40 is programmed. If for any reason the memory is lost in the Model 40 or a new unit needs to be installed, you may upload the device configuration to restore all programming.

ZEBRA is the accounting software for billing customers using the data that ZCU has downloaded from the Model 40. If you aren't billing, you only need ZCU to upload and download the Model 40's programming.

Refer to the ZCU/ZEBRA User's Guide for detailed instructions.

COMMANDS SUPPORTED IN THE MODEL 40

The Model 40 System Patch supports the following commands:

Download Billing Information
This command is used to retrieve the accumulated airtime counts and SMDR call detail records from the Model 40. SMDR records may only be downloaded when the SMDR option has been ordered. Only enabled users with accumulated airtime will be downloaded to the computer.

Clear Billing Information
The user may wish to clear all SMDR records in the Model 40. This command may be done using the computer. Note that SMDR records may be restored using the 'OOPS!' command in the Accounting Menu up until the point that another SMDR record is stored. Once another record is stored, all of the cleared records will be lost.

Download Device Configuration
Device configuration refers to how the Model 40 is programmed, including all system programming, user programming and autodials. ZCU offers the capability to store the entire Model 40 programming on disk. In case of a major fault in the Model 40 memory such as a nearby lightning strike, the repaired unit or a standby unit may be programmed quickly and accurately via the computer.

Upload Device Configuration
This is the companion command to the above download command. This command will re-program a Model 40 from disk.

INTERFACING THE COMPUTER TO THE MODEL 40

The computer may communicate with the Model 40 by various methods. They are:

1. Direct connection to the Model 40 RS-232 serial data port.

2. A modem connected to a PC communicating with the Model 40 over its telephone line.

3. Packet radio controllers may be used between the devices for "over the air" communication.

When calling the Model 40 remotely using a modem, you may communicate at either 300 or 1200 baud. It will sense the speed of the calling modem, so there is no need to set the baud rate of the modem. When communicating with the Model 40 locally (using a terminal or local PC), you may run up to 19200 baud. The local speed may be different from the modem speed.

ADDITIONAL FEATURES

ZCU provides a terminal emulator. If directly connected, the computer may be used as a dumb terminal for programming the Model 40. Be sure the baud rate is set correctly between the units. The terminal emulator feature allows the communication session to be logged to disk for later viewing or printout. It is a good idea to use the terminal feature to verify communications between the units.

For additional information, consult the ZCU User's Guide.

IN CASE OF DIFFICULTY...

The most common problems in interfacing ZCU to a Model 40 are related to cable connections, baud rate and password. See below:

Direct Connection of Computer to Model 40
First check the cable connections between the computer and the Model 40. Only three wires are required. The RS-232 connections are different on each computer based on the type and manufacturer of the serial communications card installed in the computer. Many brands and types are available, all with different connectors and pinouts.

To verify proper RS-232 communications between the computer and the Model 40, execute ZCU by typing ZCU and pressing ENTER at the DOS prompt. At the main menu, select 'Terminal Mode' and press ENTER. The screen should be blank with a menu bar at the top of the screen. Press ENTER, a menu should appear. If nothing appears on the screen, the baud rate may be incorrectly set. The baud rate can be changed using DTMF programming over the radio channel, through the local phone port, or the baud rate of the ZCU package may be changed for the particular device with the 'Edit Devices' command.

If nothing appears on the screen, disconnect the cable to the Model 40. Short pin 3 to pin 5 on the Model 40 end of the cable. Now press a number on the computer. It should not appear on the computer screen. If it does, something is wrong either with the cable or the computer. Remove the short between pins 3 and 5, then short pin 3 to pin 4. Press some number keys on the computer. They should appear on the screen. If not, there is something wrong with the cable or the computer. If both of these tests pass, the baud rate of the Model 40 must be in error.

If the RS-232 programming functions in the terminal mode but ZCU won't communicate with the Model 40, check the password. The password must be identical to the program access code of the Model 40, including the preceding zeros (the default is 0012123). Remember that the first two zeros are ALWAYS there, only the last five digits are programmable. Be sure the Model 40 is out of the program mode, or has just been powered up before trying to communicate with ZCU.

7. INSTALLATION

INSTALLATION WARNING

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. Installation of the Model 40 System Patch should only be attempted by qualified radio service personnel.

For instructions on installing a new IC chip, see "Installing a New PROM" at the end of this section.

GENERAL

Connections to the transmitter, receiver, and power are grouped on a detachable terminal strip on the rear for ease of installation. The Model 40 includes installation test modes to aid in installation. Adjustments may be made by removing the cover of the Model 40.

EQUIPMENT REQUIRED FOR INSTALLATION

Required equipment includes: (1) a communications service monitor, (2) a handheld or mobile radio with DTMF encode capability, or a DTMF telephone, (3) a VOM (volt-ohm-meter).

SOFTWARE REQUIREMENTS

When the Model 40 is connected to a Model 38 or 39 tone panel:

The Model 40 must have software version 1.1 or later.
The Model 38 must have software version 4.8 or later.
The Model 39 must have software version 1.2 or later.

INSTALLATION PROCEDURE

1. Remove the 15-pin screw-terminal connector from the rear of the Model 40.

2. POWER SUPPLY: Locate the 12-volt DC supply for the repeater receiver and transmitter. With a VOM, measure the DC voltage. It should be between 10.5V and 15.0V. If 12-volt DC is not available, a 9-volt AC wall transformer may be used. For DC operation, connect the power supply ground lead to pin 3, and the positive supply lead to pin 1. For 9-volt AC operation, connect between pins 1 and 2 (pin 1 is internally fused).

3. GROUND CONNECTION: Connect a chassis ground wire from pin 3 to the chassis ground of the transmitter/receiver.

4. TRANSMITTER PTT: For most transmitters, a contact closure to ground will cause the transmitter to key up. For this configuration, connect a wire from pin 7 (relay N.O. contact) to the PTT input of the transmitter, then ground pin 6 (relay common contact).

5. TRANSMITTER AUDIO OUTPUT: Connect pin 11 to the mic or line input of the transmitter. Shielded cable must be used for this connection, connect the braid to pin 12.

6. CTCSS/DCS ENCODE: Connect pin 13 to the direct modulation or CTCSS tone input of the transmitter. If using DCS, the transmitter MUST be capable of direct frequency modulation, and this input must be connected to the direct modulation input on the transmitter. Shielded cable must be used for this connection, connect the braid to pin 12.

7. DISCRIMINATOR INPUT: Connect pin 15 to the receiver discriminator output. Shielded cable must be used for this connection, connect the braid to pin 14.

8. COR INPUT: Connect pin 10 to the carrier active sensor in the receiver. The signal must be between 0 and 7 VDC, and change at least 1 volt between carrier and no-carrier conditions. The COR LED will indicate the presence or lack of carrier. If the indication is wrong, the polarity may be changed via the jumper marked "COR POLARITY". For installation on a receiver with CTCSS or DCS decode, connect the COR INPUT to the receiver CTCSS or DCS decoder output. A built-in squelch detector can be used if a carrier indication from the receiver is not readily available.

9. CHANNEL BUSY INPUT: The channel busy input is used to prevent the Model 40 from keying up when the radio channel is in use. This is necessary especially when the COR INPUT is connected to a CTCSS or DCS decoder. Connect pin 9 (SENSE 1 INPUT) to the carrier active sensor in the receiver, or the busy output from another piece of equipment. The channel busy input is an active low pin (low=busy), if unconnected floats high (not busy).

10. Remove the top cover from the Model 40.

11. Reconnect the screw terminal connector.

CONNECTING A MODEL 38/39 TO THE MODEL 40

A cable kit is available to simplify the interfacing of a Model 40 to a Model 38 or Model 39 tone panel (Zetron P/N 709-7165).

1. Power- If using AC power supply, parallel pins 1 and 2 between the orange connector (TB1) on the Model 38/39 and the orange connector (J4) on the Model 40. If using DC power, parallel pins 1 and 3 between TB1 on the Model 38/39 and J4 on the Model 40. Run power leads from the Model 38/39 to the AC or DC source.

2. PTT- If using a repeater requiring a ground for PTT, on the orange connector on the back of the Model 38/39, connect pin 6. TB1 (PTT COMMON) to pin 4, TB1 (GROUND). Then connect pin 7, TB1 (PTT N.O.) on the Model 38/39 to pin 7, J4 (PTT N.O.) on the Model 40. Finally connect pin 7, TB1 on the Model 38/39 to the radio PTT input. If using a repeater which requires A+ for PTT, connect pin 6, TB1 to the PTT source voltage.

