ZETRON®

Model 30 Worldpatch
Product Manual

025-9140 R

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Regulatory Compliance

FCC Class A User Information

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 own expense.

EMC Compliance Standards

This product meets the requirements of the standards listed below.

- FCC Part 15 – Radiated & Conducted Emissions (USA)
- ICES-003 – Radiated & Conducted Emissions (Canada)
- EN 55022 – Radiated & Conducted Emissions (Europe)
- EN 55024 – Immunity (Europe)

Regulatory Compliance Markings

Product Certification Markings:

- FCC Part 15 (USA)
- FCC Part 68 (USA)
- CS-03 (Canada)
- CE (Europe)
- C-tick (Australia)

Telecommunications Compliance

- FCC Part 68 (USA)
- CS-03 (Canada)

In Australia

Do not connect this item to any telecommunications network or facility unless:

a. you have the written consent of the network or facility manager; or
b. the connection is in accordance with a connection permit issued for this item; or
c. a connection rule for this item has been made by the Australian Communications and Media Authority.

The connection of this item to any telecommunications network or facility may cause a hazard or damage to the network or facility, or to users of the network or facility, and may result in you being consequentially liable to pay substantial compensation.

Information on Disposal of Old Electrical and Electronic Equipment and Batteries (applicable for EU countries that have adopted separate waste collection systems)

Pb

Products and batteries with the symbol (crossed-out wheeled bin) cannot be disposed as household waste. Old electrical and electronic equipment and batteries should be recycled at a facility capable of handling these items and their waste byproducts.

Contact your local authority for details in locating a recycle facility nearest to you.

Proper recycling and waste disposal will help conserve resources whilst preventing detrimental effects on our health and the environment.

Notice: The sign "Pb" below the symbol for batteries indicates that this battery contains lead.

Safety Summary

Warning! For your safety and the protection of the equipment, observe these precautions when installing or servicing Zetron equipment.

- Follow all warnings and instructions marked on the equipment or included in documentation.
- Only technically qualified service personnel are permitted to install or service the equipment.
- Be aware of and avoid contact with areas subject to high voltage or amperage. Because some components can store dangerous charges even after power is disconnected, always discharge components before touching.
- Never insert objects of any kind through openings in the equipment. Conductive foreign objects could produce a short circuit that could cause fire, electrical shock, or equipment damage.
- Remove rings, watches, and other metallic objects from your body before opening equipment. These could be electrical shock or burn hazards.
- Ensure that a proper electrostatic discharge device is used, to prevent damage to electronic components.
- Do not attempt internal service of equipment unless another person, capable of rendering aid and resuscitation, is present.
- Do not work near rotating fans unless absolutely necessary. Exercise caution to prevent fans from taking in foreign objects, including hair, clothing, and loose objects.
- Use care when moving equipment, especially rack-mounted modules, which could become unstable. Certain items may be heavy. Use proper care when lifting.

Change List for Rev Q1, 17 Dec 2010

- Added a table of pinouts for connector P1 to the Installation section, see *Table 2* on page *40*
- Corrected the default value for the Connect code listed in the Quick Reference table, see page *51*

Change List for Rev R, 5 Dec 2012

- Updated legal front matter and regulatory compliance information
- Added metric values for physical specifications
- Added notes about use in Australia

Contents

Introduction

Overview

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.

Features

- Simplex VOX, simplex sampling, simplex phone-key controlled 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
- 50 autodial numbers
- Non-DTMF mobile-to-phone access
- Dual function connect button
- Security password for Direct Air Access
- Repeat Courtesy tone
- Auxiliary Output Control
- Single digit access code validation
- Busy tone call disconnect
- Dial tone call disconnect

Specifications

General Specifications

Power	11-16V DC 150 mA
Temperature	0 to 65 degrees Celsius
Size	5.5 inches Wide x 6.25 inches Deep x 1.4 inches High 140 mm x 159 mm x 36 mm

Weight	1.0 pound .45 kilos

Telephone Interface

Line Type	End-to-End phone line
Connector	RJ11 modular jack
FCC Registration	EYBUSA-73434-OT-E
Ringer Equivalence	0.4 B
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
Phone Port Voice Input Level	-19 dBu RMS to -35 dBu RMS
Phone Port Sine Wave Input Level	-10 dBu RMS to -26 dBu RMS
Phone Port DTMF Decode Input Level	-6 dBu RMS to -36 dBu RMS (each tone)

Note: In Australia this product must not be connected the PSTN.

Radio Interface

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

Operation

Phone to Mobile Calls

When the telephone line rings, the Model 30 will wait the number of programmed RINGS TO ANSWER before ringing out on the channel. This is to allow a parallel phone to be manually answered before the Model 30 begins ringing on the radio channel. If the phone continues to ring, and the channel is not in use, the Model 30 will begin ringing out on the radio channel until the connect code is entered by a mobile. The Model 30 may be installed 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. After 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.

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 Originated 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.

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

Once a Call is in Progress

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

- **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 that the call is over.

  Once the disconnect code sequence has been started, each additional digit must be transmitted within 1 second of the last without dropping carrier between digits. If the user unkeys between disconnect code digits, the sign-off attempt will be ignored.
- **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.
- **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 when it detects a busy signal. The busy disconnect feature may be disabled by the installer, or enabled for the entire length of the call.
- **Mobile Activity** - The mobile must transmit at least once during the mobile activity interval. If not, the call will be terminated and 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 12 seconds before the mobile activity timer expires. This beep serves as a warning to both the telephone user and the mobile user.
- **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.
- **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.
- **Connect Button** - Pressing the disconnect 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.

