CIMARRON TECHNOLOGIES
934 S. Andreasen Drive Suite G • Escondido, CA 92029
800.487.7184 • ph. 760.738.3282 • fx. 760.480.0233
www.cimtechcorp.com

MODEL QE-1 ANI ENCODER

UNIVERSAL ANI – EMERGENCY IDENTIFICATION ENCODER

GE Star® COMPATIBLE

Instruction Manual

Rev 031029

QE-1 ANI Encoder Module Instruction Manual

Cimarron Technologies Inc.
934 S. Andreasen Suite G
Escondido, CA 92029 USA

Voice : 760-738-3282
FAX : 760-480-0233
Email : service@cimtechcorp.com
Web : www.cimtechcorp.com

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Manual revision QE-1 031029

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C H A P T E R 1
Features

What Is the QE-1

The Cimarron Technologies' Model QE-1, ANI/Emergency ID Encoder can be programmed to operate in all known variations of GE Star® signaling. The unit provides Automatic Numeric Identification (ANI) of a specific radio transmitter each time the microphone press-to-talk (PTT) switch is activated and is capable of transmitting three other data messages. The three additional messages are typically coded as "Stuck-Mic", "Emergency", and "Man-Down" but can be preprogrammed for any valid GE Star® message.

The Model QE-1 can also be used as a monitoring or alarm transmission module by programming status and "canned" messages and interpreting them as sensor inputs at the decoding site.

The QE-1 operates on 5 VDC and is programmed by the Cimarron QPF-2 PC Programmer.

Capabilities

- Identify every transmission source
- Reduce nuisance and obscene transmissions
- Emergency and Man-Down situations instantly identified
- Microphone monitoring mode
- Trunking compatible
- Stuck microphone identification
- Time-Out-Timer with alert tone
- ANI identification at beginning, End or Both
- Audible Man-Down alert

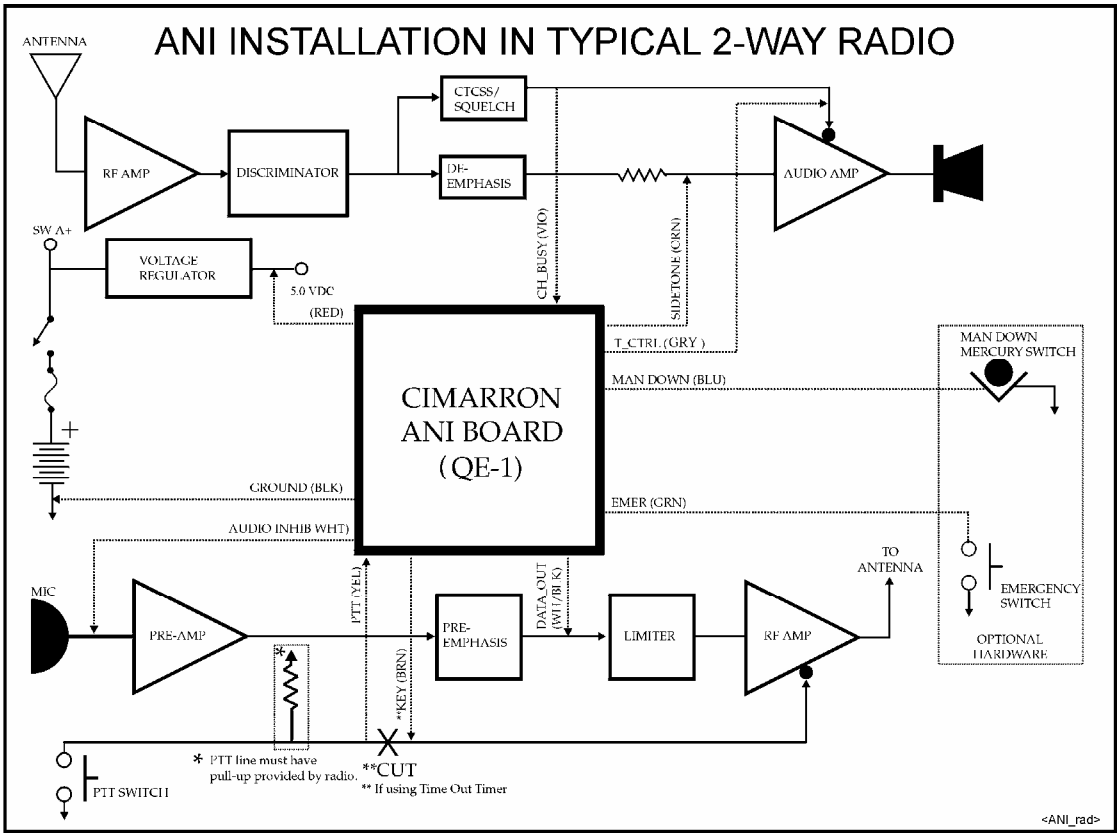
In order to realize these capabilities the QE-1 must be correctly installed and programmed. Some features may require additional equipment not supplied. The QE-1 is not programmed when received from the factory. The model QPF-2 programmer and ANIPROG software is required to program the unit for operation.

