# ZETRON ®

# MODEL 39

## Premium Repeater Panel



## FEATURES

- **Keypad and display for local programming**
- **RS-232 port for programming from PC**
- **All 50 CTCSS tones, 110 digital codes standard**
- **ToneLock ultra high performance tone decoding**
- **Low current operation**
- **Internal dual time constant squelch**
- **Simple installation and programming**
- **Programmable peruser features**
- **Automatic Morse code ID**
- **Airtime accumulation**

## INTRODUCTION

The Zetron Model 39 Repeater Panel is a flexible, locally or remotely programmable repeater tone panel. It converts any station capable of duplex operation into a full featured repeater. The Model 39 is an ideal replacement for older card-per-user tone panels, eliminating time consuming trips to remote repeater sites as well as the high cost of individual tone cards for each customer.

With a Zetron Repeater Panel, a system operator can add or remove customers without traveling to the repeater site. Several different methods of remote programming may be used. The Model 39 can also be programmed locally from its front panel keypad and display.

With 50 CTCSS tones and 110 DCS codes, up to 160 different customers or user groups can be accommodated by a single Model 39. Airtime totals may be retrieved using the front-panel display, PC,

dumb terminal, Model 8B Repeater Programmer/ Timekeeper, or even using Morse code over the radio channel. Of course, the Model 39 retains all of the features and performance of Zetron's popular Model 38.

## PERFORMANCE FEATURES

**ToneLock**, a Zetron exclusive, eliminates repeater talk-down or dropout resulting from weak, fading signals, high modulation levels, or poorly processed mobile transmitter audio. A ToneLock equipped Model 39 will recognize a CTCSS tone or digital code with a receiver quieting level of 3 dB SINAD. Typical programmable tone panels require a minimum of 8 dB SINAD before reliable tone decoding occurs. The Model 39 can even outperform traditional reed type decoders. The Model 39 will not false on adjacent tones, even when receiving CTCSS tones transmitted with a phase reversal.

The Model 39 also provides 110 digitally coded squelch **(DCS) codes** as a standard feature. This DCS capacity, when combined with 50 CTCSS tone capacity means more customers can be placed on the system.

The **Audio Quality** of the Model 39 is immediately obvious when upgrading from older repeater panels or when replacing other programmable panels. The Model 39 recognizes when a mobile, portable, or control station transmits squelch tail elimination, silently muting repeater receiver audio. The Model 39 also transmits **Squelch Tail Elimination** ensuring that listening radios quiet instantly without an annoying noise burst.

**Very low current** requirements make the Model 39 ideal for use in almost any location. With an operational current requirement of only 70 milliamps, the Model 39 can be used on repeaters powered by solar, wind, or thermoelectric energy sources.

## PROGRAMMING AND CONTROL

The Model 39 Repeater Panel can be interrogated and programmed from the front panel keypad and display, a Zetron Model 8B Programmer/Timekeeper, a computer or terminal, or a DTMF-equipped radio.

The **front panel keypad and display** allow access to every feature of the Model 39. The LCD display prompts the system manager through the programming process, making local programming fast and simple. During operation the Model 39 displays the tone or code being decoded, the tone or code being encoded and the updated airtime total for the tone or code being decoded.

The built-in **RS-232 port** may be used with nearly any terminal or personal computer. The terminal or PC may be connected directly to the Model 39 for on-site programming, or remotely via telephone modem or packet radio. Programming by terminal or computer is made simple and efficient through the use of menus and prompts.

The Model 39 remains fully operational while being programmed from the RS-232 port or front panel keypad and display. This means your repeater stays on the air even while retrieving customer usage data or when adding or deleting customers from the system.

## POLITE OPERATION FEATURES

**Courtesy Beeps** tell users exactly when to begin talking. **Tailbips** (one beep per second) can occur during the repeater hold time.