Model 30 Features

Connect Code

The mobile DTMF connect code may be up to 9 digits in length, and may include any combination of digits 0-9 and *. This code is used to gain access to the telephone line.

Disconnect Code

The disconnect code may be to up to 9 digits in length, and may include any combination of digits 0-9 and #. This code is used to terminate a call in progress.

Note Single digit connect and disconnect codes can be falsed by voice and noise. For this reason, the default setting requires single digit codes to be held for at least 0.5 seconds.

Telephone Disconnect Code

The telephone user may terminate a call in progress by dialing the code "#0" from a DTMF telephone.

DTMF or Pulse Dial Regeneration

The Model 30 defaults to regenerating the DTMF digits received from the mobile user that are used to dial the telephone. This allows the unit to present a set level and quality of DTMF to the phone line regardless of which mobile is dialing or where they are in the system's service area. 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. The audio is muted to facilitate translation of the DTMF to pulse dialing (if programmed) and to accommodate toll restrict checking while dialing. As well it is muted to assure that only a single source of interference-free DTMF is sent through the phone line for reliable dialing.

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 Restrict on 1st Digit

The Model 30 will not allow a mobile to dial a telephone number whose first digit is in the 1st digit toll restrict table. This table usually contains 0 and 1 so that long distance and operator calls may not be made. Up to four digits may be restricted as the first dialed digit.

Toll Restrict on 2nd Digit

Same operation as 1st digit restrict, but acts based on the second digit of a telephone number that a mobile dials.

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.

Repeater Transmit Hold Time

This feature sets the transmitter hold time, the time that the transmitter will stay keyed after the mobile unkeys during repeat operation.

Interconnect "Security"

Interconnect security is intended to discourage casual eavesdropping. During a 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.

Toll Defeat Code

The toll defeat code allows "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.

Ring One Time/Ring Until Answer

The Model 30 may be programmed to either ring on the channel one time and then wait for 1 minute for an answer from a mobile, or to continue ringing for up to 1 minute while waiting for an answer. In either case, if the mobile does not answer within the 1 minute timeout time, the call is terminated.

When the call ringout times out, the phone line will be taken off hook and two short beeps are sent to the caller. The caller then is given 10 seconds to enter the program access code and gain access to program mode.

Direct to Air

One last possibility exists for handling phone calls. The user may program the unit to place the received call Direct To Air. If this function is enabled, a received call waits for the number of rings to answer. The unit then takes the phone line off hook, places it on the air, and sends two beeps to the caller to indicate the connection is complete. This type of operation is particularly useful for in-house systems where the Model 30 is on an extension of a PBX.

Busy Tone On/Off

The Model 30 has the ability to automatically disconnect the call when a busy tone is detected. The busy tone detection is only enabled during the first 20 seconds of mobile originated telephone call. This feature may be disabled if desired. NOTE: Some dial-up services will read back numbers using computer generated voice. These often "sound like" a busy tone to the Model 30. Using programming commands, busy tone detection can be set to remain active for the entire call.

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.

Call Alert

Call alert, when enabled, 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 and one of them may answer the call allowing the Model 30 to answer the phone and place the call.

Autodials

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.

Repeat Courtesy Tone

During repeat mode, a courtesy tone, when enabled, will beep at the end of each transmission. For example, if you are talking to another person and you unkey, the Model 30 will beep prompting the other person to talk.

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 to turn off the output. This can be accessed from either the radio or the phone. A radio user needs only to keyup on the channel and enter the DTMF code for the desired state of the output. A beep confirming access is sent back to the user. Phone access is available at any time the caller could enter the program access code (such as after ringout on the channel).

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 mAdc, which is useful for switching relays or other low current devices. 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.

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 ringout 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.

Security Code for Direct to Air

A security code (or password) that is used for Direct-to-Air phone to mobile calls may be programmed into the unit. This password is then entered by the phone caller in order to be placed on the air. Using this feature avoids wrong numbers or unwanted calls from broadcasting on the channel.

Non-DTMF Access to Phone Line

When enabled, non-DTMF equipped radios 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".

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 is watching for either VOX or carrier detection. When the Model 30 detects VOX, it will key the transmitter and allow telephone audio to pass to the transmitter. When VOX drops and the VOX HOLD timer expires, the transmitter is dropped and the Model 30 goes back 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 once again 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 is typically lost while the transmitter (and associated repeater or links) come up on channel. CTCSS decoders will also contribute to the lost syllables. By adding the digital voice delay board, the phone audio is delayed 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 begin talking, so in anticipation of this, the Model 30 will “prekey” the transmitter. This will reduce 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 will unkey. 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 the 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.

Simplex Sampling with VOX Extended 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 the 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 is ONLY available when the Optional Simplex 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 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 will not 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 for fine tuning in 10-millisecond increments.

Options

A Digital Voice Delay Option is available for premium simplex operation.

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.

To program the unit over the dial up phone line, simply dial the phone number of the unit, but don't allow any mobiles to answer the call. After about 12 rings, the Model 30 will answer the phone line and generate a two-beep prompt tone. After the tone, enter the program mode access code using a DTMF telephone. The "go-ahead chirp" will be heard when access is granted.

