ZETRON

Model 30 Worldpatch with Selcall
Instruction Manual

Part No. 025-9431B

Please check for change information at the begining of this manual.

Table of Contents

Table of Contents
(Continued)

Table of Contents
(Continued)

Table of Contents
(Continued)

WARRANTY

Zetron's warranty is published in the current Zetron *United States Price Book*.

LIMITATION OF LIABILITY

Zetron makes no representation with respect to the contents of this document and/or the contents, performance, and function of any accompanying software and specifically disclaims any warranties, expressed or implied, as to merchantability, fitness for purpose sold, description, or quality.

Further, Zetron reserves the right to revise this document or the accompanying software and to make changes in it from time to time without obligation to notify any person or organization of such revisions or changes.

This document and any accompanying software are provided "as is." Zetron shall not under any circumstances be responsible for any indirect, special, incidental, or consequential damages or losses to the buyer or any third party arising out of or connected with the buyer's purchase and use of Zetron's products or services.

COPYRIGHT

TRADEMARKS

FEDERAL COMMUNICATIONS COMMISSION (FCC) REGULATIONS

To comply with FCC regulations, the following requirements must be met:

1. The FCC registration number (EYBUSA-73432-OT-E), ringer equivalence number (0.4 B), and interface jack (RJ11) must be reported to the telephone company, if so requested.
2. This device must not be installed on coin-operated or multiparty telephone lines.
3. The sum of ringer equivalence numbers for all devices connected to a single telephone line should not exceed 5 for reliable operation.
4. Repair work on this device must be done by Zetron, Inc. or a Zetron-authorized repair station.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

Changes or modifications not expressly approved by the manager of Zetron's compliance department can void the FCC authorization to operate this equipment.

1. INTRODUCTION

INTRODUCTION

The Zetron Model 30 is a multi-mode, easy to use telephone interconnect. Simplex VOX, simplex sampling, intelligent sampling, and half duplex modes are supported. Digital voice delay is an available option to enhance simplex operation.

Multi-digit DTMF access codes and toll restrict digits are selectable to eliminate unauthorized use of the phone line. The Model 30 allows mobile DTMF or regenerated pulse dialing. Repeat audio processing and transmitter control are included to convert a duplex base station into a repeater, allowing dispatch operation.

The Model 30 includes factory defaults for all programmable settings so that it will function on any system straight out of the box, or may be customized easily using a touch-tone telephone or DTMF equipped radio.

The Selcall option for the Model 30 allows the Worldpatch to offer both DTMF and Two-Tone selective calling of mobile and portable radio users. This capability can be used from the phone, or by radio users, to signal other radios in the system. The mobile-to-mobile signaling is available in both half duplex and simplex applications. This option can be installed at the factory, or in the field as an upgrade kit. The programming in a Selcall unit is significantly different than regular Model 30 programming, so the programming commands in Section 4 should be carefully reviewed even by technicians who have prior experience with non-Selcall versions of the Model 30 Worldpatch.

FEATURES

- Simplex VOX, simplex sampling, simplex phone key control, intelligent simplex, and half duplex modes
- Single phone line interface
- DTMF or regenerated dial pulse dialing
- Repeat audio and control for mobile to mobile calls
- Morse code station ID
- Programmable via DTMF telephone or DTMF radio
- Call progress and mobile ring-out tone generation
- Call limit and mobile activity timers
- First and second digit toll restriction

- Toll defeat access code
- 1 - 9 digit DTMF connect code
- 1 - 9 digit DTMF disconnect code
- Half-privacy mode for duplex installations
- Automatic setup mode aids installation for simplex sampling
- High-pass filter to remove mobile CTCSS
- Internal squelch circuit
- External input from CTCSS or DCS decoder to validate proper mobile
- Optional Digital Voice Delay for enhanced simplex operation
- Hook Flash capability
- Call Alert to let mobile users know that the phone is ringing during dispatch operations
- Autodial numbers
- Non-DTMF Mobile-to-Phone Access
- Dual function Connect button
- Security password for Direct Air Access
- Repeat courtesy tone
- Auxiliary output control
- Up to 13 digit DTMF paging
- 100 call and 1000 call two tone paging
- Single digit access code validation
- Automatic busy tone call disconnect
- Automatic dial tone call disconnect
- PL strip during paging

2. SPECIFICATIONS

GENERAL SPECIFICATIONS

Power	11-16V DC 150 mA
Temperature	0 to 65 degrees Celsius
Size	5.5″ W x 6.25″ D x 1.4″ H
Weight	1.0 pound

TELEPHONE INTERFACE SPECIFICATIONS

Line Type	End-to-End phone line
Connector	RJ11 modular jack
Incoming Call	Ring detection on tip-ring pair. Programmable number of rings to answer.
Call Answer	Off-hook, tip ring current draw
Call Disconnect	Busy tone, Dial tone, Call Limit, Mobile Activity timers

RADIO INTERFACE SPECIFICATIONS

PTT	FET pull to ground
COR	Noise detector
Tx Audio	-40 to +6 dBm. Hi/Lo selector. 1 kΩ output
Rx Audio	-40 to +10 dBm. (25 mV to 6 Vp-p) Hi/Lo selector. 50 kΩ input.

ADDITIONAL SPECIFICATIONS

Indicators	Phone, Carrier, Transmit, Power
Switch	Connect / Disconnect
Station ID	Morse Code, fixed 1200 Hz frequency and selectable call sign
Prompt Tones	Progress tones, error tones, and warning tones sent to phone or mobile
Programming	Programmable via DTMF phone, DTMF mobile
Data Retention	EEPROM - data retention for more than 40 years without power
Secondary Protection	Telco high voltage clamps with protective fusing elements

PAGING FORMATS

DTMF Format	Pages consist of from 1 to 8 digits entered by the caller, plus 0 to 5 additional digits that may be strapped in the patch's programming. Strapped digits can be sent before or after the digits entered by the caller. Transmission speed is fixed at 8 digits per second.
Two-Tone	Supports both a 100 call and a 1000 call configuration. In 100 call, the tone groups available are: Motorola 1, 2, 3, 4, 5, 6, A, B, Z, 10, 11 — GE A, B, C Eight common two-tone timings are available (see "Two-Tone Timing" in Section 4).

3. OPERATION

OVERVIEW

This section discusses the normal operations of the Model 30 Worldpatch. It is divided up based on the types of operations performed. The operation of the interconnect will depend on whether the SelCall or Mobile-to-Mobile calling are enabled or disabled.

BASIC CALL TYPES

Phone-to-Mobile Calls

When the telephone line rings, the Model 30 will wait the number of programmed RINGS TO ANSWER before reacting to the call. This allows for a parallel phone to be manually answered before the Model 30 attempts to process the call. What happens next depends on whether or not the SelCall feature is in use.

If SelCall is disabled, the Model 30 will begin ringing out on the radio channel. The Model 30 may be configured to ring either once and wait up to 1 minute for an answer, or ring each time the phone rings for up to 1 minute. If a mobile has not answered within this time, the call is terminated. Once a mobile answers, the Model 30 will take the phone off hook and allow the call to progress. If the line rings for 10 rings past the number of programmed RINGS TO ANSWER, the phone will be answered and the user may enter the program access code to remotely program the Model 30.

With paging enabled, incoming phone calls are answered after the appropriate number of rings. Once answered, the caller will hear two beeps as a prompt to enter the radio's capcode. The page is then transmitted followed by ringing until the mobile answers or the call times out at 1 minute.

When the Worldpatch is programmed for Direct-to-Air operation, the caller will be placed directly onto the radio channel after the page is transmitted. Enabling the Direct-to-Air security password, requires the caller enter a password before being prompted to enter the called radio's capcode.

Both DTMF and Two-Tone paging formats may be enabled in the Model 30. This requires an added digit at the beginning of the capcode to specify the type of page desired. A "1" tells the system that a DTMF page is to be placed and a "2" specifies a two-tone page. For instance, if a DTMF paged radio had a capcode of "456", the caller would enter: "1456" when both paging formats were available. Likewise, a two-tone capcode of "85" would be entered as: "285" in a dual format Model 30 Selcall Worldpatch.

Pressing the CONNECT button on the front panel while the Model 30 is on-hook causes it to go off-hook and enter into the conversation mode.

Mobile-to-Phone Calls

To place a call, a mobile enters the DTMF ACCESS CODE (sign-on sequence) and unkeys. The ACCESS CODE must be entered without unkeying between digits or waiting more than 1 second between successive digits. The Model 30 will take the phone off-hook and send dial tone (phone audio) to the transmitter. For simplex installations, the transmitter will be keyed for 2 seconds, then unkey to receive mobile dialing digits. The Model 30 will regenerate the mobile DTMF to the phone, or provide conversion from DTMF to pulse dialing until there is a 5-second gap in the entered digits. The MOBILE ACTIVITY and CALL LIMIT timers are started as soon as the telephone is taken off-hook. During dialing, if the mobile's first digit matches a digit in the first digit-restricted string, the Model 30 will terminate the call. The same applies for the second digit restrict string and the second digit dialed.

If Mobile-to-Mobile calling is enabled in the Model 30, the radio user must enter a steering digit along with the ACCESS CODE. Adding a "9" to the ACCESS CODE sets up a Mobile-to-Phone call. The Model 30 will respond by prompting for the phone number as usual.

Mobile-to-Mobile Calls

When Mobile-to-Mobile paging is enabled, radio users connecting to the Model 30 Selcall enter a steering digit after the Connect Code. This steering digit specifies whether the user wants access to the phone line or to page another mobile. Entering a "7" requests Mobile-to-Mobile paging. This is followed by a page-type digit (if required) and the capcode. Mobile-to-Mobile paging is available even in simplex systems.

Once a Call is in Progress

Once a call has been connected, the call may be terminated in one of seven ways:

1. *Disconnect Code* - A mobile may disconnect the call by sending the disconnect code. The call is terminated immediately and 5 fast beeps are sent to the mobile indicating the call is over. Once the disconnect code sequence has been started, each additional digit must be sent within 1 second of the last, without dropping carrier between digits. If the user unkeys between disconnect code digits, the sign-off attempt is ignored.
2. *Busy Disconnect* - If a busy tone is detected by the Model 30 during the first 20 seconds of a mobile originated call, the Model 30 will disconnect and send 5 fast beeps to the transmitter. The busy disconnect feature may be disabled by the installer, or enabled for the entire length of the call.

3. *Dial Tone Disconnect* - If continuous dial tone is detected after the conversation mode of a call has begun, the call will be terminated and 5 fast beeps sent to the mobile. This feature may be disabled by the installer.

4. *Mobile Activity* - The mobile must transmit at least once during the mobile activity interval. If not, the call will be terminated and the 5 fast beeps will be sent to the mobile. During the conversation, a single beep will be sent to the phone and the mobile every 3 seconds starting at 12 seconds before the mobile activity timer expires. This beep serves as a warning to both the telephone user and the mobile user.

5. *Call Limit* - Each call is limited in length. Once the call limit timer has expired, the call is terminated and 5 fast beeps are sent to the mobile. Double warning beeps are sent to the telephone and mobile every 3 seconds starting 15 seconds before the call limit timer expires. If programmed to do so, the Model 30 may allow the mobile to extend the call limit time by pressing the "*" key.

6. *Phone Party Disconnect* - The phone party may disconnect the call by entering a DTMF "#0". The call will then disconnect in the same manner as if the mobile had initiated the disconnect.

7. *Connect Button* - Pressing the connect button while the Model 30 is off-hook terminates the call in progress and forces the Model 30 back into the on-hook idle mode.

Remote Programming Access

The mobile user may enter the program access code to gain access to remote programming.

MODEL 30 FEATURES

DTMF or Pulse Dial Regeneration

The Model 30 defaults to regenerating the DTMF digits received from the mobile user to dial the telephone. This allows the unit to present a pre-set level and quality of DTMF to the phone line regardless of conditions on the channel. This function can also be programmed to translate the mobile's DTMF into pulse dialing, should that be required by the connected telephone service.