The **Morse code ID** means that users don't have to worry about providing station identification at regular intervals. The Morse code ID feature automatically transmits a user's call sign at the beginning of a transmission and at programmed intervals. An individual ID may be programmed for each user or a single system ID may be programmed for private carrier or cooperative applications.

## CUSTOMER MANAGEMENT FEATURES

The **Airtime Keeper** keeps track of all system use for customer billing purposes. Airtime totals can be retrieved remotely by Morse code, by a Model 8B Programmer/Timekeeper, or by using a pair of modems and any RS-232 equipped terminal or computer. It may also be viewed locally on the front-panel display or on a PC or dumb terminal.

The **Airtime Hog** feature penalizes long winded talkers on a per user basis. If a user exceeds a preprogrammed time limit, the user is prohibited from using the repeater for the programmed penalty period. Warning tones are transmitted when a penalty is imminent.

The **Prepaid Airtime** feature allows a customer to purchase a block of airtime in advance. As the customer uses the repeater, the amount of unused airtime decreases. When the supply of prepaid airtime is nearly gone, the customer hears a warning tone whenever a radio unkeys. If the customer does not purchase additional airtime, the customer's tone reverts to reserved status when the original block of time runs out. This permits the system operator to pre-bill problem customers.

The **Privacy Mode** feature prevents users on different CTCSS tones or digital codes from assuming control of the repeater until after the transmitter hold-time expires. This reduces or eliminates repeater barge-ins.

The **Anti-Kerchunker Filter** cancels the transmit hold-time and drops the repeater transmitter immediately if a mobile transmission lasts less than the specified time. This prevents prolonged repeater transmissions due to momentary mobile key-ups. The time period during which the Anti-Kerchunker Filter will cancel the transmit hold time is programmable from 0 to 5 seconds.

The **Stuck Mic** feature identifies which radio fleet has locked up the repeater. When the repeater times out, the Model 39 transmits a two-digit DTMF sequence corresponding to the programmed user number. This helps identify the source of intentional or accidental repeater jamming.

## SPECIAL SYSTEM FEATURES

The **Reserved User** feature prevents a co-channel system operator from commandeering a temporarily unused tone or code. The Model 39 reserves a tone or code by transmitting an alert signal and muting repeat audio when it detects the tone or code.

The **Site Alarm** transmits a DTMF page and audible alert when the alarm input to the panel detects activity. The DTMF page may also be programmed to be accompanied by a CTCSS tone or DCS code. The alarm may be used to alert the system operator via a radio equipped with a DTMF decoder. The Model 8B may be used to alert the system operator to site alarm by decoding the received DTMF sequence and closing its alarm relay.
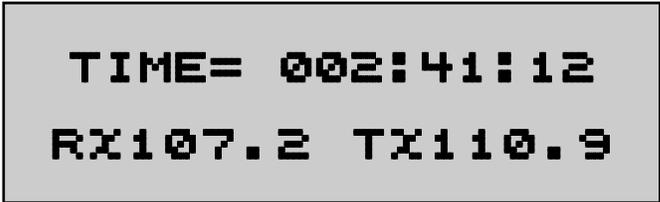
```
TIME= 002:41:12

RX107.2 TX110.9
```

*During operation, the Model 39 display shows the receive tone/code, the transmit tone/code, and the accumulated airtime of the receive tone/code.*

The **Auxiliary Relay Option** provides a set of contacts that can be programmed to close whenever a specific CTCSS tone or DCS code is received by the Model 39. Any individual tone/code or group of tones/codes may be programmed to activate the auxiliary relay.

**Cross Tone, Cross Code, and Tone Code Encoding** allow users to talk to mobiles on different CTCSS tones or codes. This feature also permits multiple repeaters at different locations to be placed on a single frequency. Mobiles may roam between two or more systems, accessing each individual repeater with a different tone or code, and receiving on a common tone. The system manager can also temporarily initiate or defeat cross encoding by entering a short DTMF code.

**DTMF Regeneration Mode** permits reliable mobile to mobile DTMF paging, ensures reliable operation of control station telephone interconnects, and allows secure DTMF remote control of equipment.