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

To program the Model 30, the 5-digit user programmable "program mode access code" must be entered. The access code is **12123** as shipped from the factory, but may be changed to any 5-digit code.

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 seconds, 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 back to default values, from the front panel, complete the following steps:

1. Turn off the 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.

Programmable Items

This section covers the DTMF commands used to program the Model 30 Worldpatch. The format for entering commands is basically:

2-digit command # data string #

The commands are listed, described and followed by their default setting from the factory.

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 sub-set of another code. For instance, if "*" is programmed as the Connect Code, a "*" must not be used as the first digit of the Toll Restrict Bypass Access Code (e.g. "* 2"). Programming the unit in such a manner would never allow Toll Bypass Access.

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	Default
05#	Pulse Dial Mobile Originated Calls	

Note When using pulse dialing, the phone line must not respond to Touch-tone digits, or wrong numbers will be called.

Number of Rings Before Active

Sets the number of rings required from the phone line before the Model 30 will begin ringing on the channel.

06#	Wait for 1 Telco Ring Before Ringing to mobile	Default
07#	Wait for 5 Telco Rings Before Ringing to Mobile	
08#	Wait for 10 Telco Rings Before Ringing to Mobile	

Note On the twelfth ring after this number of rings, the unit will answer the phone and prompt for the program mode access code.

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

DTMF Timeout Timer

This command applies when a mobile is dialing a phone number. This command sets the maximum amount of time the phone patch waits between DTMF digits before dropping out of regeneration mode. A DTMF "*" can be used to force dial regeneration to end. 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#	DTMF Timeout Timer (0 to 60 seconds)	3

Hook Flash

The hook flash, when enabled, allows the mobile to flash the telephone line by sending a "*0" without letting carrier drop between digits.

11#	Hook Flash Enabled	
12#	Hook Flash Disabled	Default

Call Alert

Normally, the Model 30 will not answer the telephone and ring out over the air when the channel is busy, but with call alert the Model 30 can alert the mobiles that a call is attempting to come in. Enabling the call alert feature allows the Model 30 to key up during an existing mobile-to-mobile call and send two quick beeps over the air. The mobiles may then elect to stop their conversation allowing the Model 30 to answer the phone and ring out on the channel.

13#	Call Alert On	
14#	Call Alert Off	Default

Toll Restrict Digits

These commands are available to prevent radio users from dialing toll calls. Command 15# sets up to 4 restricted numbers for the first mobile dialed digit. Typically set to restrict "1" and "0". Command 16# sets up to 4 restricted numbers for the second mobile dialed digit. For applications where the patch is used with a PBX, the first mobile dialed digit may be to access an "outside line". In this case, the second digit would typically be set to restrict "1" and "0".

15# Toll Restrict Digit 1

16# Toll Restrict Digit 2

Note Any programming overwrites previously stored digits. Toll restricts can be cleared by programming 15# # or 16# #.

Phone to Mobile Ringouts

These commands select what the Model 30 will do when the phone line begins ringing. If command 17# is selected, when the phone rings, after the "number of rings before active", the Model 30 will key the transmitter and generate a ringing sound to the mobile. The Model 30 will remain active and wait up to 1 minute for the mobile to answer. This mode is included to ensure FCC part 90 requirements are met for certain applications. If command 18# is selected, it allows the Model 30 to ring on the channel until an answer is received or a timeout occurs.

17# Ring Once on Air, Wait for Mobile to Answer

18# Ring Until the Mobile Answers Default

Repeat Audio and Control (Repeater Maker)

These two commands enable or disable carrier-repeat operation. This allows the model 30 to make a cheap repeater out of a pair of mobile radios.

19# Enable Carrier Repeat Audio and Control

20# Disable Repeater Mode Default

Repeater Transmit Hold Time

The following commands set the length of time during carrier repeat mode that the transmitter will stay up after a mobile unkeys.

21# No Repeater Hold Time

22# 1 Second Repeater Hold Time Default

23# 3 Second Repeater Hold Time

24# 5 Second Repeater Hold Time

Morse Code Station Identification

Command 25# sets the station's Morse code ID string. The ID is sent at 30% deviation and 25 words per minute. The ID tone frequency is 1 kHz. To disable the ID function or select when it is transmitted, see commands 64, 65, and 66 on page *33*.

The Model 30 accepts call signs up to eight characters in length. In order to enter all of the 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 blank.

Table 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	– – • •

Example:
Set call sign **WNCR-414**:
Enter DTMF ⇨ 25# 19 26 32 27 04 01 04 #
Comments ⇨ ID= **W N C R 4 1 4** done

Courtesy Tone

A courtesy beep tone may be sent when the mobile party unkeys. This tone is intended to prompt the phone party to begin speaking.

26#	Courtesy Tone Enable	
27#	Courtesy Tone Disable	Default

Half Privacy Mode

In some installations it is desirable to prevent mobiles from hearing one another during a phone call. When enabled, the half-privacy mode will generate a continuous "masking tone" to the transmitter while the mobile is speaking. Other mobiles (or anyone monitoring the channel) will only be able to hear the phone callers side of the conversation. When disabled, the mobile audio will be repeated to the transmitter.