While dial regeneration is active, audio from the mobile unit connected to the system is not passed to the telephone line.

Dialed number regeneration is a timed function. By default, the mobile user has 3 seconds to dial each digit of the phone number. This time may be programmed to be from 0 to 60 seconds. Regeneration time must end before conversation can take place. This can either be done by waiting until the regeneration timer lapses

or by forcing it to end by sending a DTMF "*" as the last digit dialed. (The "*" is not regenerated.)

Toll Restriction

The Model 30 will not allow a mobile to dial a telephone number whose first or second digit is in either toll restrict table. These tables can both contain up to four digits. Toll restriction may be turned off by programming both tables as blank.

A toll defeat code is provided to allow "privileged" users to avoid the toll restriction when making calls. This code is used in place of the access code to gain access to the phone line.

Call Limit Timer

The call timer determines the maximum time that a call may last before being terminated. The call limit timer may be reset using a DTMF "*" if programmed to do so. Double warning beeps are sent to the telco and mobile every 3 seconds, starting 15 seconds before the call is terminated.

Mobile Activity Time

The mobile activity sets the amount of time that may elapse without the Model 30 detecting a mobile transmission. When this timer expires, the call is terminated. This timer assures that if a mobile travels out of range (loses control of the interconnect), the conversation will be terminated even though the mobile cannot manually terminate the call. Single warning beeps are sent to the telco and mobile every 3 seconds, starting 12 seconds before the call is terminated.

Courtesy Tone

A courtesy tone is a short 50 millisecond beep that prompts the phone party to begin speaking. This is especially useful when phone callers are not aware that they must wait for the mobile to unkey before speaking.

Repeat Enable

The Model 30 includes the capability to turn a duplex station into a carrier controlled repeater. When enabled, the Model 30 will repeat audio any time it receives carrier detection. After receive carrier drops, the transmitter is held up for the programmable REPEATER TRANSMIT HOLD TIME.

Interconnect "Security"

Interconnect Security is intended to discourage casual eavesdropping. During a phone call with the security disabled, the mobile audio is routed to the transmitter (repeated). With security mode enabled, an annoying tone is sent to the transmitter while the mobile speaks. This masks the mobile's half of the conversation to other listening mobiles or scanners.

Direct to Air

The user may program the unit to place the received call Direct to Air. If this function is enabled, it places the caller on the air without waiting to get a response from the mobile user to complete the call. This type of operation is particularly useful for in-house systems where the Model 30 is on an extension of a PBX.

Autodial

The Model 30 allows up to 50 autodials to be stored for speed dialing. To access the autodials, the user enters his/her connect code and, within 1 second, the autodial number. For example, if the connect code is "*" and the mobile wishes to autodial the phone number stored at location 5, the user enters "*5", and the number is dialed. Up to 16 digits may be programmed into each autodial slot. Mobile users can be restricted to only accessing the phone by using the Autodial numbers. If a mobile user initiates a call while this feature is enabled, that user can only request a valid Autodial number. If the user tries to dial a regular phone number or to access an Autodial slot that is empty (not programmed), the call is be terminated and the Model 30 issues an error tone (warble) on the channel before unkeying the transmitter.

Hook-Flash

The hook flash, when enabled, allows the mobile to flash the telephone line. For example, if you are on a PBX system, the PBX may require a hook flash to perform certain functions. To flash the line, the user sends a "*0" during a call.

Non-DTMF Access to Phone Line

When enabled, non-DTMF equipped mobiles can gain access to the phone line by simply keying up four times in rapid succession. If four carrier signals are received less than 1 second apart, the phone line will be taken off hook and autodial #1 will be dialed. The phone side can disconnect the call by sending "#0".

Auxiliary Output Control

The Auxiliary Output allows an external device at the radio site to be controlled with DTMF over the radio channel or from the phone. This is useful, for example, to control an antenna switch for coverage of multiple areas. The Auxiliary Output is controlled by entering different codes to turn on or off the output. This can be accessed from either the radio or the phone. The factory defaults for these codes are 567 to turn "on" the output and 890 to turn "off" the output. These may be programmed by the user to be any code of up to nine digits each. When the On code is decoded by the Model 30, the FET on the Auxiliary Output will be switched on which pulls the open drain line to ground. The FET is capable of sinking a maximum of 200 mA DC. The output stays in the assigned

state until commanded to switch states. The output state is saved in the unit's non-volatile memory and is restored as set even if power is cycled.

Call Alert

When enabled, Call Alert allows the Model 30 to key up during an existing Mobile-to-Mobile conversation and send two quick beeps over the air when a telephone call comes in. The mobiles may then elect to stop their conversation so one of them may answer the call.

Dual Function Connect Button

This is designed for installations where the Model 30 is used on an operator's desk to route calls between the office and the field. In normal operation when the Connect button is pressed while the system is idle, the phone line is placed directly on the air in conversation mode. Enabling this option instructs the Model 30 to ring out over the air to hail the mobile user when the button is pressed. If the channel has activity, the phone line will be placed in conversation mode when the button is pressed.

SIMPLEX OPERATION

Simplex Modes

There are six simplex modes.

Simplex VOX

This is the standard simplex mode that keys the transmitter using phone voice (VOX) detection. When neither party is talking, the Model 30 watches for either VOX or carrier detection. When the Model 30 detects VOX, it keys the transmitter and allows the telephone audio to pass to the transmitter. When VOX drops and the VOX HOLD timer expires, the transmitter is dropped and the Model 30 returns to waiting. When the Model 30 detects carrier, it allows mobile audio to pass to the telephone. When carrier drops, and the COR HOLD timer expires, the Model 30 returns to waiting.

The digital voice delay option board may be installed to enhance the simplex VOX mode. Since the Model 30 uses the voice detector to know when to key the transmitter, the first syllable can be lost while the transmitter comes up. CTCSS decoders can also contribute to the lost syllables. Adding the digital voice delay board delays the phone audio so that the transmitter will have plenty of time to get "on line" before the phone audio is passed to the mobile.

Simplex VOX with Prekey

This mode is identical to the above mode, with one exception. When carrier drops, it is assumed that the telephone will want to start talking, so the Model 30 "prekeys" the transmitter. This reduces the chance of lost syllables while the transmitter is coming up to full power. If the phone party does not begin speaking

before the VOX HOLD TIME expires (typically one second), the transmitter unkeys. The Model 30 then begins watching for either VOX or mobile activity.

Simplex Sampling

When the Model 30 is connected to a radio that switches very fast between transmit and receive (and is not working through a repeater) the Sampling mode may be used. There are two parameters that affect sampling modes, they are the SAMPLE RATE and the SAMPLE WIDTH times. This mode begins with the transmitter keyed up and audio passing from the telco to the mobile. When the SAMPLE RATE timer expires, the transmitter is unkeyed and the SAMPLE WIDTH timer is started. When the SAMPLE WIDTH timer expires, the Model 30 looks for carrier detection. If carrier is not present, the transmitter is re-keyed and the cycle starts again. If carrier is present, telco to mobile audio is shut down and mobile to telco audio is opened. Audio is passed from the mobile to the telco until COR drops and the COR HOLD timer expires; the cycle starts again.

Sampling with VOX to Extend Sample Interval

This mode is identical to SIMPLEX SAMPLING, but the Model 30 looks for VOX indication also. When VOX is up, the SAMPLE RATE is extended to 4 times the normal sampling time. When the Model 30 detects VOX, the telephone is speaking, and therefore sampling only needs to happen 1/4 as often.

Intelligent Simplex Mode

When the Model 30 is not working through a repeater (not connected to a control station), the Intelligent Simplex mode will provide the best possible operation. This mode uses VOX, the SAMPLE WIDTH timer and audio delay to provide premium simplex operation. As long as VOX is detected, the transmitter is keyed and audio is passed from the telco to the mobile. When VOX drops for the SAMPLE WIDTH time (or more), the Model 30 allows the rest of the audio (still trapped in the delay) to go out the transmitter. Once the audio is out the transmitter and silence (the gap) is being transmitted, the transmitter is unkeyed. Just before the end of the gap reaches the transmitter, carrier is checked. If carrier is present, the mobile takes over the call. If carrier is not present, the transmitter is again keyed, and the remaining audio in the delay is allowed out the transmitter. Using the delay and timing the gap, the Model 30 is capable of sampling between words without the loss of telephone audio. THIS MODE IS ONLY AVAILABLE WHEN THE OPTIONAL DIGITAL VOICE DELAY HAS BEEN INSTALLED.

Simplex Phone Key Control

VOX operation may now be bypassed and transmit & receive can be controlled by the phone caller using the “*” and “#” keys on a DTMF phone set. Pressing the “*” momentarily will key the transmitter and the caller may talk. Pressing the “#” momentarily will unkey it. This allows trained callers to have very positive control in simplex dispatch operations.

Simplex Timers

VOX Hold Time

Sets the VOX hold time, or the time that the VOX detection must be gone before the telco side of the conversation is assumed over. This time should be set to the minimum required as it slows down the conversation, but a time too short will cause the conversation to flip to the mobile side prematurely. This timer only affects the VOX simplex modes.

COR Hold Time

A hold time may be added to the receive carrier detector in simplex mode to reduce the effects of "picket fencing." When mobiles operate in fringe areas, or through multi-path zones, the carrier may momentarily drop. When it does, the patch will assume that the mobile unkeyed, and could key the transmitter to allow the phone party to begin speaking. The COR hold time will allow the receive audio to be muted to the phone party, but won't assume the mobile has unkeyed until the COR hold time expires.

Sample Rate

Sets the rate that the Model 30 will sample for carrier. This is NOT the amount of time that it looks for carrier, but how often it looks. The sample rate timer is used for simplex sampling, and simplex sampling w/VOX extend. Note that simplex Intelligent mode does not use this timer.

Auto Sample Setup

This command allows the simplex sample window duration to be set automatically for any radio. Once the command is executed, the Model 30 will key the radio for 2 seconds allowing time to generate a DTMF digit into the receiver using a DTMF equipped radio. The Model 30 will unkey the transmitter and time how long it takes to decode the DTMF. This is saved as the sample width time. Commands are available to increment and decrement the sample window in 10-millisecond increments for fine tuning.

OPTIONS

A Digital Voice Option is available for premium simplex operation.

4. PROGRAMMING

PROGRAM MODE ACCESS

The Model 30 may be programmed from any DTMF equipped radio that can access the unit, or by using DTMF over the telephone line.

When programming over the radio, simply enter the program mode access code. The Model 30 will respond with a five-beep "go-ahead chirp" to indicate proper access. The transmitter will key after each command is entered to indicate a successful programming step or an error condition.

Accessing programming mode through the telephone operates differently based on how paging is enabled in the system. If paging is not enabled, the unit behaves the same as a non-Selcall Model 30 would. This means the unit will ringout over the air, until the Ringout time expires. The phone is then answered by the Model 30 giving the caller the opportunity to enter the Program Access Code (default 12030).

When either paging format is enabled as a single format within the system, the Program Access Code may be entered instead of a cap code. If both paging formats are enabled, the Program Access Code must be preceded by either of the page type digits (a 1 or 2). If the number of digits that the caller is required to enter for a cap code is five or less, the Program Access code is entered as is. If the number of digits a caller is required to enter is greater than 5, the Program Access Code is entered, but must be followed by enough additional digits to satisfy the number of digits expected. This is because the Worldpatch does not begin to analyze the input string until it has seen the required number of digits.

To program the Model 30, the 5-digit user programmable "program mode access code" must be entered. The access code is 12030 as shipped from the factory, but may be changed to any 5-digit code. Please note that the default program mode access code used here is different than the one used in non-SelCall units.

The program mode may also be accessed from the telephone by dialing the program mode access code during a call.