3. Discriminator Input- Connect pin 15, TB1 (DISC) on the Model 38/39 to pin 15, J4 (DISC) on the Model 40. Connect the discriminator output from the receiver to pin 15, TB1 on the Model 38/39.

4. COR- Connect pin 10, TB1 (COR INPUT) on the Model 38/39 to pin 10, J4 (COR INPUT) on the Model 40. Run the COR indication line from the repeater receiver to pin 10, TB1 on the Model 38/39.

5. Transmit Audio- Connect pin 11, TB1 (TX AUDIO) on the Model 38/39 to pin 8 on the Model 40's rear panel DB-9 connector. Connect pin 11, J4 on the Model 40 to the repeater transmitter audio input.

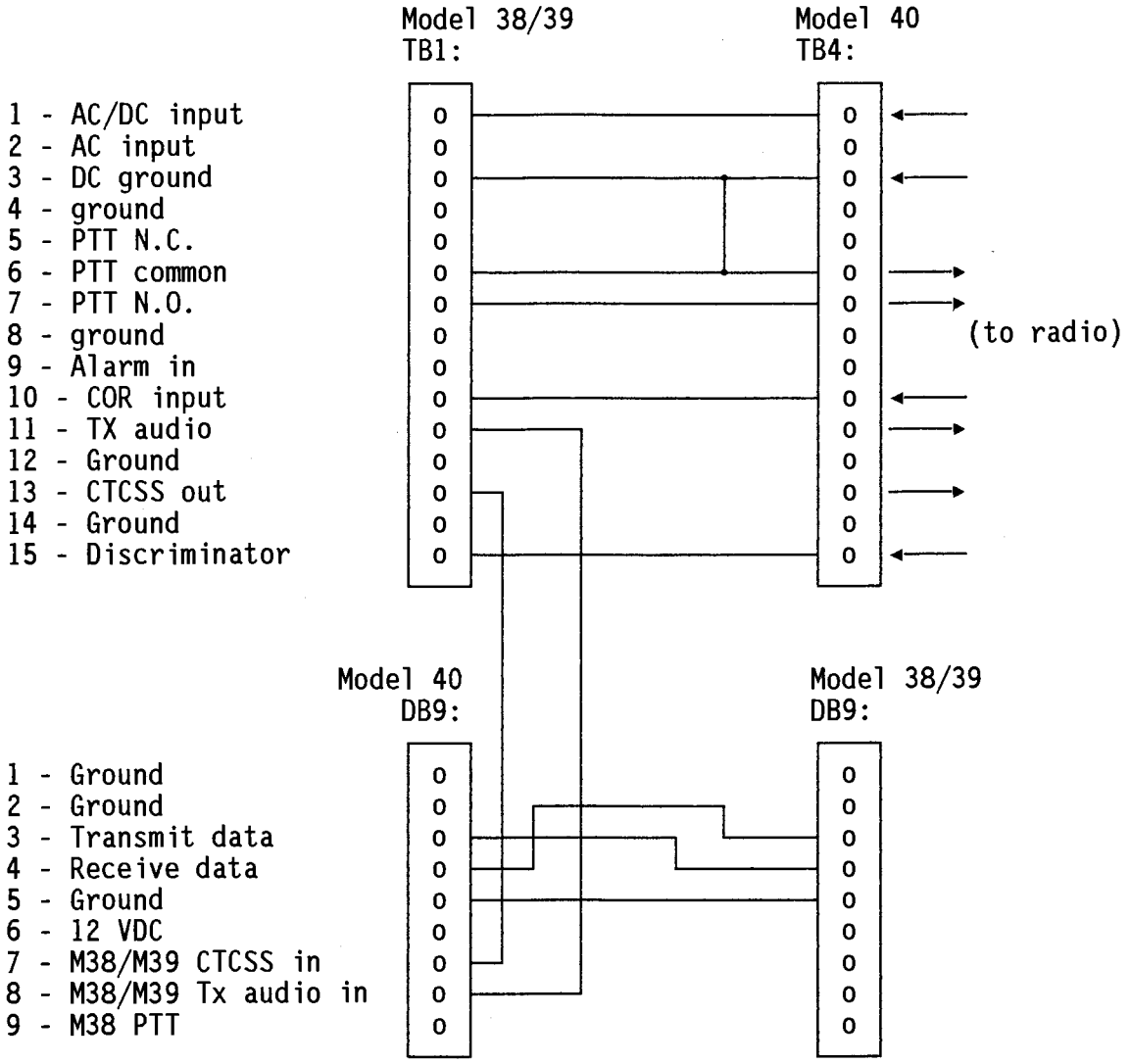
6. CTCSS Out- Connect pin 13, TB1 (CTCSS OUT) on the Model 38/39 to pin 7 on the Model 40's rear panel DB-9 connector. Connect pin 13, J4 on the Model 40 to the repeater transmitter CTCSS input.

7. TX Data- Connect pin 3 of the Model 38/39's front panel DB-9 connector to pin 4 of the Model 40's rear panel DB-9 connector.

8. RX Data- Connect pin 4 of the Model 38/39's front panel DB-9 connector to pin 3 of the Model 40's rear panel DB-9 connector.

Note: Set the Model 38/39 levels after the Model 40 levels have been set. Follow the instructions for setting levels in the Model 38/39 manual.

The following diagram shows the proper connections for connecting a Model 38/39 and a Model 40:



TESTS AND ADJUSTMENTS, INITIAL TURN-ON

Using a local DTMF telephone: (DTMF setup commands not available via radio)

1. ACCESS THE PROGRAM MODE: Plug a telephone into the local telephone port on the back of the Model 40 (leftmost when viewed from the rear). Pick up the phone, and at the dial tone, key in the DTMF program mode access code. It is initially set to "0012123". When the mode is accessed, a high pitched modem tone followed by alert tones will be sent to the telephone.

2. ENTER TEST MODE, SET TX AUDIO GAIN: Enter the command "111#". The transmitter will be keyed and a 1 kHz tone will be transmitted. This is the TX audio gain setting test. Make sure JP5 is in the "B" or "LOW" position. Using the service monitor, adjust the pot labeled "TX AUD" until the Model 40 is transmitting at +/- 3 kHz deviation. If you can't adjust the TX gain high enough, move JP5 to the "A" or "HI" position, and readjust the "TX AUD" pot. THIS IS NOT THE REPEAT AUDIO LEVEL TEST!

3. SET TX EMPHASIS: Enter the command "1". A tone of 250 Hz will be generated. Each time a "1" is entered, the tone will change. You can select from the following tones: 250, 500, 1K, 2K, 3K. When the Model 40 is generating 2K, pressing "1" will return to 250 Hz. Normally, audio tones generated by the Model 40 for selective signaling should be transmitted FLAT (i.e. all tone frequencies are sent at the same deviation). Most transmitters pre-emphasize (i.e. low tones are sent at lower levels than high tones) transmit audio (mic audio input). To obtain a flat response, the Model 40 must de-emphasize (low tones are sent at a higher level than high tones) the selective signaling tones in order to compensate for the transmitters pre-emphasis. If for any reason you wish to have pre-emphasized tones, set the jumper (JP11) to "FLT". This will force the Model 40 to transmit its tones flat, with the transmitter pre-emphasizing the audio sent to it. In either case, use a service monitor to verify that the tones are actually flat or pre-emphasized. Enter "#" to exit the TX EMPHASIS test. If the emphasis is changed, the level should be checked and re-adjusted if necessary (step 2).

4. CTCSS GAIN SET: Enter "111#2" to enter the CTCSS gain test. The Model 40 will generate 136.5 Hz. Make sure jumper (JP9) is in the "A" or "LOW" position. Using a service monitor, adjust the pot marked "SUB-OUT" so that the Model 40 is transmitting CTCSS tones at +/- 750 Hz deviation. If the level can't be adjusted high enough, move jumper (JP9) to the "B" or "HI" position, and re-adjust the "SUB-OUT" pot.

5. SET CTCSS EMPHASIS: Enter "3" to enter the CTCSS pre-emphasis test. The Model 40 will generate 67.0 Hz. Each time a "3" is entered, the tone will change. You can select from the following tones: 67.0, 136.8, 250.3. When the Model 40 is generating 250.3 Hz, pressing "3" will return to 67.0 Hz. CTCSS must be transmitted over the air FLAT, so if the transmitter pre-emphasizes the CTCSS, the Model 40 must compensate by de-emphasizing it. If the transmitter transmits the CTCSS flat, then the Model 40 must also transmit CTCSS flat. Enter

"3" several times, and using a service monitor, make sure the CTCSS tones are transmitted flat. If not, change the jumper marked "SUB-EMP" and confirm that the CTCSS tones are transmitted flat. Enter "#" to exit the CTCSS EMPHASIS test. Note that if the emphasis jumper was moved, the CTCSS GAIN may need readjustment.