28#	Half-Privacy Masking Tone Enable	
29#	Half-Privacy Masking Tone Disable	Default

Note This mode will only function in the half duplex operating mode.

Call Limit Timer

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

30#	Enable Call Limit Timer	Default
31#	Enable Call Limit Timer, allow Mobile Reset Using "*"	

The call limit time duration is set with the following commands.

32#	No Call Limit Time	
33#	3 Minute Call Limit Timer	Default
34#	5 Minute Call Limit Timer	
35#	10 Minute Call Limit Timer	

Mobile Activity Timer

During a phone call, the mobile is expected to control the radio channel. This requires the mobile to transmit to the phone party (or key up) every 30 seconds during the call. If the mobile drives out of range, or does not transmit within this time, the call will be terminated. Single beep warning tones will be sent to the phone and mobile when approaching the mobile activity limit time.

In the case of simplex VOX operation, the phone party may prevent the mobile from gaining control of the channel. This is caused by continuous phone audio holding the VOX detector locked on, which will prevent the mobile from capturing the patch. This could be caused by "music on hold", a second dial tone or error tone from a PBX, or other continuous phone audio. Just prior to mobile activity timeout, the Model 30 will drop the transmitter for five seconds to allow the mobile to regain control of the patch.

36#	30 Second Mobile Activity Timer	Default
37#	45 Second Mobile Activity Timer	
38#	1 Minute Mobile Activity Timer	
39#	No Mobile Activity Timer	

Operating Mode

The Model 30 is compatible with both simplex and duplex radio channels. The operating mode is set using the following commands. Select the best operating mode as follows:

1. Is the Model 30 connected to a repeater or full duplex base station? If yes, use Half-Duplex mode, if no select one of the simplex modes following.
2. Is the Model 30 connected to a control station working through a repeater? If yes, use Simplex VOX mode.
3. If the radio connected to the Model 30 will switch very fast between transmit and receive, use either of the sampling modes.
4. If the optional digital voice delay is installed, use the Intelligent VOX/Sampling mode.

Operating mode commands:

40#	Half Duplex Mode (requires full duplex base or repeater)	
41#	Simplex Phone Key Control (Phone	☐ and # control transmit
42#	Simplex VOX *Default*	
43#	Simplex VOX with Pre-Key	
44#	Simplex Sampling	
45#	Simplex Sampling with VOX to Extend the Sample Interval	
46#	VOX/Sampling Between Words (Intelligent Mode)	

Sample VOX before Issuing Dial Tone

The following commands affect simplex operation. With the command disabled, the Model 30 will issue dial tone for 2 seconds and then wait up to 10 seconds for the mobile to begin dialing.

In some older systems, it may take longer than 2 seconds to get dial tone making it impossible for the mobile to know if he/she got dial tone. To compensate for slower systems, allow the Model 30 to sample VOX before issuing dial tone to the mobile. After detecting dial tone, the Model 30 will proceed through the call normally. If the VOX detector does not detect dial tone within 15 seconds, the Model 30 will terminate the call.

48#	Enable VOX Sampling Before Issuing Dial Tone	
49#	Disable VOX Sampling Before Issuing Dial Tone	Default

Autodials

The Model 30 allows up to 50 autodials to be stored for speed dialing. To access the autodials, the user enters the connect code and, within 1 second, the autodial number. For example, if the connect code is "*" and the mobile wishes to autodial "number 5", the user enters "*5" and the number is dialed. Up to 16 digits may be programmed into each autodial slot. Toll restrict digits are not enforced for autodials.

Programming for the autodials is done in three parts. First, the command and "#" are entered (50#). The user then unkeys to hear two go-ahead beeps. Next, the autodial that is to be programmed is entered (0 - 49#). Following that, the user must unkey to hear 2 more go-ahead beeps. Finally, the user enters the number that will be dialed when that Autodial is accessed. This number may be up to 16 digits in length. This, of course, is followed with a "#". Once complete, the user will hear the five ready beeps and programming may continue.

As an example, if a user wants to program Autodial 37 with 820-6363, the program sequence would be:
50 # (unkey, hear 2 beeps) **37** # (unkey, hear 2 beeps) **8206363** # (unkey, hear 5 beeps)

50#	__# ___#	Autodial Programming

Limit Phone Access to Autodials

This parameter determines whether mobile users may manually dial their phone calls, or are restricted to choosing a number from a pre-programmed list.

51#	Mobile Dialing Restricted to Autodials Only	
52#	Mobile Dialing Allowed	Default

Dial Tone Disconnect

This command is used to automatically terminate a call after the phone party hangs up. If enabled, this commands sets the number of seconds of continuous VOX that will detected as dial tone. Once this threshold is exceeded, the call will be terminated. This only applies once the call enters the conversation mode; the initial dial tone at the beginning of a call or after a hook-flash do not apply.

53# __# Dial Tone Detect Time (1-9 seconds, 0 = Disabled) 0

Multiple Dial Tone

Normally, when a user initiates a call in one of the simplex modes, the Model 30 passes two seconds of dial tone to the radio. It then unkeys and waits for the user to dial. In some situations, such as when the user must pass through a PBX switch in order to get an outside line, the second dial tone from the outside line could lock up the VOX detector and hold the transmitter keyed. This command allows the Model 30 to pass two seconds of dial tone and then unkey multiple times in a row.