ENTERING A PROGRAM COMMAND

To execute a program command, a DTMF number is entered followed by the "#" key. Once the "#" has been entered, the Model 30 will respond with the 5-beep "go-ahead chirp" indicating that the command was accepted or a high-low "error tone" sequence indicating that an invalid command was received. Some commands require additional numbers, as in the case of the connect code. For these commands, the Model 30 will send two fast beeps indicating that additional digits are required. Commands should be entered one at a time (do not try to "string" commands together) until the go-ahead or error tones are sent. While

programming, a key must be depressed every 60 second, or the Model 30 will automatically exit the program mode, returning to normal operation.

The Model 30 offers no method of viewing the programmed settings (there is no RS-232 port for CRT or printer.) As such, it is important to be careful during programming and to keep track of all programmed settings. If the Model 30 is in an unknown programming state, the settings may be reset to the factory defaults from the front panel or by using a DTMF command. Care should be exercised when resetting the unit if existing Model 30 users are expecting certain access and disconnect codes.

To force the Model 30 to reset its programming to default values, from the front panel, complete the following steps:

1. Turn off power to the Model 30.
2. Press and hold the Connect button.
3. While holding the button in, turn on the power to the Model 30.
4. Hold the Connect button until the phone light starts blinking (about 4 seconds), then release the button.

The Model 30 should now be reset to default values.

PROGRAMMING COMMANDS

A number of new programming commands have been added to allow the paging to be tailored to the systems needs. In order to fit these commands into the Model 30, several changes were made to existing commands. These changes consolidate and regroup several of the existing commands into a more logical structure. More commands now use a "Command-#, Data-#" format. Programmers should find these commands easy to use.

The data portion of these commands may be from one to several digits in length. The length is determined by the range of allowable values or the maximum string length in the case of passwords. With the exception of the program access code (this must always be 5 digits), the data entered only needs to be as many digits as necessary. For instance, if the allowable range for a value is 1 to 999 and the data to be programmed is 6, the programmer may enter: 6, 06 or 006. In the following list of commands, the default setting for each command is shown in the far right-hand column.

Access and Disconnect Codes

In order to initiate and terminate phone calls, a mobile user must send a DTMF access code. In all three cases the "#" character is used to terminate both the command and the data string that follows it. In the case of the Disconnect code, the "*" is used to specify a "#". The "#" character terminates the command.

01#	_____#	Connect Code 1 - 9 digits (0 to 9, and *)	*1

02#	_____#	Disconnect Code 1 - 9 digits (0 to 9, and #)	#1
03#	_____#	Toll Restrict Bypass Code 1 - 8 digits (0 - 9, *)	99

Note: Some thought must be given to programming new access codes into the Model 30. It is best to avoid using one access code that is a direct sub-set of another code. For instance, if a single "" is used for the Connect Code, then a "*" cannot be used as the first character of the Toll Restrict Bypass Code (e.g. "*2"). Programming the unit this way would result in the patch never recognizing the Toll Restrict Bypass.*

Mobile-to-Phone Pulse or DTMF Dialing

These two commands select the dialing method that is used to place mobile-to-phone calls.

04#	DTMF Regenerate Mobile Originated Calls	**D**
05#	Pulse Dial Mobile Originated Calls	

Number of Rings-to-Answer

This command sets the number of rings that must occur on the phone line before the Model 30 will start ringing on the channel, or answer the line to prompt for a capcode.

06#	___#	Rings-to-Answer (1 to 10 rings)	1

Single Digit Access Code Validation

When enabled, this feature requires that the single digit access codes be held for a minimum of 0.5 seconds. This digit-timing minimum only applies to access codes that are programmed for a single digit. Multiple-digit access codes do not have any minimum digit timing limit. This command applies to the connect code, disconnect code, toll restrict bypass code, as well as the auxiliary output on/off codes.

09#	___#	Single Digit Access Code Validation (0 = Disabled, 1 = Enabled)	1

Dial Regeneration Timeout Timer

This timer applies whenever a mobile user is dialing a phone number. This command sets the maximum amount of time the phone patch waits between DTMF digits received from the mobile before dropping out of the regeneration mode. A DTMF "*" can be used to manually terminate the regeneration mode. Because of this, it may be preferred to set the regeneration time longer. Used in this way, a more comfortable dialing speed can be maintained while still remaining in regeneration as long as needed.

10#	___#	Dial Regeneration Timeout Timer (0 to 60 in seconds)	3

Hook Flash

The hook flash, when enabled, allows the mobile user to flash the telephone line. To hook flash a phone line, the radio user must send a "*0" without letting carrier drop between digits.

11#	___#	Hook Flash (0 = Disabled, 1 = Enabled)	0

Call Waiting Alert

Normally, the Model 30 will not answer the phone line or attempt to process a call while the channel is busy. Enabling the Call Alert feature allows the patch to key up during a Mobile-to-Mobile call and send two quick beeps on the channel. The mobile users may then elect to stop their conversation long enough for the patch to process the incoming call.

13#	___#	Call Alert (0 = Disabled, 1 = Enabled)	0

Limit Phone Access to Autodials

When enabled, this command prevents the mobile users from dialing any numbers to the telephone directly. If they try to dial a complete phone number, or access an Autodial position which is blank, the patch will terminate the call and send out an error tone (warble) before unkeying. This feature gives the system operator total control over the numbers that can be called by mobile users.

14#	___#	Limit Phone Access to Autodials (0 = Disabled, 1 = Enabled)	0

Toll Restrict Digits

These commands are provided to prevent the mobile users from dialing toll calls on the Model 30. They can be programmed independently. The default for both is blank.

15#	____#	Restricted Numbers 1st Digit (1 to 4 digits)
16#	____#	Restricted Numbers 2nd Digit (1 to 4 digits)

Ringout Mode

This command selects how the patch will process a call, once the phone line has rung for the programmed number of Rings-to-Answer.

17#	___#	Ringout Mode 0 = Ring once, wait up to 60 seconds 1 = Ringout repeatedly up to 60 seconds 2 = Direct-to-Air	1

Optional Security Code for Direct to Air

If Direct-to-Air has been selected for Ringout Mode, then this command can be used to require an access code from the phone caller before the Model 30 will proceed with processing the call. The password can be up to nine digits long, and use 0 to 9 plus the "*". To erase a previously programmed password, without programming a new one, enter the command "18#", and then enter the second "#" without any other digits. The default is blank.

18#	___#	Password for Direct-to-Air (1 to 9 digits)	

Repeat Audio Control

These commands are used to enable and disable the repeater mode in the Model 30, and to set the duration of the Repeater Transmit Hold Time if the repeat mode is enabled. The base station must be full duplex capable.

19#		Enable Repeater Mode (must be full duplex)	
20#		Disable Repeater Mode	**D**
21#	___#	Repeater Hold Time (0 to 5 seconds)	1

Call Answer Mode

These commands select which action is required on the mobile user's part to answer a phone originated call. When set to COR-to-Answer, the user only needs to key up and start talking.

22#		COR-to-Answer	
23#		Access Code to Answer	**D**

Morse Code Station ID

These commands are used to select which mode the station ID will function in, and to program the station call sign into memory. When programmed to ID with channel activity, the unit will ID after ten minutes, or, if the channel remains quite, the unit waits until carrier is detected again before sending the ID.

The Model 30 will accept call signs up to eight digits in length. In order to enter all of the call sign characters into the patch's memory from a DTMF keypad it is necessary to convert the characters into two-digit codes. These codes are found in Table 4-1. The default setting for the station ID is to be blank.

24#	___#	Station Morse ID Mode 0 = Disabled 1 = ID every 10 minutes, with activity 2 = ID every 10 minutes, regardless of activity	0
25#	_____#	Station Morse ID Call Sign (8 digits maximum)	

For example, to program the Model 30 with the call sign WNCR-414, you would look the seven characters up in Table 4-1, and then enter them using command 25# as follows:

Enter DTMF:	25#	19	26	32	27	04	01	04	#
Comments:	ID =	W	N	C	R	4	1	4	done

Table 4-1. Station ID Cross Reference

Digits	#	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	– • • –
30	/	– • • – •	35	L	• – • •	39	Y	– • – –
#	END		16	M	– –	20	Z	– – • •

Interconnect Courtesy Tones

During a telephone call, a courtesy tone may be sent to the phone whenever the mobile user unkeys. This tone is intended to prompt the phone party to begin speaking.

26#	___#	Interconnect Courtesy Tone (0 = Disabled, 1 = Enabled)	0

Half-Privacy Mode

When enabled, the Half-Privacy mode squelches the repeat audio path and sends a continuous masking tone to the transmitter when the mobile user is speaking to

the phone (i.e. whenever carrier is being received). Other mobile users, or anyone monitoring the channel, are only able to hear the phone caller's half of the conversation. This command only applies if the patch is operating in the Half-Duplex mode.

27#	___#	Half-Privacy Masking Tone (0 = Disabled, 1 = Enabled)	0

Call Limit Timer

During a phone call, a call limit time is maintained. Double beep warning tones will be sent to the phone and the radio when approaching the end of the call limit time. If desired (and enabled), the mobile user may reset the call limit timer by sending a DTMF "*".

30#	___#	Call Limit Timer Mode 0 = Disabled 1 = Enabled 2 = Enabled / Allow Mobile Reset	1
31#	___#	Call Limit Timer (1 to 60 minutes)	3

Mobile Activity Timer

During a phone call, the Model 30 needs to see carrier activity every so often to indicate that the mobile user is still able to control the patch. The Mobile Activity Timer is reset every time carrier is detected. If the timer expires before carrier is detected again, the patch terminates the call. Single beep warning tones are sent to the phone and the radio when approaching the end Mobile Activity time limit. During simplex VOX operation, continuous audio on the phone may prevent the mobile user from controlling the patch by holding the VOX detector locked on. Just prior to the Mobile Activity timeout, the patch will unkey the transmitter for five seconds to allow the mobile user to regain control. Entering a "0" disables the Mobile Activity timer.

32#	___#	Mobile Activity Timer (0 to 99 seconds)	30

Set Operating Mode

The Model 30 is compatible with both simplex and duplex radio systems. The operating mode is set using the command "33#". Advice on selecting the best simplex mode is found in Section 3, Operation.

33#	___#	Set Duplex / Simplex Mode 1 = Half Duplex (Requires full duplex base) 2 = Simplex 3 = Simplex VOX with pre-key 4 = Simplex Sampling 5 = Simplex Sampling with VOX to extend sample interval 6 = VOX / Sampling between words (Intelligent Mode) 7 = Simplex Phone Key Control (phone * and # control transmitter)	2

Sample VOX Before Issuing Dial Tone

This command selects the mode for handling the start of mobile originated phone calls when operating in simplex. When disabled, the patch goes off hook, issues two seconds of dial tone to the radio, then unkeys and waits up to ten seconds for the mobile to start dialing. In some older phone systems, it takes longer than two seconds for the switch to issue dial tone. If the patch unkeys before dial tone is issued, the mobile has no indication that they accessed the line. When enabled, the patch waits until it has detected two seconds of dial tone before it unkeys to let the mobile user dial a phone number.

34#	___#	VOX Sampling Before Dial Tone is Issued (0 = Disabled, 1 = Enabled)	0

Select Paging Format

This command enables or disables one or both of the paging formats.

35#	___#	Select Paging Format 0 = Disable paging 1 = DTMF Format 2 = 100 Call Two Tone Format 3 = 1000 Call Two tone Format 4 = DTMF and 100 Call Two Tone Formats 5 = DTMF and 1000 Call Two Tone Formats	0

Two-Tone Paging Parameters

Commands 36 through 39 configure the two-tone paging format. Systems using a 100 call format specify the tone groups for each of the two tones with commands “36#” and “37#”. Command 36 specifies the “A” (or first) tone while command 37 specifies the “B” (or second) tone. The Tone Group data is found in “Two-Tone Tone Groups” on page 4-15. This shows the numbers used to specify a particular tone group.

A 1000 call Code Plan is programmed using only command “36#”. Code Plan data is found in “Two-Tone Code Plans” on page 4-16. Command “37#” does not apply to 1000 call two-tone paging.