## SETUP AND INSTALLATION

Easy setup and installation ensures that a technician can install a Model 39 in nearly any repeater or duplex station. The Model 39 also provides a flexible COR input permitting its use with nearly any receiver. When an external COR indication is unavailable, the Model 39's internal squelch circuit may be used. Only six connections are required in typical installations and interface assistance is available from Zetron.

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**The Model 39 can be programmed by a variety of on-site or remote control devices. RS-232 and local programming does not interrupt normal repeater panel operation.**

### On-Site

If your Model 39 is located in your shop, control it with its front panel keypad and display, or an RS-232 terminal. You won't interrupt normal repeater operation when you program since the Model 39 can perform background and foreground tasks simultaneously.
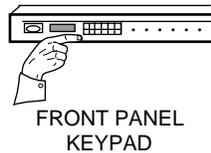
FRONT PANEL KEYPAD
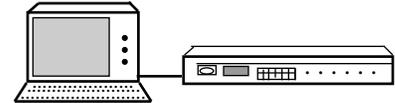
PERSONAL COMPUTER or DUMB TERMINAL

### Radio Control

DTMF-EQUIPPED RADIO

MODEL 8B TERMINAL

When you want to access the Model 39 by remote control with radio signals, use a DTMF-equipped radio or a Model 8B Terminal (working through a radio). The Model 8B can act as a repeater programmer, tone/code timekeeper, encoder of CTCSS/DCS/DTMF, and can decode and display each tone or code it detects on the channel.

### By Telephone

ONLY ONE DIAL-UP PHONE LINE NEEDED

MODEM

MODEM

RS-232 SWITCH
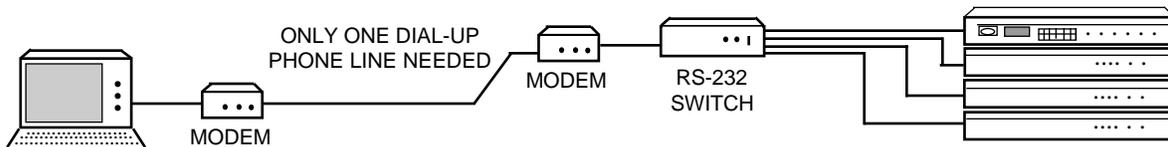
PERSONAL COMPUTER or DUMB TERMINAL

MULTIPLE MODEL 39 REPEATER PANELS, MODEL 38 REPEATER PANELS, MODEL 45 Z-PATCH INTERCONNECTS or MODEL 48-MAX INTERCONNECTED TONE PANELS

The best way to control a Model 39 over a phone line is with a PC terminal and a pair of modems. If you have several Zetron controllers at a common site, use a multi-port RS-232 switch so you don't have to obtain multiple phone lines.

## PROGRAMMABLE FUNCTIONS

| | |
|---|---|
| Programming | Front panel keypad and display, DTMF or RS-232 |
| Validation | Enable/disable per user |
| Privacy Mode | Locks out other users during Tx hold time. Programmable on/off per tone/code |
| Reserve Mode | Reserves tone/code of disabled user. Programmable on/off per user |
| Encode Select | Encode tone/code programmable to any tone/code per user |
| Encode On/Off | Encode tone/code can be enabled/disabled during the Tx hold time. Programmable on/off per user |
| DTMF Regeneration | Long DTMF * mutes audio and enables DTMF regeneration. All received digits regenerated until DTMF time-out expires (adjustable). Ideal for DTMF paging or for use with a phone patch |
| DTMF Time-out | 1 to 9 seconds |
| Temporary Cross | Allows mobiles on different tones/codes to converse. Programmable on/off per user |
| Last User ID | Sends last user's number in DTMF when user unkeys. Programmable on/off per user |
| Morse ID | 0 to 8 characters programmable per user |
| Morse ID Interval | 1 to 99 minutes |
| ID Frequency | 400 to 2000 Hz |
| Readback ID Mode | Reads back user's Morse ID |
| Courtesy Beep | Sent when user unkeys. Programmable on/off per user |
| Beep Frequency | 400 to 3000 Hz |
| Tx Hold Time | 0.0 to 25.0 sec in 0.1-sec steps, per user |
| Alarm Code | 0- to 8-digit DTMF with warble alert, with or without any tone/code |
| Call Time Limit | 1 to 99 minutes, per user |
| Idle Duration | Requires user to remain idle to reset call timer. 1 to 99 seconds |
| Hog Penalty | 10 to 9990 seconds |
| Setup Procedure | Test modes for system adjustments |
| User Time Counter | Up to 250 hours per tone/code |
| Clear Time Counter | Clear one or all time counters |
| Airtime Retrieval | Slow Morse code or DTMF. Compatible with Zetron Model 8B |