54# Multiple Dial Tone Enable

55# Multiple Dial Tone Disable Default

Non-DTMF Mobile Phone Access

When enabled, non-DTMF equipped radios can gain access to the phone line by simply keying up four times in rapid succession. If four carrier signals are received less than one 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". DTMF equipped radios can still access the unit in the normal manner.

56# Enable Non-DTMF Mobile Access

57# Non-DTMF Mobile Access Disabled Default

Dual Function Connect Button

This function 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. When this option is enabled, after the operator presses the button, the Model 30 rings out over the air to hail the mobile user. If the channel has activity, the phone line is placed in conversation mode when the button is pressed. As always, pressing the button while a call is in progress disconnects the call.

58# Enable Dual Function Connect Button

59# Enable Single Function Connect Button Default

Mobile Answer Mode

The three commands covered here determine how the mobile radio user must behave in order to answer a phone-to-mobile call.

COR To Answer allows non-DTMF mobiles to answer phone-originated calls. When a call comes in, the Model 30 answers the call and begins ringing out on the channel to alert the mobiles of an incoming call. When the mobile radio user hears the ringing on the channel, he or she can simply key the radio to answer the call.

When programmed for ANI To Answer, the mobile must enter in the Model 30's connect code (ANI) to answer a call.

When programmed for Direct Channel Access and a phone-originated call rings the Model 30, it answers the call, sends two beeps to the caller, and opens the audio paths to the radio channel. The beeps prompt the caller to talk.

60#	COR To Answer	
61#	ANI To Answer	Default
62#	Direct Channel Access	

Security Password for Direct Channel Access

If Direct Channel Access phone-to-mobile calls are enabled, it may be desirable to require an access code from the phone caller before broadcasting over the air is allowed. This password will deny wrong numbers or unwanted calls from access. The password may be up to nine digits long and can include numbers 0 - 9 and "*". To erase a previously programmed password, the 63 # command is entered and then followed with another "#".

63# _____# Add Password to Direct to Air Access (1 to 9 digits, blank = disabled) Default = blank

Repeat Morse Code Station ID

The unit may be programmed to repeat the Morse code station identification every 10 minutes or to repeat it only when there is activity on the channel. The feature may also be completely disabled. If the unit is programmed to repeat only with channel activity, the unit will ID every 10 minutes as long as a user has keyed up during the last 10 minutes. If the channel has had no activity for 10 minutes, then the unit will not ID until the end of the next transmission. If the unit is set to ID every 10 minutes, it will do so regardless of channel activity, although it will wait for the channel to be clear before sending the ID.

64#	Disable Morse ID	
65#	Repeat ID Every 10 Minutes Only After Activity	Default
66#	Repeat ID Every 10 Minutes	

Repeat Courtesy Tone

During repeat mode, a courtesy tone, when enabled, will beep at the end of each transmission prompting the other person to talk.

67#	Repeat Courtesy Tone ON	
68#	Repeat Courtesy Tone OFF	Default

Simplex Mode Parameters

The following commands are used to select the operating parameters for simplex operating mode.

70#	Sample Rate 0.5 Seconds	
71#	Sample Rate 1 Second	Default
72#	Sample Rate 1.5 Seconds	
73#	VOX Hold Time 0.5 Seconds	
74#	VOX Hold Time 0.8 Seconds	
75#	VOX Hold Time 1 Seconds	Default
76#	VOX Hold Time 1.3 Seconds	
77#	VOX Hold Time 1.5 Seconds	

The following set of commands is provided to assist the installer in setting the sample window. When the command is executed, the transmitter key and send a double beep then remain keyed for two seconds, during which time the installer must encode a DTMF digit (any digit) to the receiver. The Model 30 will unkey the transmitter and measure the amount of time it takes until the DTMF is decoded through the receiver. The Model 30 then knows how long the radio takes to go from transmit mode to receive mode. This will automatically set the sample window. Two additional commands are available to "fine tune" the sample window if desired.

Automatic sample window setup can *only* be performed from the radio side.

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

Receive Carrier Detector 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 will not assume the mobile has unkeyed until the COR hold time expires.

81#	No COR Hold Time	Default
82#	100 milliseconds COR Hold	
83#	300 milliseconds COR Hold	
84#	500 milliseconds COR Hold	

Busy Tone Disconnect

The Model 30 will try to automatically disconnect mobile originated calls when the dialed phone number is busy. This is accomplished by measuring the duration and rate of the telephone busy tone using the VOX detector, during the first 20 seconds of the phone call. Some phone calls may be to dial up services that read back numbers (such as phone number verification) or other audio that "sounds like" a busy tone to the Model 30. For this reason, the busy detector may be disabled if required. Busy tone detection may alternately be set to remain active for the entire call.

85#	Automatic Disconnect on Busy Tone for First 20 Seconds of Call Default
86#	Busy Tone Detector Disable
87#	Automatic Disconnect on Busy for Entire Call

Auxiliary Output Control

Auxiliary output control, when enabled, allows the user to remotely control a device at the radio site via DTMF over the radio channel. For example, a user may switch a relay to change antennas for coverage of multiple areas. The user programs the Model 30 to have separate auxiliary on and off codes. When the on code is decoded by the Model 30, the FET auxiliary output is pulled low. It will stay enabled until the auxiliary off command is received by the Model 30. Each code may be up to nine digits in length.