Tone timing is programmed with command “38#”. The available timings are give in “Two-Tone Timing” on page 4-14.

Group Calls are by default enabled. A diagonal tone may replace either the “A” or “B” tone to disable group calls. Command “39#” is used for this operation.

36#	___#	(100 Call)“A” Tone - Tone Groups - 0 to 13 or (1000 Call) - Code Plans - 0 to 24	0
37#	___#	“B” Tone - Tone Groups 0 to 13	0
38#	___#	Set Two-Tone Timing (Range 0 to 7)	0
39#	___#	Group Call Operation 0 = Group Calls Enabled 1 = Diagonal Tone Replaces “A” Tone 2 = Diagonal Tone Replaces “B” Tone	0

DTMF Paging Parameters

When DTMF paging is enabled, the system must be programmed for the number of capcode digits the caller must enter. This may be from 1 to 8 digits and does not include the page type digit if both formats are enabled. The default for the strapped digits is to be blank.

40#	___#	Number of DTMF Digits User Must Enter (1 to 8)	3
41#	_____#	DTMF Strapped Digits (up to 5 digits maximum)	
42#	___#	DTMF Strapped Digits Position 1 = Strapped Digits Precede Digits Entered 2 = Strapped Digits Follow Digits Entered	2

The system can be programmed to always send up to five digits in addition to those the caller entered. These are called “Strapped” digits. Strapped Digits can be sent either before or after the caller entered digits and are used to help build a DTMF page. Commands “41#” and “42#” specify the strapped digits and their placement. The DTMF paging speed is fixed at 8 digits per second.

Mobile-to-Mobile Paging

This command selects whether or not a mobile user can access the Model 30 to have it selectively call another radio. When enabled, this feature requires the mobile user add a steering digit to the end of the Connect Code. This indicates whether a phone call or mobile-to-mobile call is being initiated. A “7” indicates a mobile-to-mobile call, and a “9” indicates a mobile-to-phone.

49#	___#	Mobile-to-Mobile Paging (0 = Disabled, 1 = Enabled)	0

Autodial Numbers

Programming for the Autodial numbers is done in three parts. First the command is entered, and the patch responds with a double-beep to prompt for the next entry. Next the Autodial slot that is being programmed is entered (0 to 49), and the prompt is repeated. Finally, the phone number itself is entered, and the patch responds with a five-beep prompt. Autodial numbers can be up to 16 digits long. A one second pause can be inserted in the dialing sequence by entering a "*".

50#	_# ____#	Program Autodial Numbers (0 to 49)	

Dial Tone Disconnect

This command is used to automatically terminate a call after the phone party hangs up. If enabled, this command sets the number of seconds of continuous vox that will be detected as dial tone. Once this threshold is exceeded, the call is disconnected. This parameter only applies once a call enters the conversation mode; the initial dial tone at the start of a call or after a hook-flash is performed are not affected by this time limit.

53#	_#	Dial Tone Detect Time (1 to 9, 0 = disabled)	0

Non-DTMF Mobile Access

When this command is enabled, non-DTMF equipped radios can access the Model 30 to place a phone call simply by keying up four times in rapid succession. If four separate carrier detects occur, less than a second apart, the patch will go off hook and dial the number programmed in Autodial slot #1. The phone party can disconnect the call by sending "#0" from a DTMF phone. DTMF equipped mobile users continue to access the patch in the normal way.

57#	___#	Non-DTMF Mobile Access (0 = Disabled, 1 = Enabled)	0

Dual Function Connect Button

In normal operation, when the Connect button is pressed, the Model 30 connects the phone to the radio and drops directly into the conversation mode. When this command is enabled, what the patch does depends on whether or not the channel is busy. If there is no carrier present, the patch rings on the air to signal a mobile user. If there is carrier activity, the patch drops into the conversation mode. As always, pressing the button after a call is in progress disconnects the call.

58#	___#	Dual Function Connect Button (0 = Disabled, 1 = Enabled)	0

Multiple Second Dial Tone

Normally, when a mobile user initiates a phone call in simplex, the Model 30 allows two seconds of dial tone to pass from the phone to the radio, then it unkeys and waits for the user to dial. If no digits are received before the DTMF Timeout timer expires, the patch will disconnect the call. This is adequate except in situations where the mobile user must pass through a PBX switch to get an outside line. The second dial tone would lock up the VOX detector and hold the patch keyed until the DTMF Timeout timer disconnected the call. When this command is enabled, the Model 30 will pass only two seconds of the second dial tone (stopping the DTMF Timeout timer while it does) and then unkey as it did for the first dial tone to let the mobile user continue to dial.

59#	___#	Multiple Second Dial Tone (0 = Disabled, 1 = Enabled)	0

Repeat Courtesy Tone

This command applies only to repeater operations. When enabled, a courtesy tone (a single beep) is added at the end of each mobile user's transmission to prompt the other mobile to start talking.

69#	___#	Repeat Courtesy Tone (0 = Disabled, 1 = Enabled)	0

Simplex Sample Rate

This command applies only to simplex operation when Sampling or Sampling with VOX is enabled. This timer determines how often the patch unkeys to check the receive channel for the presence of carrier.

70#	___#	Set VOX Sample Rate (0.5 to 1.5 seconds, in 100 ms increments, entry range is 5 to 15)	10

VOX Hold Time

This timer only applies to the Simplex VOX modes. When the VOX detector output goes false, the patch waits for the period set with this command before switching to the receive direction. It should be set as short as practical, in order to prevent the conversation becoming awkward due to a slow turn around when the phone party stops speaking. If it is set too short, the phone party will start dropping out in the middle of sentences. The range is 0.5 to 1.5 seconds, in 100 ms increments.

73#	___#	Set VOX Hold Time (entry range is 5 to 15)	10

Automatic Sample Window Setup

These commands are used to configure the Sample Window timer, which control how long the patch remains in receive looking for carrier when it samples. Command 78# can only be done from the radio. Once the command is entered, the Model 30 keys up for two seconds. While it is keyed, the technician keys up and sends a continuous DTMF digit. When it unkeys, the Model 30 times how long it takes after dropping PTT before a valid DTMF digit is decoded. It saves this time as the Sample Window time. This test should be run only after installation and all level adjustments are complete. Commands 79# and 80# allow the technician to adjust the size of the window manually if operating experience indicates the need.

78#	___#	Automatic Sample Window Setup
79#	___#	Increment Sample Window by 10 ms
80#	___#	Decrement Sample Window by 10 ms

COR Hold Time

This timer is similar in function to the VOX Hold timer. It sets the amount of time that carrier detection must go away before the patch reacts to it and switches from receive back to transmit. Valid entries are 0 to 5, in 100 millisecond increments, giving a range of 0 to 500 milliseconds.

81#	___#	Set COR Hold Time (range is 0 to 5)	0

Busy Tone Detector

The Model 30 uses its VOX detector to look for the characteristic pattern of busy tone during the first 20 seconds of any mobile originated phone call. If it detects a busy tone it disconnects the call automatically. This is particularly useful on simplex systems. A disable is provided for this feature because some automated telephone voice prompts can be falsely identified as busy tone. This feature can also be set to be active for the entire call.

85#	___#	Set Busy Tone Detect Mode 0 = Busy Tone Detection Disabled 1 = Disconnect If Busy Detected in First 20 Seconds 2 = Disconnect If Busy Detected During Entire Call	1

PL Strip Output

The auxiliary output FET can be configured for use as a PL strip output. If enabled, the FET pulls the output to ground during paging, and remains there for the duration of a page initiated call. This is intended to indicate to the radio that subaudible signaling should be turned off.

87#	___#	Use Auxiliary Output for PL Strip (0 = Disabled, 1 = Enabled)	0

Auxiliary Output Control

The Model 30 provides an open drain FET circuit as an auxiliary output. This can be used to control external equipment that is located at the radio site. When the Auxiliary Output is turned ON, the FET pulls the output to ground and holds it there until the OFF command is received. These commands allow the system operator to program new access codes for ON and OFF.

88#	___#	Set Auxiliary Output ON Code (1 to 9 digits)	567
89#	___#	Set Auxiliary Output OFF Code (1 to 9 digits)	890

Program Access Code

This command allows the system operator to program a new access code in the field to maintain system security. The Program Mode Access Code must always be five digits long. The default code is "12030".

90#	_____#	Set Program Access Code (Must be 5 digits)

Reset All Parameters to Factory Default

This command is used quickly return all programmable parameters in the Model 30 to known, factory default values. All programming changes must be re-entered after using this command.

91#	Reset All Memory to Factory Defaults

Installation Tests

These commands are used to set transmit and receive levels during initial installation, and later on for trouble shooting. They are described in Section 5, Installation.

92#	Transmit Level Test
93#	Repeat Audio Test / Receive Level Adjustment
94#	Enable High-Speed Phone Programming (This command disables all prompt and confirmation tones for an automated program upload.)

Exit Program Mode

99#	Exit Program Mode

TWO-TONE TABLES

Two-Tone Timing

Timing #	1st	Gap	2nd	Group	Type
0	1.0	0	3.0	8.0	GE Std
1	0.4	0	0.8	8.0	Mot Tone Only
2	1.0	0	3.0	6.0	NEC-B
3	1.0	.25	3.0	6.0	NEC-A
4	1.0	0	1.0	4.0	NEC-C
5	0.4	0	0.8	4.0	NEC-M
6	0.5	0	0.5	3.0	NEC-L
7	0.4	0	0.4	3.0	NEC-D

Two-Tone Tone Groups

Group	0	1	2	3	4
Tone #	MOT 1	MOT 2	MOT 3	MOT 4	MOT 5
0	330.5	569.1	1092.4	321.7	553.9
1	349.0	600.9	288.5	339.6	584.8
2	368.5	634.5	296.5	358.6	617.4
3	389.0	669.9	304.7	378.6	651.9
4	410.8	707.3	313.0	399.8	688.3
5	433.7	746.8	953.7	422.1	726.8
6	457.9	788.5	979.9	445.7	767.4
7	483.5	832.5	1009.9	470.5	810.2
8	510.5	879.0	1037.7	496.8	855.5
9	539.0	928.1	1062.2	524.6	903.2
Diag	569.1	979.9	569.1	569.1	979.9

Group	5	6	7	8	9
Tone #	MOT 6	MOT A	MOT B	MOT Z	GE A
0	1122.5	358.9	371.5	346.7	682.5
1	1153.4	398.1	412.1	384.6	592.5
2	1185.2	441.6	457.1	426.6	757.5
3	1217.8	489.6	507.0	473.2	802.5
4	1251.4	543.3	562.3	524.8	847.5
5	1285.8	602.6	623.7	582.1	892.5
6	1321.2	668.3	691.8	645.7	937.5
7	1357.6	741.3	767.4	716.1	547.5
8	1395.0	822.2	851.1	794.3	727.5
9	1433.4	912.0	944.1	881.0	637.5
Diag	979.9	979.9	979.9	979.9	742.5

Group	10	11	12	13
Tone #	GE B	GE C	MOT 10	MOT 11
0	652.5	667.5	1472.9	1930.2
1	607.5	712.5	1513.5	1989.0
2	787.5	772.5	1555.2	2043.8
3	832.5	817.5	1598.0	2094.5
4	877.5	862.5	1642.0	2155.6
5	922.5	907.5	1687.2	2212.2
6	967.5	952.5	1733.7	2271.7
7	517.5	532.5	1781.5	2334.6
8	562.5	577.5	1830.5	2401.0
9	697.5	622.5	1881.0	2468.2
Diag	742.5	742.5	None	None