6. SET REPEAT AUDIO GAIN: Enter "5" to enter the repeat audio gain test. Set jumper (JP7) to the "A" or "20" position and set the "AUD IN" (JP15) jumper to the "A" or "FLAT" position. Supply a 1kHz test tone of known deviation on the receiver frequency, then monitor the deviation of the transmit frequency. Adjust the "RX AUD" pot for unity gain (input deviation = output deviation). If the level cannot be adjusted high enough, move jumper JP7 to the "B" or "40" position, and re-adjust. Now insert 500 Hz, 1000 Hz, and 2000 Hz. The output deviation should be flat. If not, move the "AUD IN" jumper to the "B" position. If the jumper is moved, check the output level and re-adjust if necessary.

7. DTMF DECODE TEST: Enter "6" to enter the DTMF decode test mode. Enter any numerical digit and verify that the DTMF decode LED on the front panel illuminates and count the beeps back and verify that the number of beeps matches the digit entered. Either a "#" or a "*" will exit from this test. Note that the Model 40 will revert back to the TX GAIN test until another command is given.

8. EXIT TEST MODE: Enter "#" to return to the program mode. Enter "0#" to exit the program mode and return to the online mode.

9. COR (SQUELCH) ADJUSTMENT: Set JP10 to the "A" or "EXT" position. The "COR POLARITY" jumper sets the COR polarity. Adjust the "COR" pot while watching the CARRIER LED for optimum performance. The CARRIER LED will be lit when the Model 40 is detecting carrier. To use the internal noise detector, set JP10 to the "B" or "INT" position. Adjust R71 to the midway point. If the carrier LED is on, adjust R112 until its LED goes out. If you cannot adjust it so the LED goes out, change the polarity jumper (JP13) and readjust R112 again. Once the LED is off, key a radio and verify that the carrier LED comes on.

10. SET THE HYBRID BALANCE: Connect the outside phone line to line #1, call the Model 40 from another phone and access the DTMF programming mode. Enter "111#4" to enter the hybrid balance test. The Model 40 will key the transmitter and send a 1kHz tone out the telephone line. The tone will bounce off the hybrid and be transmitted out the transmitter. Using a service monitor, set to transmit frequency, adjust the balance pot marked 'R' for the lowest transmitted tone deviation. Once that point is reached, adjust the pot marked 'C', again looking for the minimum transmitted tone deviation. Adjust the hybrid in the same way again for optimum results. Hybrid balance is important for proper modem operation. This test must be done from line #1 to ensure that the hybrid is balanced to that line.

Using a local terminal through the RS-232 port:

1. ACCESS THE PROGRAM MODE: Connect the terminal to the Model 40 running at 4800 baud (factory setting), with 8 data bits, 1 stop bit and no parity, press the ENTER key. The main menu should appear on the terminal. Press 4 ENTER to access the diagnostics menu.

2. SET TX AUDIO GAIN: Press 2 ENTER. The transmitter will be keyed and a 1 kHz tone will be transmitted. This is the TX audio gain setting test. Make sure JP5 is in the "B" or "LOW" position. Using the service monitor, adjust the pot labeled "TX AUD" until the Model 40 is transmitting at +/- 3 kHz deviation. If you can't adjust the TX gain high enough, move JP5 to the "A" or "HI" position, and readjust the "TX AUD" pot. THIS IS NOT THE REPEAT AUDIO LEVEL TEST!

   Press ENTER when the level is correct.

3. SET TX EMPHASIS: Press 3 ENTER. A tone of 250 Hz will be generated. Each time a key (other than ENTER) is pressed, the tone will change. You can select from the following tones: 250, 500, 1K, 2K, 3K. When the Model 40 is generating 2K, pressing a key will return to 250 Hz. Normally, audio tones generated by the Model 40 for selective signaling should be transmitted FLAT (i.e. all tone frequencies are sent at the same deviation). Most transmitters pre-emphasize (i.e. low tones are sent at lower levels than high tones) transmit audio (mic audio input). To obtain a flat response, the Model 40 must de-emphasize (low tones are sent at a higher level than high tones) the selective signaling tones in order to compensate for the transmitter's pre-emphasis. If for any reason you wish to have pre-emphasized tones, set jumper JP11 to "FLT". This will force the Model 40 to transmit its tones flat, with the transmitter pre-emphasizing the audio. In either case, use a service monitor to verify that the tones are actually flat or pre-emphasized. If the emphasis is changed, the level should be checked and re-adjusted if necessary.

   Press ENTER when the emphasis is correct.

4. CTCSS GAIN SET: Press 4 ENTER. The Model 40 will generate 136.5 Hz. Make sure jumper JP9 is in the "A" or "LOW" position. Using a service monitor, adjust the pot marked "SUB-OUT" so that the Model 40 is transmitting CTCSS tones at +/- 750 Hz deviation. If the level can't be adjusted high enough, move jumper JP9 to the "B" or "HI" position, and re-adjust the "SUB-OUT" pot.

   Press ENTER when the CTCSS level is correct.

5. SET CTCSS EMPHASIS: Press 5 ENTER. The Model 40 will generate 67.0 Hz. Each time a key (other than ENTER) is pressed, the tone will change. You can select from the following tones: 67.0, 136.8, 250.3. When the Model 40 is generating 250.3 Hz, pressing a key will return to 67.0 Hz. CTCSS must be transmitted over the air FLAT, so if the transmitter pre-emphasizes the CTCSS, the Model 40 must compensate by de-emphasizing it. If the transmitter transmits the CTCSS flat, then the Model 40 must also transmit CTCSS flat. Press a key several

times, and using a service monitor, make sure the CTCSS tones are transmitted flat, if not, change the jumper marked "SUB-EMP" and confirm that the CTCSS tones are transmitted flat. Note that if the emphasis jumper was moved, the CTCSS GAIN may need readjustment.

Press ENTER when the emphasis is correct.

6. SET THE HYBRID BALANCE: Call the Model 40 on line #1 from another phone and while it is ringing, press 6 ENTER. The Model 40 will key the transmitter and send a 1kHz tone out the telephone line. The tone will bounce off the hybrid and be transmitted out the transmitter. Using a service monitor, adjust the balance pot marked 'R' for the lowest transmitted tone deviation. Once that point is reached, adjust the pot marked 'C', again looking for the minimum transmitted tone deviation. Adjust the hybrid in the same way again for optimum results.

   NOTE: The hybrid may NOT be checked or adjusted if the Model 40 is being setup or tested using the dial-up modem.

   Press ENTER when the hybrid is balanced.

7. SET REPEAT AUDIO GAIN: Press 7 ENTER. Set jumper JP7 to the "A" or "20" position and set the "AUD IN" jumper, JP15, to the "A" or "FLAT" position. Supply a 1kHz test tone of known deviation on the repeater receiver frequency (input), then monitor the deviation of the repeater transmit frequency (output). Adjust the "RX AUD" pot for unity gain (input deviation = output deviation). If the level cannot be adjusted high enough, move the "IN LVL" jumper to the "B" or "40" position, and re-adjust. Now insert 500 Hz, 1000 Hz, and 2000 Hz. The output deviation should be flat. If not, move the "AUD IN" jumper to the "B" position. If the jumper is moved, check the output level and re-adjust if necessary.

   Press ENTER when repeat audio is set.

8. DTMF DECODE TEST: Press 8 ENTER. Enter any numerical digit and verify that the DTMF decode LED on the front panel illuminates and that the correct digit is displayed on the terminal.

   Press ENTER when DTMF decodes reliably.

9. EXIT TEST MODE: Press E ENTER to return to the main menu. Press E ENTER again to exit the program mode.

10. COR (SQUELCH) ADJUSTMENT: Set JP14 to the "A" or "EXT" position. The "COR POLARITY" jumper sets the COR polarity. Adjust the "COR" pot while watching the CARRIER LED for optimum performance. The CARRIER LED will be lit when the Model 40 is detecting carrier. To use the internal noise detector, set JP10 to the "B" or "INT" position. Adjust R71 to the midway point. If the carrier LED is on, adjust R112 until its LED goes out. If you cannot adjust it so the LED goes out, change the polarity jumper (JP13) and readjust R112 again. Once the LED is off, key a radio and verify that the carrier LED comes on.

MISCELLANEOUS HOOKUP NOTES (on interfacing to a Model 38/39)

1. The Model 38/39 may be programmed remotely using a dial up modem if the Model 40 has the optional internal modem and modem software installed. This provides a simple method of programming new system users and billing users for accumulated dispatch airtime.