88#	_____#	Auxiliary Output ON Code	567
89#	_____#	Auxiliary Output OFF Code	890

Program Mode Access Code

The DTMF access code required to put the Model 30 into program mode is user programmable for added security. The number must be 5 digits in length, and is defaulted to 12123.

90# _____# PROGRAM ACCESS CODE 12123

Reset All Programmable Settings to Factory Defaults

This command will erase ALL previous settings in the unit, and return them to the Zetron factory defaults. *THERE IS ABSOLUTELY NO WAY OF RESTORING PREVIOUSLY PROGRAMMED SETTINGS ONCE THIS COMMAND HAS BEEN ISSUED*. Memory reset may also be done holding the "CONNECT" switch for an extended time while turning on power to the unit. Hold the button until the "PHONE" LED blinks.

91# Reset Memory to Factory Defaults

Transmit Audio Level Setup

This command will key the transmitter and send a 1 kHz test tone to the transmitter. Adjust the "TRANSMIT LEVEL" pot for 70% of maximum allowable deviation (usually 3.5 kHz). The test is terminated by pressing any DTMF digit, pressing the connect/disconnect button, or a timeout.

92# TX Test

Repeat Audio (Audio Input) Level Setup

When this command is executed, the Model 30 will enter a temporary "repeater mode". When receive carrier is detected, the Model 30 will repeat received audio. Adjust the "RX LEVEL" pot until the transmitted level on the channel equals the received level (requires a duplex service monitor or equivalent). This command cannot be executed on a simplex system since the simplex radio cannot receive and transmit at the same time. Any DTMF digit, or pressing the connect/disconnect button, or a timeout will terminate the test. NOTE: The CARRIER ADJUST may need to be moved to enable carrier detect. The CARRIER ADJUST level should be set like the "squelch" knob on a radio AFTER the receive level has been set.

For simplex systems, place a phone call through the Model 30, and adjust for a comfortable mobile-to-phone receive level. If an oscilloscope is available, generate a 1 kHz audio tone at 70% of maximum allowable channel deviation (usually 3.5 kHz), at full quieting into the receiver. Set the RX LEVEL for 1.0 volts peak-to-peak at U1 pin 14.

93# Repeat Audio Test / Receive Level Adjustment

High Speed Phone Programming Upload

This command may be used by automatic equipment that can upload all programmable settings via high speed DTMF over the phone line (off-line programming). It will disable the prompt beeps, error tones, and eliminate the delays between commands. If executed, this command is only effective one time, during the program mode. This command is only accessible when programming over the phone line (DTMF programming on the radio channel will always send the prompt tones).

94# High Speed Phone Programming Upload Command

Exit the Programming Mode

This is the final command, to return the Model 30 to operational mode.

99# EXIT PROGRAM MODE

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 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:

- communications service monitor,
- handheld or mobile radio with DTMF encode capability,
- VOM (volt-ohm-meter).

An oscilloscope is highly recommended, but not absolutely required.

Installation Procedure

Table 2: Model 30 Connector P1 Pinouts

Pin #	Description
1	+12 Vdc Input
2	Ground
3	Discriminator Audio Input
4	Ground
5	Transmit Audio Output
6	Ground
7	Push-To-Talk Output
8	COR (Carrier Detect) Input
9	PL/DPL Tone Validation Input
10	Auxiliary Output

- **Installing the Model 30:**

1. **POWER SUPPLY:** Locate the 12 Vdc power supply for the radio receiver and transmitter. With a VOM, measure the voltage. It should be between 10.5 Vdc and 15.0 Vdc. 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 PTT 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 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!

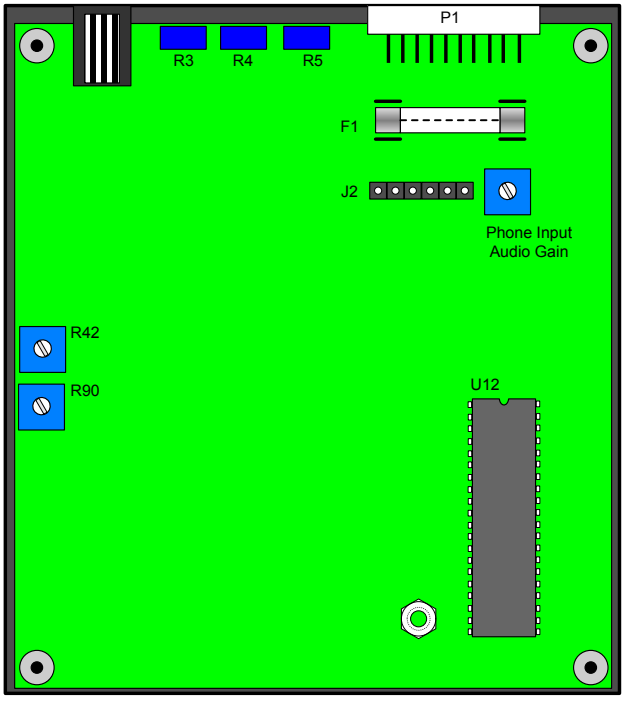
6. **OPTIONAL CTCSS/DCS DECODE INPUT:** If the Model 30 is connected to a control station that operates through a community repeater, or a receiver equipped with CTCSS or DCS decode, the DECODE input should be used. This will enable the Model 30 to determine the difference between a busy channel

(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.