Specifications

Data Format	GE Star®
Modulation Type	PSK (Phase Shift Key)
Rate	400 bps on 1600hz carrier
ID Range	0001 to 9999 in 16 different formats
ID Locations	PTT ANI at Beginning, End or Both
Messages programmable	PTT Emergency – many programmable modes ManDown – triggered by external mercury tilt switch – many modes Stuck Mic – triggered when PTT is active continuously for 1 minute
Sidetone	1 KHz during transmission of data.
Burst Length	Programmable for 1½, 2 ½, 3 ½, or 4 ½ messages.
Preamble Length	16, 24, 32, or 48 bits programmable.
Attack Delay	125, 325, 625, or 1300 mS programmable.
Outputs	KEY – HiZ to Low. Open collector with 100 mA sink. Audio Inhibit – HiZ to Low. Open collector with 100 mA sink. Tone Control – Many voltage levels possible via Jumpers. Sidetone – 1 Khz Data Out – Capacitively coupled. Idle: >1 Megohm impedance. Encode: adjustable 100 mV to 5 V P-P Aux I/O – Logic level.
Inputs	Emergency – Logic level with 39Kohm pull-up to +5vdc ManDown – Logic level with 39Kohm pull-up to +5vdc PTT – 0 to +12vdc with 50mS debounce Channel Busy – Logic level with 39Kohm pull-up to +5vdc Aux I/O – Logic level. *Caution: Do not exceed +5vdc on any logic level point!*
Programming	Use Cimarron's QPF-2 PC based programmer and software.
Radio Interface	11 wires (26 ga. teflon). Wires are nominally 6" in length.
Supply Voltage	5.0 regulated.
Supply Current	3.5 mA standby, 35 mA encoding when connected to +12vdc.
Temperature	Operating: -30°C to +70°C (-22°F to +158°F).
Humidity	0% to 90% (non-condensing).
Dimensions	13.7mm x 23.7mm x 2.5mm.

C H A P T E R 2
Installation

Typical Radio Installation



Quick Start Installation

Before a QE-1 will work in a radio, the device must be programmed. The Cimarron QPF-2 programming pod (with red programming guide) is used in conjunction with the "ANIPROG" programming software. This software is delivered in two 3.5" disks and must be installed onto your computer hard drive. The software is not compatible with Windows 3.1 or earlier operating systems and must be run in Windows. The installation setup routine is on disk 1 and all running programs must be terminated before installation. Once installed, you can run ANIPROG via the Start button/Programs/ANIPROG. It will open with a gray screen like in figure 1. Select Edit and then select QE/QE-1. The programming screen like in figure 2 will appear. It is very important that you load default parameters before selecting customer desires. Do this by clicking on the *Load Defaults* button Two times. Once defaults are loaded, go through the tabs making selections required for your installation.

Figure 1

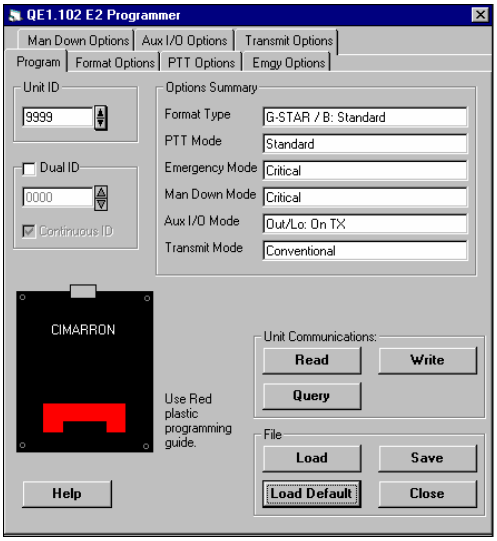


Figure 2

The QPF programming pod should be connected to COM1 with a fully populated serial cable. Hold the QE-1 onto the QPF as shown in figure 3 and press the Write button. Remember that you must load new QE-1's with defaults before they will work. If you are just changing ID's on a QE-1 that has been in service, read the device first, change the ID and then write back to the device.