2. The Model 38 must have software version 4.8 or later.
   The Model 39 must have software version 1.2 or later.

3. Set the Model 38/39 levels after the Model 40's levels have been set. Follow the instructions for setting levels in the Model 38/39 manual.

4. CTCSS/DCS encode levels will always be sent flat from the Model 38/39. Make sure switch 5 on the Model 38/39 back panel DIP switch is set to the flat or "off" position. The Model 40 provides the proper audio output shaping for both the Model 38/39 and the Model 40. If deemphasized CTCSS encode is needed for use with some phase modulated transmitters, place jumper JP12 (inside the Model 40) in the "A" or deemphasized position. If flat audio is required for a direct or true FM transmitter, place JP12 in the "B" or flat position.

5. Transmit voice audio is processed in a slightly different manner. If unfiltered discriminator audio is used (unfiltered discriminator audio is required for the proper operation of the Model 38/39), both the Model 38/39 and the Model 40 must be set for deemphasis. On the Model 38/39, place switch 4 on the rear panel DIP switch in the deemphasis or "on" position. Inside the Model 40, place jumper JP15 in the "B" or "Disc" position.

6. When programming the Model 38/39, set the "Serial Tone" feature to "on". The Serial Tone output provides an RS-232 signal indicating which user number is being decoded by the Model 38/39. This signal indicates which CTCSS/DCS user is attempting to place a phone call. The Model 40 can then be programmed to require a correct CTCSS/DCS for telephone interconnect access. In order for this to function, the baud rate in the tone panel must match the "Local port speed" setting in the Model 40. If you are going to use the modem in the Model 40 to program both the tone panel and the Model 40 remotely, you must set the baud rate to 300 or 1200 baud to match the local modem you plan to use. To get the maximum decode performance from your Zetron Tone Panel, set the baud rate in the Model 40 to match. Perform the following programming BEFORE attempting this installation.

   Model 38: Using your terminal or PC running terminal emulation software, select "System Programming", then select item 2, "Program System", and set "Serial Tone" to "On". Return to the "System Programming" menu and select item 5, "Set Baud Rate". Set this "6" for 4800 baud, "4" for 1200 baud or "2" for 300 baud. Default is 300 baud. Now cycle power to update the baud rate.

Model 39: Using the front panel keypad, select "System Programming" and set "Serial Tone" to "on". Set "Baud Rate" to "7" for 9600 baud, "4" for 1200 baud or "2" for 300 baud. Note: Changing baud rate on a Model 39 is immediate. Use caution if using a terminal to program the Model 39.

Model 40: Using your terminal or PC running terminal emulation software, select "Mobile System Menu" and set item 12, "Local port speed", to the same baud rate as the tone panel you are using. Now cycle power to update the baud rate.

CONNECTIONS TO SPECIFIC RADIOS

Connection to a GE MASTR II Base/Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Station Supply +12VDC
12 Volts AC input	2	---	
DC ground	3	Black	Station Supply Ground
Ground	4	Drain	No Connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	J931 Pin 14, Local PTT
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	J932 Pin 18, CAS
Tx audio	11	Blue	J933 Pin 6 OLD, Control board P2 Pin 4 NEW IDA
Ground	12	---	
CTCSS/DCS encode	13	Green	J933 Pin 3, CG Hi
Ground	14	Brown	J933 Pin 2, CG Lo
Discriminator in	15	White	J606 on IF/Audio/Sq board

MASTR II CONFIGURATION:

1. Two versions of the GE Repeater Control Panel exist. The "Earlier" version is identified by multiple plug-in cards, the 10 volt regulator card being on the far right. The "Later" version is a single panel (no plug-in cards), and is identified by the local mic connector, speaker and volume knob on the front. All connections are the same except the for TX AUDIO. On "Late" models, the audio is connected to the "battery alarm audio" point.

2. Remove the jumper between H16 and H17 (if installed) on the 10-volt regulator card.

3. If DCS decode is required, discriminator audio MUST be connected to J606 on the IF/Audio/Squelch board. If only CTCSS tone decode is required, discriminator audio may be connected to Volume Squelch Hi (J932 Pin 3).

4. Remove any existing repeater tone panel (card-per-tone), and "Repeater Audio" and/or "Repeater Control" cards (if installed).

5. If digital coded squelch encode is to be used, the exciter MUST be the newer style "FM" unit. If using the Audio Processor board number 19C321542G1, C105 must be 10uf, and C110 must be 22uf for proper digital encoding.

Connection to a GE Custom MVP

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Inside front panel, S701 (switched side)
12 Volts AC input	2	---	
DC ground	3	Black	Chassis Ground
Ground	4	Drain	No Connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	System Audio Squelch board, J911 (PTT)
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	System Audio Squelch board, J912 (CAS)
Tx audio	11	Blue	Exciter board, P902 Pin 4 (Mic Hi)
Ground	12	---	
CTCSS/DCS encode	13	Green	Exciter board, P902 Pin 9 (CG Hi)
Ground	14	Brown	Exciter board, P902 Pin 5 (Mic Lo)
Discriminator in	15	White	IF Detector board, junction of R606/R608/C622

GE MVP CONFIGURATION:

1. Cut circuit trace on top of System Audio Squelch board which runs from U902 pin 6 toward R11. Cut trace close to U902. This disables receiver muting on PTT.

2. Install a jumper between J904 pin 2 (rx osc control) and J904 pin 1 (10v reg) on the System Audio Squelch board. This provides a source of unswitched 10V to the receiver oscillator at all times.

Connection to a GE Exec II Base

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	H20 (A+)
12 Volts AC input	2	---	
DC ground	3	Black	Chassis Ground
Ground	4	Drain	No Connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	J907 pin 10 (PTT)
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	J913 pin 4 (CAS)
Tx audio	11	Blue	H36 (Tone Hi)
Ground	12	---	
CTCSS/DCS encode	13	Green	J907, pin 6 (CG Hi)
Ground	14	Brown	Gnd trace
Discriminator in	15	White	J907, pin 8 (vol hi)

GE EXEC II CONFIGURATION:

To modify the radio for full duplex (repeater) operation, do the following:

1. Remove Q905 and Q908 on the System Audio Squelch board (SAS board).
2. Install a wire jumper from Q908 emitter solder pad to Q908 collector solder pad.
3. Care should be taken not to damage the transmitter PA due to continuous duty operation.

Connection to a General Electric Mastr Pro Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	TB501 Pin 8 or 9, +12.6V
12 Volts AC input	2	---	
DC ground	3	Black	TB501 Pin 11 or 12, GRD
Ground	4	Drain	No connection
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	TB502 Pin 10, XMIT
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	TB502 Pin 16, COS FEED
Tx audio	11	Blue	J902 Pin 2, MIKE HI (mic connector)
Ground	12	---	
CTCSS/DCS encode	13	Green	P101 Pin 10, Tone Encoder In (xmitter)
Ground	14	Brown	No connection
Discriminator in	15	White	TB502 Pin 2, AUD CPLR HI

INSTALLATION NOTES:

1. Connect transmit audio directly to the microphone connector.

2. Verify the transmitter is equipped with the channel guard encode option. Remove any existing CTCSS tone encoder hardware.

3. Disable any channel guard decode in the receiver, or connect TB502 Pin 11 (CG MON) to ground.

Connection to an ICOM IC-RP1510 Repeater

ZETRON END Function	Pin	Color	RADIO END Connections
12 Volts AC/DC in	1	Red	Anode DC, pwr bus
12 Volts AC input	2	---	
DC ground	3	Black	J2 pin 1, GND (logic board)
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	J2 pin 5, PTT (logic board)
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	P5 pin 2, Sqlsw (green wire rx unit)
Tx audio	11	Blue	Junction of R49 and C20 (logic board)
Ground	12	---	
CTCSS/DCS encode	13	Green	Right side of R43 (logic board)
Ground	14	Brown	J2 pin 3, GND (logic board)
Discriminator in	15	White	Negative side of C32 (logic board)

RADIO CONFIGURATION:

1. Remove R22 (22K) to isolate PTT indication to control logic.
2. Isolate PTT control line from control logic by cutting trace next to J2 pin 6 (PTT).
3. Remove C20 (0.1uf) to isolate voice audio from summing amp.
4. Change R43 to 10K ohm, and cut trace between IC8 pin 7 and R43.
5. Remove C32 (0.47uf) to isolate discriminator output from logic board.