7. **DECODE INPUT:** 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 Vdc, and 3.5 Vdc 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".
8. **COR INPUT:** Connect pin 8 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. A built-in squelch detector can be used if a carrier indication from the receiver is not readily available.

Tests and Adjustments, Initial Turn-on

Figure 1: Model 30 Potentiometer Locations



- **Initial adjustment of the Model 30:**

1. **INITIAL SETTING OF RECEIVE LEVEL AND CARRIER DETECT:** In order to get started with the rest of the adjustments, it is 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 for 0.5 VAC per 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 VP-P signal at U1 pin 14. If you are not able to reach this level with **JP-1** 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 if it wasn't already on.

   Once the CARRIER LED is 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 will not 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 A 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 12123). When the program mode is accessed, a five beep "go ahead" chip 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 **JP-6** and make sure it is in the correct position ("B" for an 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 **JP-3** 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 30 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 **JP-3** to the "A" (HI) position and try again.

Note THIS IS NOT THE REPEAT AUDIO LEVEL ADJUSTMENT! That comes in step 5.

4. **VERIFY TELEPHONE INPUT AUDIO GAIN:** Check the telephone-to-radio gain by looking at the transmitted voice audio with a service monitor. If the level of the voice audio coming from the phone line falls within the normal range, no adjustment should be necessary. If the incoming voice audio is too low or so loud that it causes clipping at the output to the transmitter, the gain can be adjusted +/- 6 dB by means of a pot that has been added to the board near the fuse F1 and the 6-pin header J2 (see *Figure 1* on page *41* for the location of this pot). If the transmitted voice is too low, turn the pot clockwise to increase it. If the transmitted voice audio is too loud (distorted or clipping) turn the pot counterclockwise to decrease the input gain. The telephone voice input gain adjustment is independent of any of the tones that the Model 30 detects or sends.

> **Note** The following step is for full duplex base or repeater installations only. Simplex users can skip on to step 6.

5. **SET REPEAT AUDIO GAIN:** Enter the command "40#" 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 **JP-2**. If you do move **JP-2**, 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 AFTER 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.

6. **CARRIER ADJUST:**
   d. 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.
   e. 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 CARRIER detector. The CARRIER detector REQUIRES unfiltered discriminator audio for proper operation.

7. **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 the command "42#" to set the Model 30 to Simplex VOX. Enter the command "78#". The Model 30 will key the transmitter, put out two beeps, and remain keyed for two seconds. While the Model 30 still has the transmitter keyed, the installer should key his radio and encode a DTMF digit (any digit it does not 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 to radio to go from transmit to receive, and to set the sample window.
8. **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 any time the Model 30 is used in the simplex mode.

9. **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 mobile "#2" from 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 206-820-6363 and ask for technical assistance on the Model 30.

Note PROGRAMMING: While it is true, generally speaking, that the Model 30 will take programming 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 "40#" or "42#" 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 ad digital voice delay to an existing Model 30:**

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.
6. Replace the top cover.
7. Restore power to the unit

You should test the card in a simplex phone call and determine whether or not you need to adjust the delay setting of the card.

Repair

In Case of Difficulty

In case of installation difficulty, contact Zetron Technical Support Toll Free at 1-877-284-4616 or 1-425-820-6363. 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.

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, 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 *Tests and Adjustments, Initial Turn-on* on page *41*, 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 *Tests and Adjustments, Initial Turn-on* on page *41*, Step 1).

Unable to Access Dial Tone or Answer Call

1. Make sure the COR LED is operating correctly (see above).
2. Check the position of JP6. If not using the Decode Input (P1 pin 6), set JP6 to the B position. (See *Installation Procedure* on page *40*, step 8).
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 the preceding item on unreliable dialing).

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 (for example, #), voice audio may be falsing the DTMF decoder so the unit decodes the DTMF disconnect code. Try setting the disconnect code to several digits (for example, #12)

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 12123.

Programming

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

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 digits.

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

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

Programming Example

The commands presented in the following table will set the Model 30 to pulse dial mobile originated calls, set the toll restrict first digit numbers to prevent 0+ and 1+ calls, and remove any second digit toll restrict digits.

DTMF Digits	Prompts	Comments
12123	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 2nd digit toll restricts
99#	Ringing	Exit the program mode