Once the device has been programmed, it can be installed into the target radio. Figure 4 shows a simplified radio block diagram and generic installation points for the QE-1 interface wires. It is very important to adjust transmit data deviation before placing the radio back into service. As the data insertion point will be affected by the radio limiter, data deviation should be adjusted so it is just below that of voice deviation.

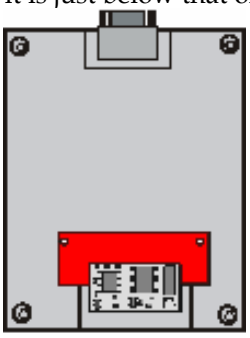


Figure 3

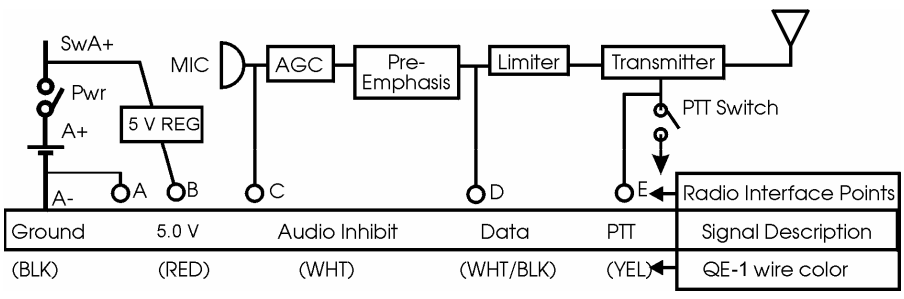


Figure 4

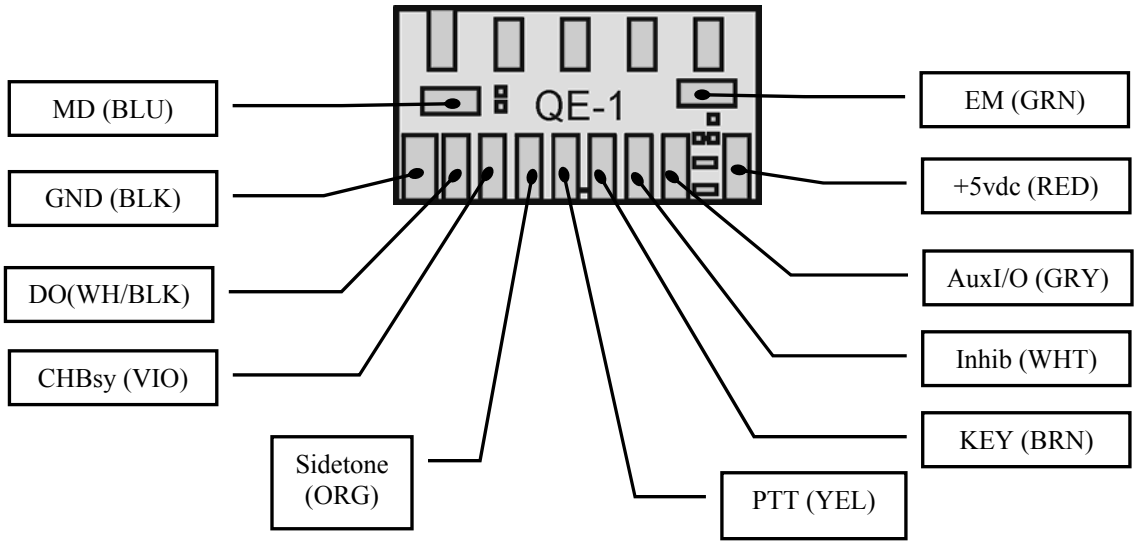
Radio Connections

Signal	Color	Description
A+	Red	Positive supply voltage to the QE-1. Regulated 5.0 VDC.
A-	Black	Supply ground.
Aud Inhib	White	Audio Inhibit Output – This line is used to disable the microphone during data transmission time. This is an open collector output and is at high impedance when idle and sinks to within 1 volt of system ground (300 mA max) during data transmission. Usually interfaced to Mic High.
KEY	Brown	Key Output. This line keys the radio when required by the QE-1. It can be isolated from the PTT input line (see below) by removing Jumper J1. This is an open collector output and is high impedance when idle and sinks to within 1 volt of system ground when active. It should be connected to a point on the radio which when grounded will key the radio.
PTT	Yellow	PTT input. This line is used by the QE-1 to detect when the radio has been keyed. The signal is not buffered before being sent to the microprocessor and must never exceed 5VDC. As shipped, a signal above 2.5 VDC is interpreted as unkeyed. A level below 2.5 VDC is interpreted as keyed.
Sidetone	Orange	Capacitively coupled 1 Khz 5 Vpp signal output, to be interfaced to the radio audio amplifier input. A point should be selected that is not affected by the radio volume control. The QE-1 microprocessor activates this tone line under the following circumstances. If programmed for tone on PTT, this line will be active for the duration of the transmitted ANI data. This gives the operator audible notice when the ANI burst is finished and un-clipped speech is possible. If programmed for tone on Emergency or Man-Down, this line will be active as described in the applicable sections.