OPERATIONAL NOTES:

1. Squelch control on front panel sets COR for tone panel and speaker.
2. Front panel speaker will monitor all channel activity.
3. Microphone set on front panel will still function.
4. This transmitter is not capable of DCS encode.

Connection to an E.F. Johnson CR1000 Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Pin 21, Level Adjust Card
12 Volts AC input	2	---	
DC ground	3	Black	Pin 24, Level Adjust Card
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	Pin 19, Level Adjust Card
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Pin 12, Level Adjust Card
Tx audio	11	Blue	Pin 18, Level Adjust Card
Ground	12	---	
CTCSS/DCS encode	13	Green	Pin 22, Level Adjust Card
Ground	14	Brown	Ground
Discriminator in	15	White	Pin 11, Level Adjust Card

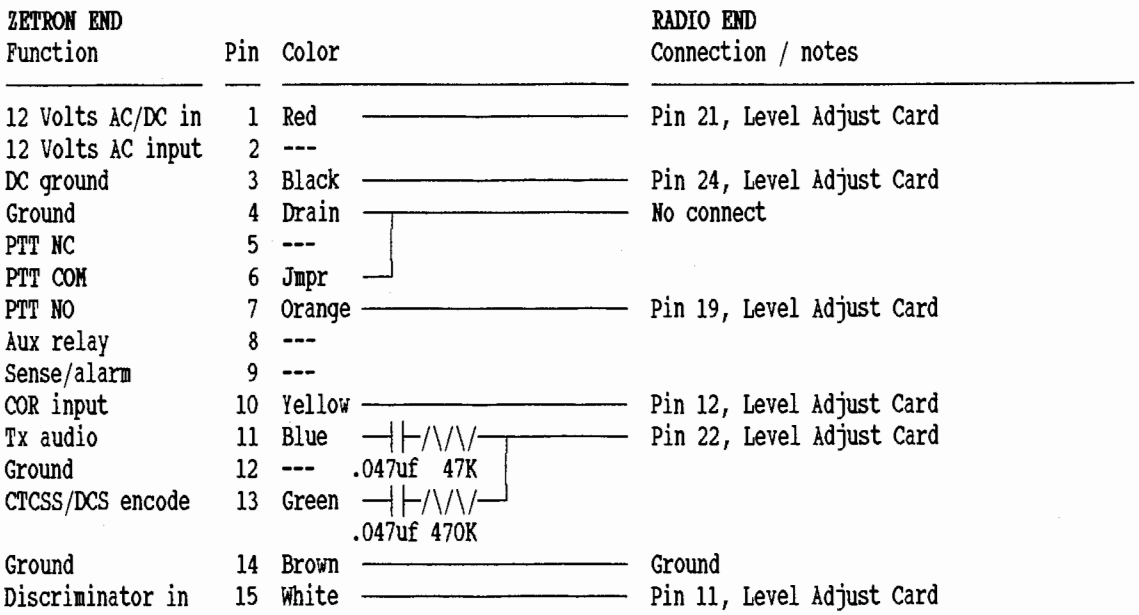
CR1000 CONFIGURATION:

1. Move the wire in the receiver off of J211, connect to U201 pin 6. This provides unfiltered receive audio to the Zetron device.

2. Disconnect one side of C709 on the Level Card.

3. Set the Repeat switches to: Access=tone, Repeat=off.

Connection to an E.F. Johnson CR1000, with DCS MODS



CR1000 CONFIGURATION:

1. Move the wire in the receiver off of J211, connect to U201 pin 6. This provides unfiltered receive audio to the Zetron device.

2. Disconnect one side of C709 on the Level Card.

3. Set the Repeat switches to: Access=tone, Repeat=off.

4. Modifications to exciter: remove C304, change R316 to 4.7K, short out C399, add a 0.47uf cap across C701 (TCXO), short U301 pin 5 to pin 10.

Connection to an E.F. Johnson CR1010 Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Logic Drawer Pin 15, +13.8V
12 Volts AC input	2	---	
DC ground	3	Black	Logic Drawer Pin 13, Gnd
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	Logic Drawer Pin 23, $\overline{PTT}$
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Logic Drawer Pin 19, Fast squelch
Tx audio	11	Blue	Exciter Drawer Pin 1, Tx audio
Ground	12	---	
CTCSS/DCS encode	13	Green	Logic Drawer Pin 18, Tx tone CG
Ground	14	Brown	Ground
Discriminator in	15	White	Logic Drawer Pin 5, CG Audio

CR1010 CONFIGURATION:

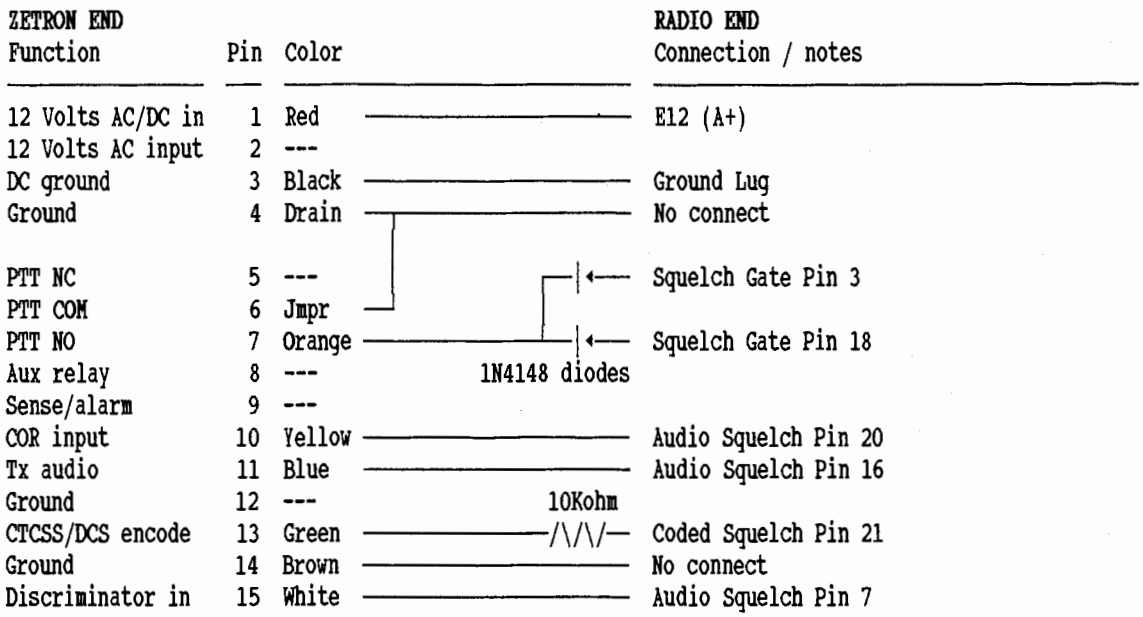
1. Remove the brown wire from receiver going to the exciter transmit audio (Pin 1).

   NOTE: This configuration uses the limiter and high-pass filter in the exciter. Since the Zetron device has a high-pass filter to remove the CTCSS or digital coded squelch encode from the repeat audio, as well as the exciter, two high-pass filters in series may degrade the audio quality. The repeat audio quality may be improved by deleting (bypassing) the high-pass filter in either the Zetron device or the exciter.

Connection to a Midland Basetech Repeater

ZETRON END Function	Pin	Color	RADIO END DB-9 connector Connection / notes
12 Volts AC/DC in	1	Red	Pin 1, +12.6V
12 Volts AC input	2	---	
DC ground	3	Black	Pin 3, Ground
Ground	4	Drain	No connection
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	Pin 5, PTT
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Pin 6, COS
Tx audio	11	Blue	Pin 2, AF
Ground	12	---	
CTCSS/DCS encode	13	Green	Pin 9, TONE
Ground	14	Brown	No connection
Discriminator in	15	White	Pin 3, RX DISC

Connection to a Motorola MSR 2000 Base/Repeater



MSR 2000 CONFIGURATION:

- Remove all jumpers on the RF control chassis backplane except JU1, JU4, JU5 and JU9
- Only R1 Audio and Station Control Modules are required
- Changes to control cards:
  - R1 Audio: install JU1 and JU101
    Remove JU2, JU103, JU104, JU105, CR2 and CR106
  - Station Card: install JU2 - JU8, remove JU9 - JU11
  - Line Driver: Remove JU15 and CR3