Programming Log and Quick Reference

Command	Data String	Description	Default
01#	_____ #	Connect code, may include the * digit	*1
02#	_____ #	Disconnect code, to enter a #, press *	#1
03#	_____ #	Toll restrict bypass, may include *	99
04#	[ ]	DTMF dial mobile originated calls	Default
05#	[ ]	Pulse dial mobile originated calls	
06#	[ ]	Wait for 1 telco ring before ringing to the mobile	Default
07#	[ ]	Wait for 5 telco rings before ringing to the mobile	
08#	[ ]	Wait for 10 telco rings before ringing to the mobile	
09#	_____ #	Single Digit Access Code Validation (0 = Disabled, 1 = Enabled)	1
10#	_____ #	DTMF Timeout Timer (0 to 60 seconds)	3
11#	[ ]	Hook Flash Enabled	
12#	[ ]	Hook Flash Disabled	Default
13#	[ ]	Call Waiting Alert ON	
14#	[ ]	Call Waiting Alert OFF	Default
15#	_____ #	Restricted numbers for the 1st mobile dialed digit	
16#	_____ #	Restricted numbers for the 2nd mobile dialed digit	
17#	[ ]	Ring once on air, wait up to 1 minute for mobile answer	
18#	[ ]	Ring on the channel until the mobile answers	Default
19#	[ ]	Enable carrier repeat audio and control (must be a true duplex radio)	
20#	[ ]	Disable repeater mode	Default
21#	[ ]	No repeater hold time (when repeater mode is enabled)	
22#	[ ]	1 second repeater hold time	Default
23#	[ ]	3 second repeater hold time	
24#	[ ]	5 second repeater hold time	
25#	_____ #	Morse code station ID call sign (see page *28*)	
26#	[ ]	Courtesy tone enable	
27#	[ ]	Courtesy tone disable	Default
28#	[ ]	Half-privacy masking tone enable (for half duplex mode only)	
29#	[ ]	Half-privacy masking tone disable	Default

Command	Data String	Description	Default
30#	[ ]	Enable call limit timer	Default
31#	[ ]	Enable call limit timer, allow mobile reset using *	
32#	[ ]	No call limit time	
33#	[ ]	3 min. call limit timer	Default
34#	[ ]	5 min. call limit timer	
35#	[ ]	10 min. call limit timer	
36#	[ ]	30 second mobile activity timer	Default
37#	[ ]	45 second mobile activity timer	
38#	[ ]	1 minute mobile activity timer	
39#	[ ]	No mobile activity timer	
40#	[ ]	Half duplex mode (requires full duplex base or repeater)	
41#	[ ]	Simplex Phone Key Control	
42#	[ ]	Simplex VOX	Default
43#	[ ]	Simplex VOX with pre-key	
44#	[ ]	Simplex sampling	
45#	[ ]	Simplex sampling, VOX extends the sample interval	
46#	[ ]	VOX/Sampling between words (Intelligent mode)	
48#	[ ]	Enable VOX sampling before issuing dial tone	
49#	[ ]	Disable VOX sampling before issuing dial tone	Default
50#	___# _____ #	Program Autodial Numbers 0 to 49 (up to 16 digits each)	
51#	[ ]	Mobile Dialing Restricted to Autodials only	
52#	[ ]	Mobile Dialing Allowed	Default
53#	_____ #	Dial Tone Detect Time (1 to 9 seconds, 0 = disabled)	0
54#	[ ]	Multiple Dial Tone Enable	
55#	[ ]	Multiple Dial Tone Disable	Default
56#	[ ]	Non-DTMF Mobile Access Enable	
57#	[ ]	Non-DTMF Mobile Access Disable	Default
58#	[ ]	Enable Dual Function Connect Button	
59#	[ ]	Disable Dual Function Connect Button (button starts conversation mode)	Default
60#	[ ]	COR to answer	
61#	[ ]	Connect code to Answer	Default
62#	[ ]	Direct to air	

Command	Data String	Description	Default
63#	_____ #	Optional security code for direct to air	
64#	[ ]	Disable Repeat ID	
65#	[ ]	ID every 10 minutes, if channel has been active	Default
66#	[ ]	ID every 10 minutes	
67#	[ ]	Repeat Courtesy Tone ON	
68#	[ ]	Repeat Courtesy Tone OFF	Default
70#	[ ]	VOX Sample rate 0.5 seconds	
71#	[ ]	VOX Sample rate 1 second	Default
72#	[ ]	VOX Sample rate 1.5 seconds	
73#	[ ]	VOX hold time 0.5 seconds	
74#	[ ]	VOX hold time 0.8 seconds	
75#	[ ]	VOX hold time 1 seconds	Default
76#	[ ]	VOX hold time 1.3 seconds	
77#	[ ]	VOX hold time 1.5 seconds	
78#	[ ]	Automatic sample window setup (can only be performed from radio)	
79#	[ ]	Increment sample window by 10 msec (__ __ times)	
80#	[ ]	Decrement sample window by 10 msec (__ __ times)	
81#	[ ]	No COR hold time	Default
82#	[ ]	100 milliseconds COR hold	
83#	[ ]	300 milliseconds COR hold	
84#	[ ]	500 milliseconds COR hold	
85#	[ ]	Automatic disconnect on busy tone for first 20 seconds	Default
86#	[ ]	Busy tone detector disable	
87#	[ ]	Automatic disconnect on busy tone for entire call	
88#	_____ #	Auxiliary Output ON Code	567
89#	_____ #	Auxiliary Output OFF Code	890
90#	_____ #	Program Access Code (must be 5 digits)	12123
91#		Reset all programmable values to the factory defaults. The memory may also be reset to factory defaults from the front panel. To accomplish this, press the “CONNECT” switch while applying power, then keep the switch depressed until the “PHONE” LED begins to flash. All programmable settings will be reset to the factory defaults.	
92#		Transmit audio test, keys transmitter with test tone for 30 seconds	

Command	Data String	Description	Default
93#		Repeat audio test (to set RX level with duplex radios)	
94#		High Speed Phone Programming (Do *NOT* use this command)	
99#		Exit program mode, returns the Model 30 to normal operation	

Autodial Programming Log

Slot #	Phone Number & Notes
1	
2	
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Slot #	Phone Number & Notes
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