Two-Tone Code Plans

Plan #	0	1	2	3	4	5	6
Capcode	Mot B	Mot C	Mot D	Mot E	Mot F	Mot G	Mot H
0xx	1+3	None	None	None	None	None	None
1xx	0+0	0+0	0+0	0+0	0+0	0+0	0+0
2xx	1+1	1+1	1+1	1+1	0+2	0+2	0+2
3xx	2+2	0+1	0+1	0+1	2+2	2+2	2+2
4xx	0+1	3+3	0+4	1+0	3+3	2+0	2+0
5xx	0+2	0+3	4+4	0+5	2+0	4+4	0+5
6xx	1+0	1+0	1+0	5+5	0+3	0+4	5+5
7xx	2+0	3+0	4+0	5+0	3+0	4+0	5+0
8xx	1+2	1+3	1+4	1+5	2+3	2+4	2+5
9xx	2+1	3+1	4+1	5+1	3+2	4+2	5+2

Plan #	7	8	9	10	11	12	13
Capcode	Mot J	Mot K	Mot L	Mot M	Mot N	Mot P	Mot Q
0xx	None	None	None	3+1	3+1	3+1	3+1
1xx	0+0	0+0	0+0	1+2	1+2	1+2	1+3
2xx	0+3	0+3	0+4	1+1	1+1	1+1	1+1
3xx	3+0	3+0	4+0	2+2	2+2	2+2	3+1
4xx	3+3	3+3	0+5	3+3	2+1	2+1	3+3
5xx	4+4	0+5	4+4	2+1	4+4	1+5	4+4
6xx	0+4	5+5	5+5	1+3	1+4	5+5	1+4
7xx	3+4	5+0	5+0	3+1	4+1	5+1	3+4
8xx	4+3	3+5	4+5	2+3	2+4	2+5	4+3
9xx	4+0	5+3	5+4	3+2	4+2	5+2	4+1

Two-Tone Code Plans (Continued)

Plan #	14	15	16	17	18	19	20
Capcode	Mot R	Mot S	Mot T	Mot U	Mot V	Mot W	Mot Y
0xx	3+1	3+1	3+1	3+1	3+1	3+1	None
1xx	1+3	1+4	2+3	2+3	2+4	3+5	6+6
2xx	1+1	1+1	3+2	3+2	4+2	5+3	7+7
3xx	3+1	4+1	2+2	2+2	2+2	4+5	8+8
4xx	3+3	1+5	3+3	3+3	2+5	3+3	6+7
5xx	1+5	4+4	4+4	2+5	4+4	4+4	6+8
6xx	5+5	5+5	2+4	5+5	5+5	5+5	7+6
7xx	5+1	5+1	3+4	5+2	5+2	3+4	8+6
8xx	3+5	4+5	4+3	3+5	4+5	4+3	7+8
9xx	5+3	5+4	4+2	5+3	5+4	5+4	8+7

Plan #	21	22	23	24
Capcode	**Mot MT**	**GE X**	**GE Y**	**GE Z**
0xx	3+1	9+9	10+10	9+9
1xx	0+0	10+9	11+10	11+9
2xx	1+1	10+10	11+11	11+11
3xx	0+1	9+10	10+11	9+11
4xx	3+3	11+11	None	None
5xx	4+4	11+9	None	None
6xx	1+0	11+10	None	None
7xx	3+4	9+11	None	None
8xx	4+3	10+11	None	None
9xx	1+3	None	None	None

5. INSTALLATION

INSTALLATION WARNING

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. Instillation of the Model 30 Worldpatch should only be attempted by qualified radio service personnel.

GENERAL

Connections to the transmitter, receiver, and power are grouped on a detachable terminal strip on the rear for ease of installation. The Model 30 includes installation test modes to aid in installation. Adjustments may be made on the back of the Model 30.

EQUIPMENT REQUIRED FOR INSTALLATION

Required equipment includes:

1. a communications service monitor
2. a handheld or mobile radio with DTMF encode capability
3. a VOM (volt-ohm-meter)

An oscilloscope is highly recommended, but not absolutely required.

INSTALLATION PROCEDURE

1. POWER SUPPLY: Locate the 12 V_{DC} supply for the radio receiver and transmitter. With a VOM, measure the voltage. It should be between 10.5 V_{DC} and 15.0 V_{DC}. Connect the power supply ground lead to pin 2, and the positive supply lead to pin 1.
2. GROUND CONNECTION: Connect a chassis ground wire from pin 2 to the chassis ground of the transmitter/receiver.
3. TRANSMITTER PTT: Connect a wire from pin 7 (PTT) to the input of the transmitter. Note that this output is a FET pull to ground.
4. TRANSMITTER AUDIO OUTPUT: Connect pin 5 to the microphone input of the transmitter. Shielded cable must be used for this connection, connect the braid to pin 6.

5. DISCRIMINATOR INPUT: Connect pin 3 to the receiver discriminator output. Shielded cable must be used for this connection, connect the braid to pin 2.

   Note: If a carrier detect signal from the receiver is not used, then unfiltered, unsquelched, raw discriminator audio MUST be used for proper operation of the squelch and receive audio circuits in the Model 30. Speaker audio may not be used. The discriminator must pass frequencies above 6 kHz for proper operation!

6. OPTIONAL CTCSS / DCS DECODE INPUT: If the Model 30 is connected to a control station that operates through a community repeater, or a receiver equipped with CTCSS or DCS decode, the DECODE input should be used. This will enable the Model 30 to determine the difference between a busy channel (from co-channel mobiles), and a valid user with the correct tone. This will prevent co-channel users from accessing or interfering with the phone patch.

   The DECODE input (pin 9) should be connected to the CTCSS or DCS decoder output in the receiver. The signal must switch between less than 1.5 V_{DC}, and 3.5 V_{DC} during "decode" and "not-decode" conditions. A jumper is provided to select the polarity of the signal. If the decode output is low during decode condition, set jumper JP6 to position "A". If the decode output is high during decode condition (or is not required and left unconnected), set jumper JP6 to position "B".

7. COR INPUT: If a carrier detect signal is to be provided from the receiver, connect pin 8 to the carrier active sensor in the receiver. The signal must be between 0 and 7 V_{DC}, and change at least 1 volt between carrier and no-carrier conditions. The built-in squelch detector can be used if carrier indication from the receiver is not readily available.

TEST AND ADJUSTMENTS / INITIAL TURN-ON

1. INITIAL SETTING OF RECEIVE LEVEL AND CARRIER DETECT: In order to get started with the rest of the adjustments, it s necessary to do a rough set-up of the RECEIVE GAIN and the CARRIER DETECTOR sensitivity. Connect an oscilloscope to U1 pin 14 and set it 0.5 V_{AC}/division. Supply a full quieting signal with a 1 kHz audio tone at 70% of full channel deviation (typically 3.5 kHz deviation, if a service monitor is not available, try using a radio with a DTMF keypad, sending any digit continuously will do). While supplying this signal, adjust the RECEIVE GAIN (R4) for a 1 V_{p-p} signal at U1 pin 14. If you are not able to reach this level with JP1 in the "A" position, move it to the "B" position.

   Once the RECEIVE GAIN is set, remove the signal. Make sure JP7 and JP8 are in the "A" position. Now rotate the CARRIER control counter-clockwise

until the CARRIER LED comes on, then rotate the control clockwise until the LED goes out again and a little past that. Supply the modulated signal again to verify that the CARRIER LED comes on and stays on while signal is present. If it flutters or won't stay on with DTMF or voice present, turn the control clockwise a little more until it stays on solid. Remove the signal and the LED should drop out smartly.

2. ACCESS THE PROGRAM MODE:

   FROM THE PHONE:
   While the CARRIER LED is off, dial the number the Model 30 is on using a line other than the one the Model 30 is connected to. After approximately 14 rings (60 seconds), the Model 30 will answer the line with a double beep. Key in the program mode access code (default is 12030). When the program mode is accessed, a five beep "go ahead" chirp is heard. The Model 30 will not answer the phone at all while the CARRIER LED is on.

   FROM A DTMF RADIO:
   If it is more convenient to do so, the test may be accessed over the radio channel from a DTMF equipped handheld or mobile radio. The program mode access code is the same for both phone and mobile programming. If the unit does not respond to your attempts to access the program mode and the RECEIVE GAIN and CARRIER are set, check the DECODE polarity jumper JP6 and make sure it is in the correct position ("B" for active high decode or no decode input connected, and "A" for an active low decode input.)

3. SET TRANSMIT AUDIO GAIN: Start with the jumper JP3 in the "B" (low gain) position. Enter the DTMF command "92#". The transmitter will be keyed and a 1 kHz test tone will be generated for 90 seconds. Using a service monitor, adjust the TRANSMIT LEVEL pot (R5) for 70% of full channel deviation (typically 3.5 kHz). If the deviation won't go high enough, move JP3 to the "A" (HI) position and try again.

   Note: THIS IS NOT THE REPEAT AUDIO LEVEL ADJUSTMENT! That comes in step 4.

Note: Step 4 is for full-duplex base or repeater installations only. Simplex users can skip on to step 5.

4. SET REPEAT AUDIO GAIN:
   Enter the command "33# 1#" to set the Model 30 to Half-Duplex. Enter the command "93#". Supply a full quieting signal to the receiver with a 1 kHz audio tone at 70% of full channel deviation (typically 3.5 kHz), the transmitter should key. While monitoring the transmit channel with the service monitor set to duplex, adjust the RECEIVE LEVEL control until the transmitter deviation matches the input deviation. If a full duplex capable service monitor is not available, another radio can be used to supply the signal into the receiver. Now insert a 500 Hz, 1000 Hz, and 2000 Hz tone. The output deviation should remain flat. If it does not, try moving the position of JP2. If you do move JP2, check the repeat audio for unity gain again. OUTPUT DEVIATION = INPUT DEVIATION

   Enter a "#" to return to the program mode.

   Note: The CARRIER detector operates on audio <u>after</u> the RECEIVE gain setting, so it will interact with the RECEIVE LEVEL adjustment. The CARRIER LED must be on during this test; if necessary, adjust the CARRIER control to force it on. When done with all RECEIVE LEVEL adjustments, reset the CARRIER ADJUST as you did in step 1.

5. CARRIER ADJUST:

   a. INTERNAL SQUELCH (no connection to pin 8):
      Set JP7 and JP8 to the "A" position. Adjust the CARRIER ADJUST by watching the CARRIER LED. It should be set exactly like the squelch on a receiver. This adjustment must be made after the RECEIVE LEVEL is set.

   b. EXTERNAL SQUELCH:
      When using an external COR, set JP7 to the "B" position. JP8 will select the COR polarity. Adjust the COR threshold using R90 while watching the CARRIER LED for optimum performance.

   Note: Since the CARRIER detector operates after the receive audio amplifier, any changes to the RECEIVE LEVEL will affect the CARRIER detector. The CARRIER detector requires unfiltered discriminator audio for proper operation.

6. SIMPLEX SAMPLING WINDOW SETUP: If the Model 30 is to be used in any of the simplex modes, the automatic sample window command should be executed. This step should be skipped by Half-Duplex users.

   Enter command "33# 2#" to set the Model 30 to Simplex VOX. Enter

command “78#”. The Model 30 will key the transmitter, put out two beeps, and remain keyed for two seconds. While the Model 30 has the transmitter keyed, the installer should key his radio and encode a DTMF digit (any digit, it doesn’t matter) for about 4 seconds. The Model 30 will unkey its transmitter and measure how long it takes to decode the DTMF digit being sent. This allows it to determine how long it takes the radio to go from transmit to receive, and to set the sample window.

7. EXIT THE TEST MODE: Enter a “99#” to exit the program mode and return to the normal operating mode.

   Note: The VOX threshold should be checked and if need be adjusted anytime the Model 30 is used in the simplex mode.

8. SETTING THE TELEPHONE VOX THRESHOLD:
   Remove the top of the Model 30 and locate the VOX adjustment pot (R42). Call the Model 30 from the phone and then answer it from the radio, the default answer code is “*1”. Adjust the VOX pot until the Model 30 keys up reliably when you talk on the phone and unkeys reliably when you stop talking. Once you have the Model 30 tracking voice on the phone, you can terminate the call (default is “#1” from the mobile, “#0” from the phone) and put the top back on the unit.