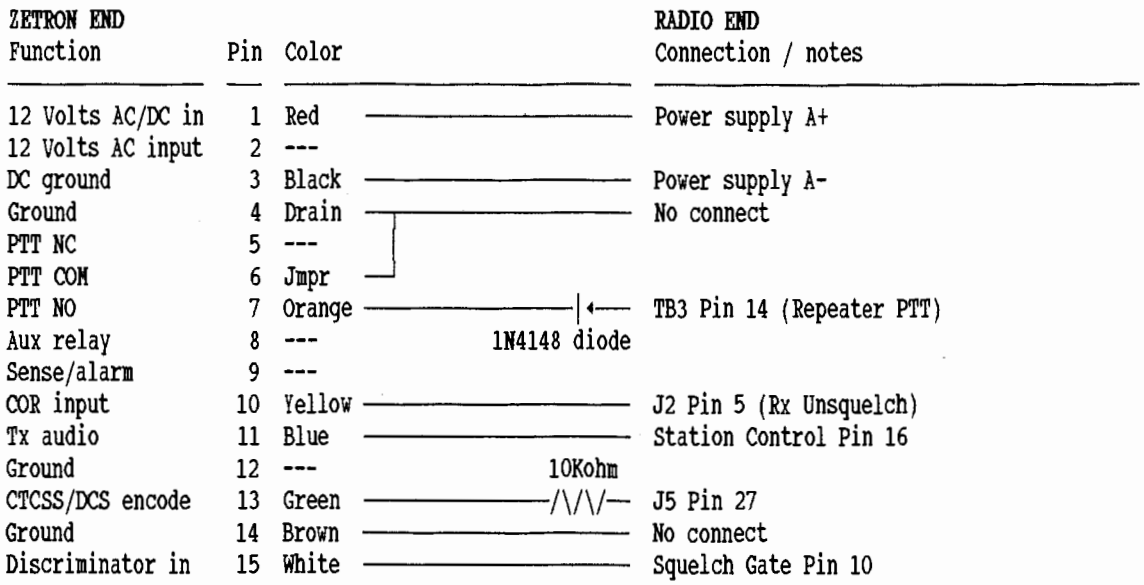
Connection to a Motorola MSF 5000 Repeater

ZETRON END Function	Pin	Color		RADIO END Connection / notes
12 Volts AC/DC in	1	Red	———	J800 Pins 1 and 2, or TB601 (A+) on pwr supply
12 Volts AC input	2	---		
DC ground	3	Black	———	J800 Pins 7 and 8, or TB601 (gnd) on pwr supply
Ground	4	Drain	———	No connect
PTT NC	5	---		
PTT COM	6	Jmpr		
PTT NO	7	Orange	———	J801 Pin 14
Aux relay	8	---		
Sense/alarm	9	---		
COR input	10	Yellow	———	Test Point 6 (0.5v SQ, 2.9v US)
Tx audio	11	Blue	———/\/\/—	U834 Pin 13 (1vpp=3kHz)
Ground	12	---	both 33Kohm	
CTCSS/DCS encode	13	Green	———/\/\/—	Wiper of R889 IDC pot (3vpp=0.75kHz)
Ground	14	Brown	———	No connect
Discriminator in	15	White	———	Test Point 3 (3kHz=1vpp)

MSF 5000 CONFIGURATION:

- Make all connections to the Station Control Module PCB.
- Set "AccDis" switch UP.

Connection to a Motorola Micor Community Repeater



MICOR CONFIGURATION:

1. Remove all modules except Station Control and the Squelch Gate card.

2. Modify the control modules as follows:
   a) Station Control: Jumper the "PL Disable" switch ON.
   b) Squelch Gate: Remove C17, in the exciter output line.

3. Modify Rx audio squelch board (TRN-6006A);
   Add jumper from U202 pin 10 to P903 pin 14.

4. Modify exciter board (TLE-1720A);
   Add jumper from IDC pot wiper to P902 pin 8, cut trace between P902 pin 8 and JU401.

5. Modify backplane board (TRN-6421A);
   Cut trace going to J2 pin 5, cut trace going to J5 pin 27.

Connection To a Motorola Micor Single-User Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
AC/DC input	1	Red	TB1 (A+) On the station power supply.
AC input	2	---	
DC ground	3	Black	TB1 (GND) On the station power supply.
Ground	4	Drain	To PTT Common (Pin 6) on Zetron device.
PTT NC	5	---	
PTT COM	6	Jmpr	To Ground (Pin 4) on Zetron device
PTT NO	7	Orange	Pin 3, F1/PL Card position on backplane and Pin 16, Guard Tone Card position on backplane. Use isolation diodes.
		1N4148 diode	
Auxiliary relay	8	---	
Alarm input	9	---	
COR input	10	Yellow	U202, pin 10 on the audio-squelch board.
Tx audio output	11	Blue	Pin 16, station control module.
Ground	12	---	
CTCSS output	13	Green	Wiper of IDC pot on exciter board. Use 10K series resistor to prevent circuit loading.
Ground	14	Brown	
Discriminator in	15	White	Pin 10, squelch gate module position on backplane.

MODIFICATIONS TO RADIO:

1. Remove all control cards from the card chassis with the exception of the Station Control Module and if local speaker audio is desired, the Line Driver Module.

2. Make sure that isolation diodes are placed in line with the PTT line and that a 10K resistor is used in the CTCSS/DCS output line.

3. Make sure that the Micor station operates as a full duplex station before installation of the Zetron device is attempted. Jumpers JU1 and JU4 may need to be installed on the Micor Unified Chassis Backplane and CR957 on the Receiver Interconnect Board may need to be removed if local audio and COR indications disappear when the Zetron device transmits.

4. On Micor stations fitted with a Squelch Gate Module, the Squelch Gate Module may be used to provide a COR indication. The use of the Squelch Gate Module is less desirable than using U202, Pin 10 since the Squelch Gate Module switching circuit has a slow decay time when a signal has been received for less than approximately 0.5 seconds. This slow rate of decay may result in lengthened squelch tails on brief key-ups. Modify the Squelch Gate Module as follows. Cut jumpers JU3, JU4, and JU12. Place JU15 in the 1CS' or carrier squelch position. Connect the COR Input wire to Pin 9 of the Squelch Gate Module. The COR line sensitivity will now be controlled by both the COR pot on the Zetron device and by R2 on the Squelch Gate Module.

Connection to a Motorola MCR-100 / Radius R-100

ZETRON END Function	Pin	Color	RADIO END (DB-25P) Connection / notes
12 Volts AC/DC in	1	Red	JAUX Pin 3, A+
12 Volts AC input	2	---	
DC ground	3	Black	JAUX Pin 14, Desk set ground
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	JAUX Pin 4, PTT
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	JAUX Pin 12, Audio Control
Tx audio	11	Blue	JAUX Pin 5, Audio from phone patch
Ground	12	---	
CTCSS/DCS encode	13	Green	JAUX Pin 23, uncommitted
Ground	14	Brown	JAUX Pin 6
Discriminator in	15	White	JAUX Pin 25, uncommitted

MODIFICATIONS TO RADIO:

1. Install a jumper from U601 pin 9 on the TX Command Board to JAUX Pin 23. This routes CTCSS/DCS modulation to the TX Command Board.

2. Install a jumper from U551A pin 4 on the RX Board to JAUX Pin 25. This routes unfiltered discriminator audio from the receiver to the JAUX connector.

3. Program the R-100 for carrier squelch operation and disable repeater operation using the RPTR Disable Switch on the RPT Control Board.

4. Order the R-100 with the DPL Option if DPL is to be used in the device. If the R-100 is ordered as either the PL or carrier squelch model, several capacitors need to be changed in the receiver and transmitter. See the R-100 service manual for additional information concerning what capacitor values require changing.

5. Repeated audio from the Zetron device will be heard in the local speaker if the Zetron transmit audio is connected to JAUX Pin 5. This is because audio appearing at pin 5 is distributed to several points in the R-100 Interface Board (including the local audio amp, the exciter board, and the line output) before being applied to the TX Command Board. If desired, transmitted voice modulation may be applied directly to the TX Command Board using the emitter of Q601.

Connection to an RCA TAC-200 Radio

ZETRON END Function	Pin	Color		RADIO END Connection / notes
12 Volts AC/DC in	1	Red	———	System A+, Interconnect Board
12 Volts AC input	2	---		
DC ground	3	Black	———	System A-, Interconnect Board
Ground	4	Drain	———	No connect
PTT NC	5	---		
PTT COM	6	Jmpr		
PTT NO	7	Orange	———	Pin 7 (Tx key), System Connector
Aux relay	8	---		
Sense/alarm	9	---		
COR input	10	Yellow	———	Pin 13 (Squelch gate), Interconnect Board
Tx audio	11	Blue	———	Pin 12 (Mic), Interconnect Board
Ground	12	---	22 Kohm	
CTCSS/DCS encode	13	Green	———/\/\/—	Pin 2, Audio Processor Board
Ground	14	Brown	———	No connect
Discriminator in	15	White	———	Pin 6 of U3, Receiver IF and Audio Board

MODIFICATIONS TO RADIO:

1. Remove or disable the factory CTCSS board.
2. If removing the factory CTCSS board, install jumper JU5 on the Interconnect Board.
3. Remove CR5 from the Interconnect Board.
4. Install a wire jumper from the collector of Q7 to the emitter of Q7 on the Voltage Regulator Board.
5. Run individual coax cables to the receiver and transmitter.
6. The TAC-200 is a direct FM radio, it may be used with DCS as a result.
7. COR polarity is active low.