## SPECIFICATIONS

### DECODER

| | |
|---|---|
| Frequency Range | 67 to 254.1 Hz |
| No. of Tones | 50 |
| No. of Digital Codes | 110 (000 to 777) |
| Input Impedance | 100K-ohm AC coupled. For connection to unsquelched discriminator audio |

### ENCODER

| | |
|---|---|
| Freq. Accuracy | 0.05 Hz |
| Freq. Stability | Crystal controlled |
| Output Amplitude | 0.0 to 4.0 or 0.0 to 0.4 V p-p, selectable |
| Output Mode | Flat or de-emphasized |
| Output Distortion | Less than 1% |
| Impedance | Less than 1K-ohm AC coupled |

### TONE ENCODER

| | |
|---|---|
| Morse ID Freq. | 1200 Hz; adjustable ±800 Hz |
| Beep Frequency | 1000 Hz; adjustable 400 to 4000 Hz |
| DTMF Encoder | Standard DTMF tones |

### GENERAL

| | |
|---|---|
| Connections | COR; Discriminator; Push-to-Talk; CTCSS Output; Repeat Audio; Alarm Input; Power; Ground |
| Connector Type | Detachable screw terminal |
| Transmit | SPDT relay |
| Adjustments | Five adjustments from rear panel: Input Level; CTCSS Encode Level; Output Level; COR Threshold; Internal Squelch Threshold |
| Indicators | Power; Carrier; Decode; Encode; Transmit; DTMF, 2 by 16-character LCD |
| Local Programming | Front-panel 12-button keypad |

| | |
|---|---|
| Serial Data Port Interface Handshake Baud Rate | RS-232 compatible levels: Tx data, Rx data, common/gnd. Follows XON/XOFF protocol. Selectable: 150; 300; 600; 1200; 2400; 4800; 9600 |
| Rear Switches | Audio Input Level (high/low); Audio Input (flat/de-emphasized); CTCSS Output Level (high/low); CTCSS Output (flat/de-emphasized); Audio Output Level (high/low); COR (internal/external); COR Polarity (positive/negative); LED Power (on/off) |
| Repeat Audio | Flat or de-emphasized |
| Long Digit Reset | A single DTMF digit received by the Model 39 for 15 seconds may be used to reset the Model 39 remotely |
| ToneLock | ToneLock decodes a CTCSS tone with a receiver quieting level of 3 dB SINAD after initial acquisition |
| COR Input Range | Adjustable threshold of 0 to 7VDC. Level must change by at least 1 volt between carrier and no carrier conditions |
| Receive Squelch Tail Elimination | Recognizes a phase reversal and DCS turnoff code from a mobile and mutes audio |
| Transmit Squelch Tail Elimination | Drops transmit CTCSS or sends DCS turnoff code before PTT muting listening receivers |
| Current Consumption | 70 mA at 13.8VDC (LEDs turned off) |
| Operating Voltage Range | 10.5VDC to 15.0VDC |
| Rackmount Size | 1.7" x 19" x 4.8" |
| Weight | 2.2 lb. |
| Operating Temp. | 0 to 65°C. |

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