That completes the adjustments. You can now program the unit for your installation. If you have any problems or questions, NOW IS THE TIME to call 425-820-6363 and ask for technical assistance on the Model 30.

Note: While it is true, generally speaking, that the Model 30 will take commands in any order, it will not allow you to use commands specific to simplex operation while it is set for half-duplex, and vice versa. If you get an error tone back in response to an otherwise valid command, try entering “33# 1#” or “33# 2#” as appropriate, and then try the command you were working with again.

OPTIONAL DIGITAL VOICE DELAY

The optional digital voice delay module is available to enhance the simplex mode of operation. When installed, the phone to mobile audio is delayed 0.5 seconds allowing the Model 30 to key the transmitter before the phone audio reaches the transmitter. This ensures that the mobile units will hear the first word spoken by the phone party. To add the digital voice delay to a Model 30, do the following:

1. Remove power from the unit.
2. Remove the top cover.
3. Mount the board on connector J2.
4. Secure the board with a #440 x 0.25″ screw.
5. Remove JP4.

INSTALLING THE SELCALL OPTION

The upgrade kit for the Selcall option (950-9957) consists of two ICs and can be installed in the field. The Selcall option also includes all of what would be the APO extensions in a normal Model 30 as well.

Note: As part of this installation, all programming in the Model 30 will be reset to factory default values. For this reason it is necessary that all of the unit's current programming be documented prior to installing the Selcall option so it may be re-entered after the installation is complete.

1. Document all current programmable parameters.
2. Remove the Model 30 from service. Disconnect all cables to the unit.
3. Remove the top cover of the unit. Locate the large, 40-pin IC designated U12. With the front of the unit facing you it will be in the front, right corner, right behind the TRANSMIT and POWER LEDs. Make a note of which way it is oriented.
4. Gently remove the IC U12 from its socket. Use caution not to damage the IC or its socket. Set this IC aside.
5. Remove the upgrade IC from its package. This is a static sensitive part, so use appropriate precautions. Locate the orientation marks on the IC that identify the end with pin 1 (these will most likely take the form of a notch in the end or large dot in one corner, DO NOT use the printed label as a reference). Carefully insert the IC in socket U12 with pin-1 facing the rear of the unit.
6. Locate IC socket U8, near U12. If it is empty, fill this socket (or replace the existing IC) with the 8-pin IC from the update kit. Its orientation notch should face the left-hand side of the unit.
7. After confirming that all the pins on the IC are correctly placed, press the IC firmly in place. Replace the top cover on the unit. No other adjustments are necessary.
8. Reconnect the cabling to the unit. Before applying power, press and hold the CONNECT button. Apply power to the unit and continue to hold the CONNECT button in until the PHONE LED begins blinking rapidly. This indicates that all programmable memory has been reset to factory default values.
9. Reprogram the unit, set up the paging formats, and place the system back in service.

6. REPAIR

IN CASE OF DIFFICULTY

In case of difficulty, call the Zetron Model 30 Applications Engineering Department at (425) 820-6363. Engineers are available. Please have the serial number of the unit and/or the Zetron Order number. If the call is made from the installation site by the installer or radio technician, the problem can usually be solved over the phone.

If a problem develops after a unit has been in service for some time, call the Zetron Model 30 Service Department at (425) 820-6363. If the call is made from the installation site by a radio technician, the problem can usually be solved over the phone.

The parts lists for the Model 30 and Voice Delay boards are included in this section to aid installation or repair of the unit.

TROUBLESHOOTING

COR and Squelch Problems

For the internal squelch circuit to operate properly the receiver audio must be unsquelched and contain a high percentage of high frequency noise when no carrier is present. For example, if the audio level for full deviation tone at 1 kHz is 0.2 Vp-p, then the unsquelched noise level with no carrier present should be at least 1.0 Vp-p.

1. Key and unkey the PTT on a radio and watch the Carrier LED on the Model 30. The Carrier LED should light solidly when the radio is keyed and go out when it is unkeyed.

2. If the radio does not provide adequate discriminator level to operate the internal COR circuit in the Model 30, set JP7 for EXT and connect a wire from the COR line in the receiver to pin 8 on the Model 30 (see Section 5, “Tests and Adjustments/Initial Turn-on”, step 5). JP8 sets the COR polarity.

Unreliable Dialing or Misdialed Numbers

1. Check the DTMF deviation on the radio. It should be between 3 and 3.5 kHz deviation.

2. Check the receive level coming into the Model 30 at U1 pin 14 (see Section 5, “Tests and Adjustments/Initial Turn-on”, step 1).

Unable to Access Dial Tone or Answer a Call

1. Make sure the CARRIER LED is operating correctly (See Step 5 in Section 5, “Test and Adjustments/Initial Turn-on”).
2. Check the position of JP6. If not using the Decode Input (p1 pin 6), set JP6 to the B position. (See Step 6 in Section 5, “Installation Procedure”).
3. Scope U13 pin 12 while transmitting the access code. This pin should go high with each DTMF digit. If the pin does not follow the DTMF digits, recheck the DTMF level out of the radio and the receive audio level into the Model 30 (See Step 1 in Section 5, “Test and Adjustments/Initial Turn-on”).

Intermittently Disconnecting During a Call

1. Noise on the phone line may false the busy tone detector causing the unit to disconnect the call. Try disabling the busy tone detector (86#).
2. If the Disconnect code is only a single character (e.g. “#”), voice audio may be falsing the DTMF decoder so the unit decodes the DTMF Disconnect code. Try setting the Disconnect code to several digits (e.g. “#12”), or try enabling Single Digit Access Code Validation.

MODEL 30 CONTROL BOARD (702-9321K)

Parts List

LEGEND:
+ = OPTION
= NOT INSTALLED
^ = INSTALLED ON HIGHER ASSY
- = SUBSTITUTE PART

ZETRON MODEL 30 CONTROL BOARD PARTS LIST:

Item Ref.	Qty	Reference	Part	Description	Part
1	1	R56	101-0025	RESISTOR,10 OHM,1/4W,5%,CARBON FILM	10
2	3	R9,R12,R68	101-0047	RESISTOR,47 OHM,1/4W,5%,CARBON FILM	47
3	1	R80	101-0049	RESISTOR,100 OHM,1/4W,5%,CARBON FILM	100
4	6	R10,R19,R84,R85, R86,R87	101-0057	RESISTOR,220 OHM,1/4W,5%,CARBON FILM	220
5	2	R72,R20	101-0059	RESISTOR,270 OHM,1/4W,5%,CARBON FILM	270
6	1	R18	101-0061	RESISTOR,330 OHM,1/4W,5%,CARBON FILM	330
7	4	R8,R49,R57,R69	101-0065	RESISTOR,470 OHM,1/4W,5%,CARBON FILM	470
8	2	R6,R11	101-0066	RESISTOR,510 OHM,1/4W,5%,CARBON FILM	510
9	3	R22,R26,R52	101-0073	RESISTOR,1.0K OHM,1/4W,5%,CARBON FILM	1.0K
10	1	R63	101-0081	RESISTOR,2.2K OHM,1/4W,5%,CARBON FILM	2.2K
11	1	R55	101-0083	RESISTOR,2.7K OHM,1/4W,5%,CARBON FILM	2.7K
12	1	R45	101-0085	RESISTOR,3.3K OHM,1/4W,5%,CARBON FILM	3.3K
13	1	R14	101-0089	RESISTOR,4.7K OHM,1/4W,5%,CARBON FILM	4.7K
14	2	R27,R29	101-0090	RESISTOR,5.1K OHM,1/4W,5%,CARBON FILM	5.1K
15	2	R74,R54	101-0091	RESISTOR,5.6K OHM,1/4W,5%,CARBON FILM	5.6K
16	2	R71,R17	101-0093	RESISTOR,6.8K OHM,1/4W,5%,CARBON FILM	6.8K
17	1	R36	101-0096	RESISTOR,9.1K OHM,1/4W,5%,CARBON FILM	9.1K
18	10	R28,R41,R51,R61, R64,R65,R66,R81, R82,R83	101-0097	RESISTOR,10K OHM,1/4W,5%,CARBON FILM	10K
19	2	R59,R43	101-0099	RESISTOR,12K OHM,1/4W,5%,CARBON FILM	12K
20	1	R24	101-0101	RESISTOR,15K OHM,1/4W,5%,CARBON FILM	15K
21	1	R76	101-0104	RESISTOR,20K OHM,1/4W,5%,CARBON FILM	20K
22	4	R7,R44,R70,R73	101-0105	RESISTOR,22K OHM,1/4W,5%,CARBON FILM	22K
23	1	R21	101-0109	RESISTOR,33K OHM,1/4W,5%,CARBON FILM	33K
24	5	R25,R30,R50,R60, R75	101-0113	RESISTOR,47K OHM,1/4W,5%,CARBON FILM	47K
25	1	R15	101-0115	RESISTOR,56K OHM,1/4W,5%,CARBON FILM	56K
26	3	R16,R34,R88	101-0117	RESISTOR,68K OHM,1/4W,5%,CARBON FILM	68K
27	16	R23,R31,R32,R33, R35,R37,R38,R39, R40,R53,R67,R78, R79,R92,R93, RX1 **NOTE 3**	101-0121	RESISTOR,100K OHM,1/4W,5%,CARBON FILM	100K
28	1	R48	101-0123	RESISTOR,120K OHM,1/4W,5%,CARBON FILM	120K
29	2	R47,R46	101-0129	RESISTOR,220K OHM,1/4W,5%,CARBON FILM	220K
30	2	R13,R58	101-0131	RESISTOR,270K OHM,1/4W,5%,CARBON FILM	270K
31	4	R62,R77,R89,R91	101-0145	RESISTOR,1.0M OHM,1/4W,5%,CARBON FILM	1.0M
32	2	RV2,RV1	105-0001	VARISTOR,250VAC,70J	250VAC
33	0	R1#,R2#	106-1175	RESISTOR,FUSIBLE,75 OHM,1W,5%	75-1F
34	2	R5,R3	107-0003	POT,2K OHM,1 TURN,R/A	2K
35	1	R4	107-0015	POT,50K OHM,1 TURN,R/A	50K
36	1	R42	107-0202	POT,2K OHM,1 TURN	2K
37	1	R90	107-0502	POT,50KOHM,1 TURN	50K
38	1	RP3	119-0021	R-NETWORK,R/2R,100K/200K,SIP-10	
	100K/200K				
39	1	RP2	119-0025	R-NETWORK,10K OHM x 4,ISOLATED,SIP-08	10K
40	1	RP1	119-0026	R-NETWORK,2K OHM x 4,ISOLATED,SIP-08	2K
41	3	C9,C10,C11	150-0096	CAP,1000pF,1KV,10%,CERAMIC DISC,Y5P	.001
1KV					
42	4	C16,C23,C26,C37	151-0020	CAP,.001uF,100V,10%,CERAMIC X7R	.001
43	1	C22	151-0027	CAP,270pF,100V,10%,CER. NPO(USE 151-0028)	270pF
44	1	C17	151-0047	CAP,470pF,100V,10%,CERAMIC NPO	470pF
45	2	C34,C27	151-0100	CAP,.033uF,50V,10%,CERAMIC X7R	.033
46	3	C3,C4,C18	151-0120	CAP,.01uF,50V,10%,CERAMIC X7R	.01