Connection to a Repco Dimension Repeater

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Pin 8, CTCSS barrier strip (13.6 VDC)
12 Volts AC input	2	---	
DC ground	3	Black	Pin 2, CTCSS barrier strip (GND)
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	Pin 4, Tel barrier strip (KEY)
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Pin 7, CTCSS barrier strip (COS), active low
Tx audio	11	Blue	Pin 4, CTCSS barrier strip (A IN)
Ground	12	---	
CTCSS/DCS encode	13	Green	Pin 3, CTCSS barrier strip (T IN)
Ground	14	Brown	No connect
Discriminator in	15	White	Pin 1, CTCSS barrier strip (DISC)

REPCO REPEATER CONFIGURATION:

1. Remove factory tone boards from card slots.

2. Set front panel switches as follows:
   - TONE = off
   - LOCAL/RPT = LOCAL

Note: Repeater is not capable of Digital Coded Squelch.

Connection to Regency/Wilson Microcomm Repeaters

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	+12VDC, power supply in repeater
12 Volts AC input	2	---	
DC ground	3	Black	DC Ground, power supply in repeater
Ground	4	Drain	No connection
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	PTT, C6 on control board
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	K9 or Pin 15 of IC20, SQ indication
Tx audio	11	Blue	U1 on control board
Ground	12	---	
CTCSS/DCS encode	13	Green	U2 on control board
Ground	14	Brown	No connection
Discriminator in	15	White	A0 on receiver shield, Rec Audio

MODIFICATIONS TO RADIO:

1. Remove jumper between A2 and A3 of P706 if present. This will break the repeat audio path if the station was configured for carrier squelch operation.

2. Remove any CTCSS tone decode boards if present.

3. Move jumper JU702 from P709 (transmit) to the NC (disable) position. This disables repeater PTT while still allowing local and M39 generated PTT.

4. Move jumper JU718 from P707 (tone) to P708 (squelch). This configures the unit as a carrier squelch repeater.

5. A series resistor may be needed in the CTCSS and TX modulation encode lines if loading is noted. Values of 10K to 50K ohm are typical.

Connection to a Standard RPT10/RPT21

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 Volts AC/DC in	1	Red	Multitone Pin 4, 13.8v
12 Volts AC input	2	---	
DC ground	3	Black	Multitone Pin 5, Gnd
Ground	4	Drain	No connect
PTT NC	5	---	
PTT COM	6	Jmpr	
PTT NO	7	Orange	Multitone Pin 9, PTT
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Receiver Pin 7, COR
Tx audio	11	Blue	Control Pin 9, Mic Hi
Ground	12	---	
CTCSS/DCS encode	13	Green	Multitone Pin 3, Tone
Ground	14	Brown	Control Pin 6, Mic Lo
Discriminator in	15	White	Multitone Pin 2, Disc

CONFIGURATION NOTES:

1. Set the switch on the front of the repeater to "NON-RPT".

2. When connected to a Zetron Model 38 or 39 set the CTCSS de-emphasis switch on the 38/39 to 'ON' for the RPT10 and 'OFF' for the RPT 21.

Connection to a Tait T300 Series Radio

ZETRON END Function	Pin	Color	RADIO END, 25 way "D" range female socket Connection / notes
12 Volts AC/DC in	1	Red	Pin 8, +VE 12V
12 Volts AC input	2	---	
DC ground	3	Grey	Pin 5, GROUND
Ground	4	Link	
PTT NC	5	---	
PTT COM	6	Link	
PTT NO	7	Yellow	Pin 10, TX KEY
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Purple	Pin 20, RX GATE, ** NOTE 2
Tx audio	11	Brown	Pin 7, TX AF
Ground	12	---	
CTCSS/DCS encode	13	White	Pin 2, CTCSS ENCODE
Ground	14	---	
Discriminator in	15	Blue	Pin 6, RX AF

TAIT CONFIGURATION:

1. Links made on "D" range socket:
   - 1-4 Earth one side Rx 600 ohm
   - 1-3 Earth one side Tx 600 ohm
   - 1-5 Earth

2. Check the RX GATE lead goes to RX GATE on the Tait Base Station as on some models this lead may have been left disconnected.

Connection to a Uniden ARU 251 Repeater

ZETRON END Function	Pin	Color	RADIO END Accessory jack
12 Volts AC/DC in	1	Red	Pin 4
12 Volts AC input	2	---	
DC ground	3	Black	Pin 5
Ground	4	Drain	No connect
PTT NC	5	---	Pin 7 audio amp out
PTT COM	6	Jmpr	Pin 8 speaker in
PTT NO	7	Orange	Pin 3
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Pin 2
Tx audio	11	Blue	Pin 6
Ground	12	---	
CTCSS/DCS encode	13	Green	Pin 9
Ground	14	Brown	No connect
Discriminator in	15	White	Pin 1

RADIO CONFIGURATION:

1. Disconnect the tone encode lead from the exciter at FT18 on the exciter case (leave wire disconnected).

2. Attach a wire from FT18 on the exciter case to pin 9 of the accessory jack. This provides CTCSS encode from the tone panel to the transmitter.

3. Set the control board switch to "Carrier Squelch" position.

4. Set the front panel switches to: LOCAL and MONITOR.

NOTE: This radio is not capable of DCS encode.

Connection to a Uniden ARU 251 "K" Repeater

ZETRON END Function	Pin	Color	RADIO END Accessory jack
12 Volts AC/DC in	1	Red	Pin 6
12 Volts AC input	2	---	
DC ground	3	Black	Pin 8
Ground	4	Drain	No connect
PTT NC	5	---	Pin 4 audio amp out
PTT COM	6	Jmpr	Pin 5 speaker in
PTT NO	7	Orange	Pin 1
Aux relay	8	---	
Sense/alarm	9	---	
COR input	10	Yellow	Pin 2
Tx audio	11	Blue	Pin 7
Ground	12	---	
CTCSS/DCS encode	13	Green	Pin 9
Ground	14	Brown	Pin 8
Discriminator in	15	White	Pin 3

RADIO CONFIGURATION:

1. Disconnect the tone encode lead from the exciter at FT18 on the exciter case (leave wire disconnected).

2. Attach a wire from FT18 on the exciter case to pin 9 of the accessory jack. This provides CTCSS encode from the tone panel to the transmitter.

3. Set the control board switch to "Carrier Squelch" position.

4. Set the front panel switches to: LOCAL and MONITOR.

NOTE: This radio is not capable of DCS encode.

INSTALLING A NEW PROM

The software is contained in an IC (Integrated Circuit) called an EPROM (Erasable Programmable Read Only Memory). The EPROM contains the software program that controls the operation of the Model 40.

This device is delicate and sensitive to static electricity. When handling it, be sure to keep your fingers in contact with the chassis sheet metal to keep yourself grounded. Only remove the IC from the static protective shipping material when ready for installation. To install the new EPROM IC, do the following:

1. Turn off the power.
2. Remove the cover.
3. Remove the old EPROM from the board.
4. Look at the old EPROM carefully. There is an orientation notch on the end.
5. Install the new EPROM in the socket with the orientation notches aligned with the notches in the socket.
6. Now take some time to look carefully at all of the pins of the chip. Make sure that the pins are aligned in the socket and are fully inserted, not bent out, and not bent under. If the unit is powered on without proper EPROM connection, the user programmable memory (database) may be cleared.
7. Read any attached rework instructions for your hardware version.
8. Turn on the power and make sure that the display indicates normal.
9. Replace the cover.
10. Return the old EPROM to Zetron in the protective shipping material in which the new EPROM was shipped.

TRANSMIT GAIN TEST

This command is used to test and adjust the transmitter deviation to the proper level. Using this command will cause the interconnect to key the transmitter and put out a 1 KHz tone continuously until you terminate the test. The transmit gain of the unit should be set to 60% of the allowable full channel deviation, e.g. on a channel allowing +/- 5 KHz deviation, the transmit gain should be set to +/- 3 KHz with this test. This will be the same level the prompts and pages will go out at.

How to program it:

1) Using DTMF on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (unit keys and puts out 1 KHZ test tone)

At this point, entering a # will terminate the test. If you enter a single DTMF digit, 1 to 6, you will switch to one of the other setup tests. If you are in another test and want to come back to the Transmitter gain test, then enter a 0.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT timeout and exit the test mode the way it will from the general program mode. If you do not terminate the test with a "#" prior to hanging up the phone, then you must cycle power on the unit to stop the test.

2) Programming via a computer or terminal, either connected directly to the Model 40 or connected through its optional modem.

Once connected to the Model 40 and entered into programming at the main menu, type a '4' and press Enter. When the Diagnostics menu comes up, type '2' and press Enter. The unit will start the test.

Pressing any key terminates the test.

TRANSMIT AUDIO PRE-EMPHASIS TEST

The purpose of this test is to allow you to check the roll off in gain as the frequency of the tone transmitted increases. This test will send out tones of 250 Hz, 500 Hz, 1 KHz, 2 KHz, and 4 KHz; all at the same level. While the Model 40 is transmitting each of these tones, you should measure the transmit deviation with your service monitor and move JP-11 to whichever position provides the flattest response over the whole range. There will always be some tilt to the deviation readings; however, if the jumper is properly set up, it should not be more than a few hundred hertz difference top to bottom.

This test should be run after you have set the transmitter gain with AR-21.

How to program it:

1) Using DTMF on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (the unit will key and start the Tx gain test)

Enter: 1 (the unit will now switch to 250 Hz tone)

Once the command "111#" has been given, you switch to the pre-emphasis test by entering a "1", and you can switch back to it from any other test by entering a "1". Once you have started the pre-emphasis test, you can step the Model 40 through the various tones by entering the "1" again and again. The tones will loop around from top to bottom.

To exit the test, enter a "#". To switch to another test enter a "0", or "2" to "6".

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will from the general program mode. If you do not terminate the test with a "#" prior to hanging up the phone, then you must cycle power on the unit to stop the test.

2) Programming via computer or terminal, either connected directly to the Model 40 or connected through its optional modem:

Once connected to the Model 40 and at the Main menu, type a '4' and press Enter. The Diagnostic menu will appear. To start the pre-emphasis test, type a '3' and press Enter. Pressing any key will increment the tone, and pressing Enter ends the test.

CTCSS GAIN SET

This test is provided to allow accurate setting of the encode deviation independent of the transmit audio gain setting. The command functions in the same way as the transmit gain test.

Once the test is started, the unit keys the transmitter and encodes a 136 Hz CTCSS tone. Use R-109 and JP-9 to set the transmitter deviation to 600 Hz to 800 Hz.

How to program it:

1) Using DTMF either on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (the unit will key and start the Tx gain test)

Enter: 2 (the unit will begin encoding 136 Hz out "SUB-OUT")

To terminate the test enter a "#". You may start the CTCSS gain test from any other test by entering a "2". You may switch to any other test by entering its number.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will the general program mode. If you do not terminate the test with a "#" prior to hanging up the phone, then you must cycle power on the unit to stop the test.

2) Programming via a computer or terminal, either connected directly to the Model 40 or through its optional modem:

Once connected to the Model 40 and at the Main menu, type a '4' and press Enter. This will bring up the Diagnostics menu. Now, type a '4' and press Enter to start the CTCSS gain test.

Press any key to terminate the test.

CTCSS PRE-EMPHASIS TEST

This test is used to check that the pre-emphasis on the encode output matches what is required at the CTCSS/DCS input to the exciter. When CTCSS is transmitted on phase modulated exciters, then we need to roll off the high tones; however, when CTCSS or DCS are transmitted on a true FM exciter (NOTE: DCS can ONLY be done on true FM exciters), then the frequency response needs to be flat.

How to program it:

1) Using DTMF either on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (the unit will key and start the Tx gain test)

Enter: 3 (the unit will shift to encoding 67 Hz via "SUB OUT")

To step through the other encode tones (67 Hz, 136 Hz, 250 Hz, and DCS 047), enter the '3' again, once for each step. The tones will loop around from top to bottom. To terminate the test, enter a '#'. You may switch to any other test by entering its number.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will from the general program mode. If you do not terminate it with a "#" prior to hanging up the phone, then you must cycle power on the unit to stop the test.

2) Programming via a computer or terminal, either connected directly to the Model 40 or through its optional modem:

Once connected to the Model 40 and at the Main menu, type a '4' and press Enter to bring up the Diagnostics menu. Then type a '5' and press Enter to start the test. Pressing any key will increment the tone encode to the next tone, and pressing Enter will terminate the test.

HYBRID ADJUST

This test is provided to allow matching of the hybrid impedance of the unit to that of the telephone line the Model 40 is connected to. Most telephone lines are not "text book" in their impedance and a good match to the line is essential for proper operation.

NOTE: This test only serves a purpose if it is done on the line between the Model 40 and the telephone switch providing it. The hybrid balance should not be done to the local phone or to a line with dial tone on it.

While the test is running, you should monitor the transmit channel with your service monitor and set the hybrid adjust controls, R75 and R76, to get the minimum deviation out over the transmitter.

How to program it:

1) Using DTMF on the telephone line into the line #1 port (this test cannot be started from the radio side and should not be done from the local telephone port):

Enter: 111# (the unit will key and start the Tx gain test)

Enter: 4 (the unit will shift to sending 800 Hz out the telephone)

To switch to another test, enter its number. The test is terminated by entering a '#'.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will from the general program mode. If you do not terminate the test with a "#" prior to hanging up the telephone, then you must cycle power on the unit to terminate the test.

2) Programming via a computer or terminal that is connected directly to the Model 40 (this test is not available from the modem; in fact the entry will be absent from the menu):

Once connected to the Model 40 and at the Main menu, type a '4' and press Enter to bring up the Diagnostics menu. Then type a '6' and press Enter to start the test.

Pressing any key terminates the test.

REPEAT AUDIO ADJUST

If the unit is to be used in any manner that requires repeating the received audio, then it is necessary to set the receive gain level to provide unity gain through the Model 40. This test provides for that by keying the transmitter and setting up the repeat path. In order to conduct this test, you must be able to provide signal of about 1 KHz at a known deviation on the receive channel while at the same time being able to measure the transmit deviation. You adjust R57, "RX AUD", until the transmit deviation matches that of the signal being provided to the receiver.

How to program it:

1) Using DTMF either on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (the unit will key up and start the Tx gain test)

Enter: 5 (the unit will set up the Repeat audio path)

Now you can set the Repeat Gain level. To switch to another test, enter its number. To terminate the test, enter a '#'.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will from the general program mode. If you do not terminate the test with a "#" prior to hanging up the telephone, then you must cycle power on the unit to stop the test.

2) Programming via a computer or terminal, either connected directly to the Model 40 or through its optional modem:

Once connected to the Model 40 and at the top menu, type a '4' and press Enter to bring up the Diagnostics menu. Then type a '7' and press Enter to start the test. Now set the repeat gain as described before.

Press any key to terminate the test.

DTMF DECODE TEST

This test is provided to allow testing the operation of the DTMF decoder in the Model 40. When using the DTMF setup mode, this test only decodes DTMF from the telephone and, when using terminal mode programming either connected directly to the Model 40 or via modem, it only decodes digits from the receiver.

How to program it:

1) Using DTMF either on the telephone line or through the local telephone port (the DTMF setup commands cannot be used from the radio side):

Enter the program mode using the program access code (default is 0012123).

Enter: 111# (the unit will key and start the Tx gain test)

Enter: 6 (the unit starts the DTMF decode test)

At this point, if you enter any more digits, the Model 40 will send "beeps" back to the telephone, the number of beeps being equal to the digit decoded. To terminate the DTMF decode test, enter a "*" or a "#"; however, unlike the other tests, this does not get you all the way out of the test mode. The Model 40 will stop the DTMF test and go back to the Transmitter gain test. To exit the test mode completely, you need to enter one more '#'.

WARNING!!: Once you have started the test, YOU must terminate it! The Model 40 will NOT time out and exit the test mode the way it will from the general program mode. If you do not terminate the test with a "#" prior to hanging up the telephone, then you must cycle power on the unit to stop the test.

2) Programming via a computer or terminal, either connected directly to the Model 40 or through its optional modem:

Once connected to the Model 40 and at the Main menu, type a '4' and press Enter to bring up the Diagnostics menu. Then type a '8' and press Enter to start the test.

The unit will display to the screen all the digits that it decodes from the receiver until the test is terminated.

Press any key to terminate the test.