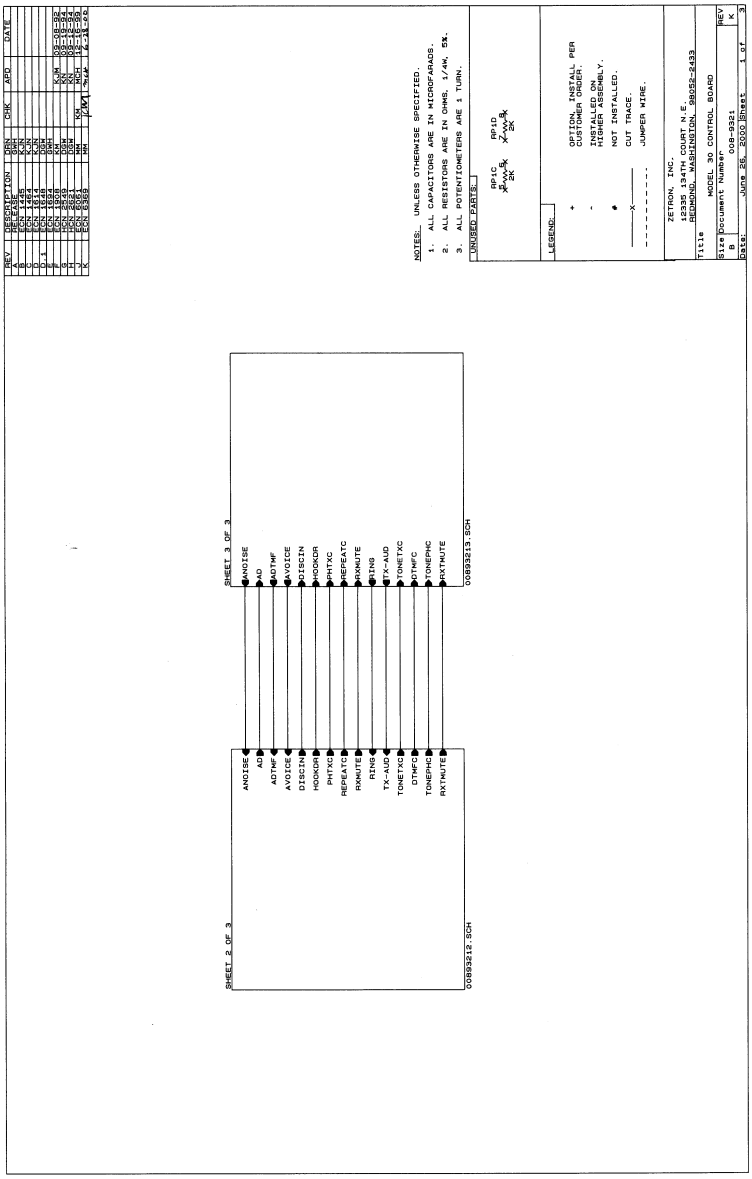
MODEL 30 CONTROL BOARD (702-9321K)

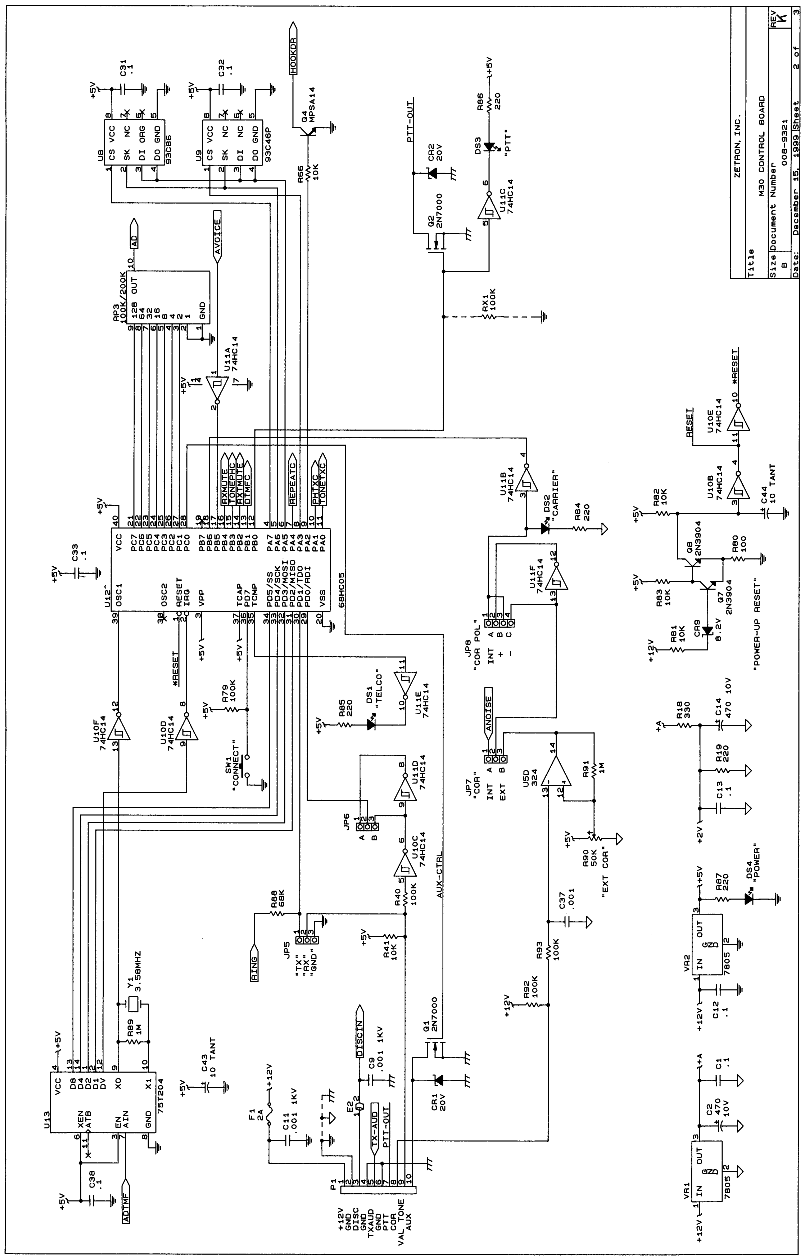
Parts List (Continued)

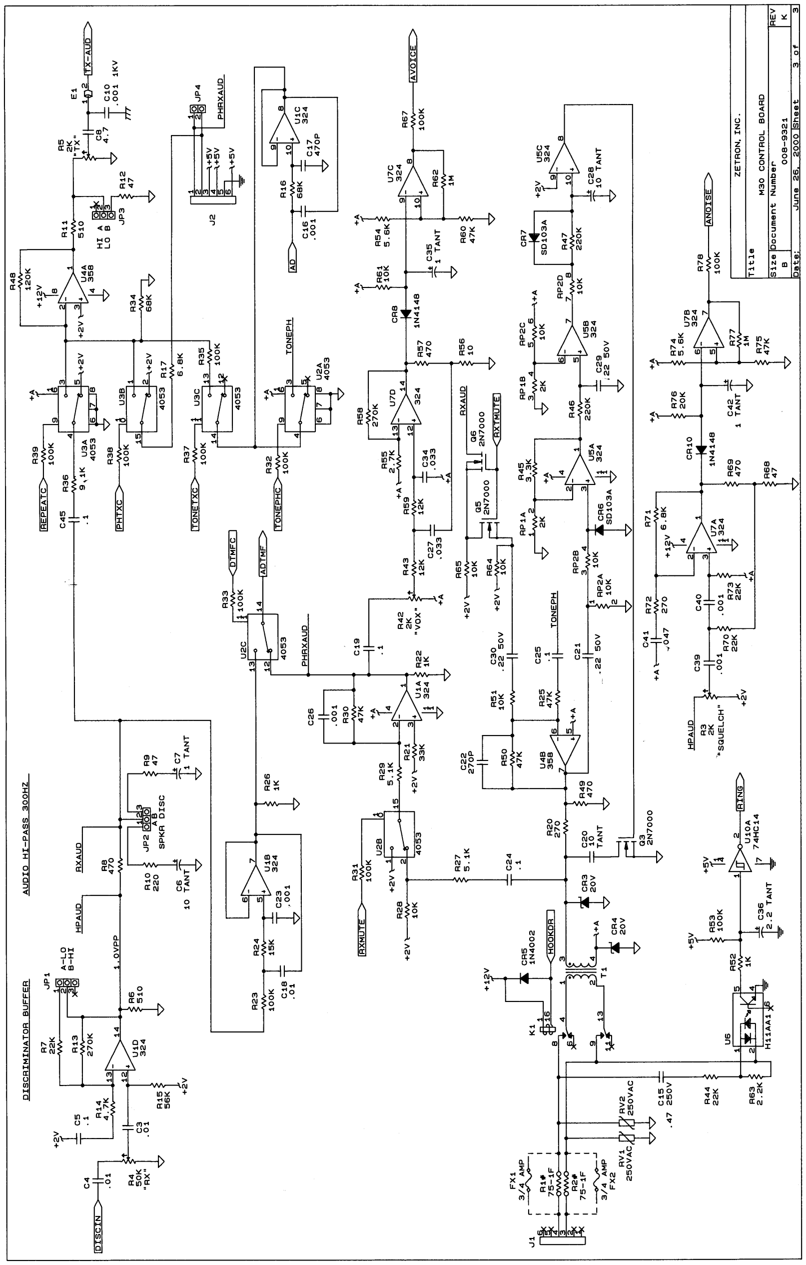
Item Ref.	Qty	Reference	Part	Description	Part
47	1	C41	151-0130	CAP,.047uF,50V,10%,CERAMIC X7R	.047
48	8	C1,C5,C12,C13, C31,C32,C33,C38	151-0180	CAP,.1uF,50V,20%,CERAMIC Z5U	.1
49	4	C19,C24,C25,C45	152-0012	CAP,.1uF,50V,5%,POLYESTER	.1
50	1	C15	152-0021	CAP,.47uF,250V,10%,POLYESTER	.47 250V
51	1	C8	152-0040	CAP,4.7uF,50V,20%,NON-POLAR ELECTROLYTIC,AXIAL	4.7
52	3	C21,C29,C30	152-0080	CAP,.22uF,50V,5%,POLYESTER	.22 50V
53	2	C40,C39	152-0089	CAP,.001uF,50V,5%,POLYESTER	.001
54	3	C7,C35,C42	154-0025	CAP,1uF,35V,10%,TANTALUM	1 TANT
55	1	C36	154-0035	CAP,2.2uF,25V,10%,TANTALUM	2.2 TANT
56	5	C6,C20,C28,C43, C44	154-0100	CAP,10uF,16v,10%,TANTALUM	10 TANT
57	2	C2,C14	155-0083	CAP,470uF,10V,20%,RADIAL,Al-E	470 10V
58	2	E2,E1	305-0001	BEAD,3B FERRITE,W/LEADS	
59	1	T1	305-2105	XFMR,TELCO MODEM, 600 OHM,80MA DC	
60	1	DS4	311-0015	LED,GREEN,TRANSPARENT,T1-3/4	
61	3	DS1,DS2,DS3	311-0016	LED,RED,TRANSPARENT,T1-3/4	
62	1	U6	311-1001	OPTO ISOLATOR,BI-POLAR	H11AA1
63	3	U1,U5,U7	316-0324	OP-AMP,BIPOLAR,358 EQUIVALENT,QUAD,DIP-14	324
64	1	U4	316-0358	OP-AMP,BIPOLAR,DUAL,DIP-8	358
65	2	VR1,VR2	316-7805	REGULATOR,+5V,1.5A,TO-220	7805
66	1	U13	321-0204	RCVR,DTMF,DIP-14	75T204
67	0	U12^	321-6806	8 BIT CMOS OTP (68HC705A),DIP-40	ASIC 009
68	1	U8	322-0103	EEPROM,SERIAL,16K BIT,DIP-8	93C86
69	1	U9	322-9346	EEPROM,1024-BIT(64x16),SERIAL,DIP-8	64x16
70	2	U3,U2	323-4053	ANALOG SWITCH,TRIPLE SPDT,DIP-16	4053
71	2	U10,U11	324-7414	INVERTER,SCHMITT,HEX,DIP-14	74HC14
72	1	Q4	340-0014	XSTR,NPN,DARLINGTON,0.5A 30V,TO-92	MPSA14
73	2	Q7,Q8	340-3904	XSTR,NPN,40V/200MA,TO92	2N3904
74	5	Q1,Q2,Q3,Q5,Q6	340-7000	XSTR,MOSFET,N-CHANNEL,60V/ 0.2A,TO-92	2N7000
75	1	CR5	342-0001	DIODE,SILICON,1A,100V,DO-41	1N4002
76	2	CR7,CR6	342-0103	DIODE,SCHOTTKY,0.37V @ 1MA TYP	SD103A
77	2	CR10,CR8	342-3009	DIODE,SILICON,100V,250MW	1N4148
78	1	CR9	343-3100	DIODE,ZENER,8.2V,1W,5%	8.2V
79	4	CR1,CR2,CR3,CR4	343-3110	DIODE,ZENER,20V,1W,5%	20V
80	1	SW1	371-0024	SWITCH,PB,SPST,MOM,R/A,PWB MNT	
81	1	Y1 **NOTE 1** 3.58MHZ	376-0358	XTAL,3.579545MHZ,CL=18pF,HC-49	
82	1	K1	380-0030	RELAY,DPDT,12 V COIL,MINI-DIP	
83	1	J1	401-0080	6-PIN LO PRO R/A TELCO	
84	1	P1	401-0202	10 PIN X .156 R/A CONN	
85	1	J2	401-6006	6-POS MALE	
86	1	JP4	403-0002	02 OF 401-0052	
87	6	JP1,JP2,JP3,JP5, JP6,JP7	403-0003	03 OF 401-0052	
88	1	JP8	403-0004	04 OF 401-0052	
89	1	F1	416-1202	FUSE,AGC,2 AMP,FAST-BLOW	2A
90	2	FX1,FX2 **NOTE 2**	416-1303	FUSE, 3/4-AMP, SLOW-BLOW,SUBMINIATURE	3/4 AMP
91	7	XJP3,7,8 **(POS A)** XJP1,2,6 **(POS B)** XJP4 **(IN)**	402-3040	MINI JUMPERS	
92	2	XU8,9	407-0008	SKT, 8 PIN DIP	
93	1	XU12	407-0040	SKT, 40 PIN DIP	
94	1	PCB	410-9321D	MODEL 30 CONTROL BOARD	
95	2	XF1	416-3040	FUSE CLIP	
96	4	XDS1-4	417-0010	LED MOUNT RA	

NOTES: (Notes are for Production use only.)

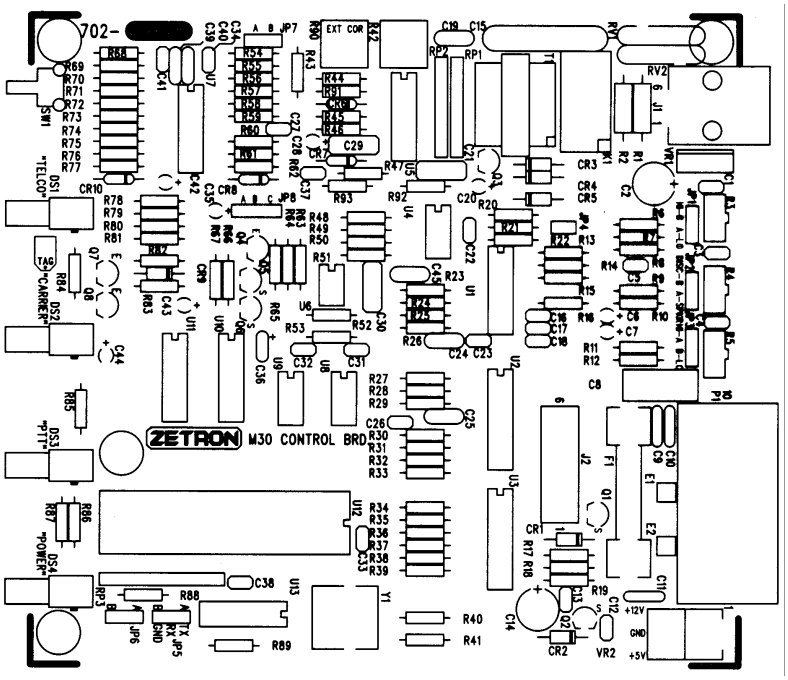
Schematic




ZETRON, INC.
M30 CONTROL BOARD
008-9321
December 15, 1999
Sheet 2 of 3


DISCRIMINATOR BUFFER
AUDIO HI-PASS 300HZ
ZETRON, INC.
Title M30 CONTROL BOARD
Size B
Document Number 008-9321
REV K
Date: June 26, 2000
Sheet 3 of 3

Silkscreen



7. PROGRAMMING LOG AND QUICK REFERENCE

Use the following pages to log all programmed settings for future use and as a quick reference for programming commands. Be sure to log all commands entered into the Model 30!

The Model 30 may be programmed over the radio or phone line using DTMF commands. See Section 4 for detailed instructions. The default program mode access code is 12030.

PROGRAMMING

While the program mode is active, the "*" and "#" keys have special functions. The "#" key is used as the ENTER key, and will execute the selected command. The "*" key is substituted for the "#" key when programming the disconnect code. The "*" is also used as a CLEAR key, and will cause the Model 30 to ignore any previously entered digits.

Programming commands are entered as two digit function codes followed by the "#" key to execute the command. Some commands require extra digits, such as connect and disconnect codes, toll restrict digits, and station ID. When extra digits are required, the "#" is used both after the command and at the end of the extra data digits.

While programming the Model 30, audio tones are used to indicate progress.

Prompt Tone	Meaning
Chirp	Ready for a Command
Double beep	Enter extra digits (Connect code, etc.)
Warble	Error, invalid command
Ringing	Program mode exit, returning to operational mode

Programming Example

Set Model 30 to pulse dial mobile originated calls, set first digit toll restrict to prevent 0+ and 1+ calls, and remove any second digit toll restrict digits.

DTMF	Prompt Tones	Comments
12030	Chirp	Access the Model 30 program mode
05#	Chirp	Set for pulse dial phone line
15# 01#	Double beep, Chirp	Set first digit restrict to 0 and 1
96#	Warble	Invalid command, no operation
16# #	Double beep, Chirp	Remove second digit toll restricts
99#	Ringing	Exit the program mode

PROGRAMMING LOG AND QUICK REFERENCE

01#	_____#	Connect Code 1 - 9 digits (0 to 9, *)	*1
02#	_____#	Disconnect Code 1 - 9 digits (0 to 9, #)	#1
03#	_____#	Toll Restrict Bypass Code 1 - 8 digits (0 - 9, *)	99
04#		DTMF Regenerate Mobile Originated Calls	**D**
05#		Pulse Dial Mobile Originated Calls	
06#	___#	Rings-to-Answer (1 to 10 rings)	1
09#	___#	Single Digit Access Code Validation (0 = Disabled, 1 = Enabled)	1
10#	___#	DTMF Timeout Timer (0 to 60 in seconds)	3
11#	___#	Hook Flash (0 = Disabled, 1 = Enabled)	0
13#	___#	Call Alert (0 = Disabled, 1 = Enabled)	0
14#	___#	Limit Phone Access to Autodials (0 = Disabled, 1 = Enabled)	0
15#	____#	Restricted Numbers 1st Digit (1 - 4 digits)	
16#	____#	Restricted Numbers 2nd Digit (1 - 4 digits)	
17#	___#	Ringout Mode 0 = Ring once, wait up to 60 seconds 1 = Ringout repeatedly for up to 60 seconds 2 = Direct-to-Air	1
18#	____#	Password for Direct-to-Air (1 to 9 digits)	
19#		Enable Carrier Repeat Audio (radio must be full duplex)	
20#		Disable Repeater Mode	**D**
21#	___#	Repeater Hold Time (0 to 5 seconds)	1

22#		COR-to-Answer	
23#		Access Code to Answer	**D**
24#	___#	Station Morse ID Mode 0 = Disabled 1 = ID every 10 minutes, with channel activity 2 = ID every 10 minutes, regardless of activity	0
25#	_____#	Morse Code Station ID Call Sign	
26#	___#	Interconnect Courtesy Tone (0 = Disabled, 1 = Enabled)	0
27#	___#	Half-Privacy Masking Tone (0 = Disabled, 1 = Enabled)	0
30#	___#	Call Limit Timer Mode 0 = Disabled 1 = Enabled 2 = Enabled / Allow Mobile Reset	1
31#	___#	Call Limit Timer (1 to 60 minutes)	3
32#	___#	Mobile Activity Timer (0 to 99 seconds, 0 = disabled)	30
33#	___#	Set Duplex / Simplex Mode 1 = Half Duplex (Requires full duplex base or repeater) 2 = Simplex 3 = Simplex VOX with pre-key 4 = Simplex Sampling 5 = Simplex Sampling with VOX to extend sample interval 6 = VOX/Sampling between words (Intelligent Mode) 7 = Simplex Phone Key Control (phone * and # control transmitter)	2
34#	___#	VOX Sampling Before Dial Tone is Issued (0 = Disabled, 1 = Enabled)	0

35#	___#	Select Paging Format 0 = Disable paging 1 = DTMF Format 2 = 100 Call Two Tone Format 3 = 1000 Call Two tone Format 4 = DTMF and 100 Call Two Tone Formats 5 = DTMF and 1000 Call Two Tone Formats	0
36#	___#	(100 Call) “A” Tone - Tone Groups - 0 - 13 or (1000 Call) Code Plan, Code Plans - 0 - 24	0
37#	___#	“B” Tone - Tone Groups 0 - 13	0
38#	___#	Set Two-Tone Timing (Range 0 to 7)	0
39#	___#	Group Call Operation 0 = Group Calls Enabled 1 = Diagonal Tone Replaces “A” Tone 2 = Diagonal Tone Replaces “B” Tone	0
40#	___#	Number of DTMF Digits User Must Enter (1 to 8)	3
41#	_____#	DTMF Strapped Digits	
42#	___#	DTMF Strapped Digits Position 1 = Strapped Digits Precede Digits Entered 2 = Strapped Digits Follow Digits Entered	1
49#	___#	Mobile-to-Mobile Paging (0 = Disabled, 1 = Enabled)	0
50#	_# ____#	Program Autodial Numbers (0 to 49)	
53#	___#	Dial Tone Detect Time (1 to 9 seconds, 0 = Disabled)	0
57#	___#	Non-DTMF Mobile Access (0 = Disabled, 1 = Enabled)	0
58#	___#	Dual Function Connect Button (0 = Disabled, 1 = Enabled)	0
59#	___#	Multiple Second Dial Tone (0 = Disabled, 1 = Enabled)	0

69#	___#	Repeat Courtesy Tone (0 = Disabled, 1 = Enabled)	0
70#	___#	Set VOX Sample Rate (0.5 to 1.5 seconds, in 100 ms increments, entry range is 5 to 15)	10
73#	___#	Set VOX Hold Time (0.5 to 1.5 seconds, in 100 ms increments, entry range is 5 to 15)	10
78#	___#	Automatic Sample Window Setup (only from radio)	
79#	___#	Increment Sample Window by 10 ms	
80#	___#	Decrement Sample Window by 10 ms	
81#	___#	Set COR Hold Time (0 to 500 ms, in 100 ms increments)	0
85#	___#	Set Busy Tone Detect Mode 0 = Busy Tone Detection Disabled 1 = Disconnect If Busy Detected in First 20 Seconds 2 = Disconnect If Busy Detected During Entire Call	1
87#	___#	Use Auxiliary Output for PL Strip (0 = Disabled, 1 = Enabled)	0
88#	___#	Set Auxiliary Output ON Code (1 to 9 digits)	567
89#	___#	Set Auxiliary Output OFF Code (1 to 9 digits)	890
90#	_____#	Set Program Access Code	12030
91#		Reset All Memory to Factory Defaults	
92#		Transmit Level Test	
93#		Repeat Audio Test / Receive Level Adjustment	
94#		Enable High-Speed Phone Programming (This command is for future use only.)	
99#		Exit Program Mode	

AUTODIAL PROGRAMMING LOG

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	

23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	