Emergency	Green	Emergency message input from external switch. This line is normally pulled high and grounding it activates the emergency condition. The sense can be reversed by programming the QE-1 as desired. If the switch is greater than 6” from the QE-1, greater RF immunity can be obtained by keeping this line grounded and removing the ground via a N/C switch to activate the emergency. In this case, the sense would be programmed for Normally Closed. This line can alternately be used as a status or canned message.
Man-Down	Blue	Man-Down message input from external sensor or switch. This line is normally pulled high and grounding it activates the Man-Down condition. The sense can be reversed by programming the QE-1 as desired. Like the Emergency line, this line can also be used as a status message or canned message.
Aux I/O	Gray	Auxiliary input/output. Can be programmed to perform one of the following four functions. **1. Transmit Control**. Idle state is +5 VDC. Active state occurs during all data burst transmissions. When active, it sinks a maximum 10 mA to within 1 volt of system ground. Typically used to control a transmitter CTCSS, turning it off during ANI transmissions.

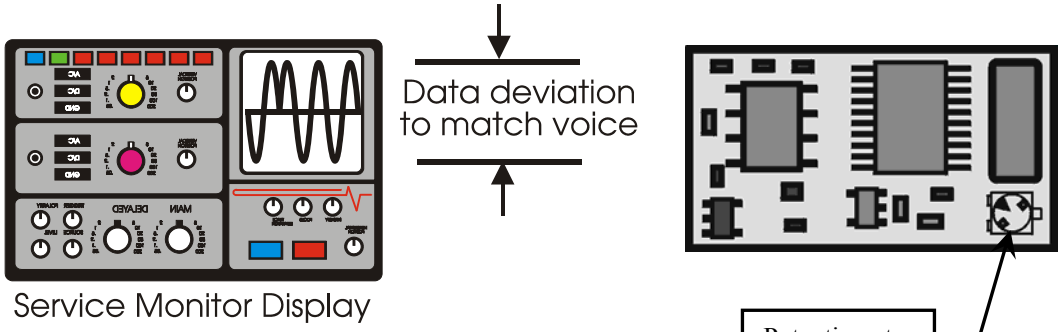
		2. Home Control. Similar to Transmit control but can be programmed active only during Emergency or Man-Down data transmissions. Typically used to change the radio channel to a "Home" channel before sending the Emergency or Man-Down message. **3. Tone Control.** Idle state is +5 VDC. Active during sidetone outputs. When active, it sinks a maximum 10 mA to within 1 volt of system ground. Used to enable receiver audio circuits to allow amplification of the Sidetone signal. **4. Data Inhibit Control.** An input to the QE-1 microprocessor. Will put the QE-1 to "sleep" when active. Active state is programmable for logic 1 or 0.
Chan Busy	Violet	Channel Busy input. Provides the QE-1 the status of the interfaced radio. When in conventional mode, the line should be interfaced to a COS or squelch line which changes state when receiving. This effects the manner in which the QE-1 handles the Emergency and Man-Down transmissions.
Data Out	Wh/Blk	Capacitor coupled ANI data output. To be connected to the radio transmitter microphone audio, between the pre-emphasis filter and the limiter. The output is adjustable from 0.0 to 4.5 Vpp.

Physical Installation

Find a location in the radio for the Model QE-1, preferably away from the transmitter output amplifier stage. Locate the interface points for the QE-1 interface wiring, cut the wires to the correct size and solder them to the radio interface points and the associated pads on the back of the QE-1. Place the insulating sleeve over the QE-1 module.

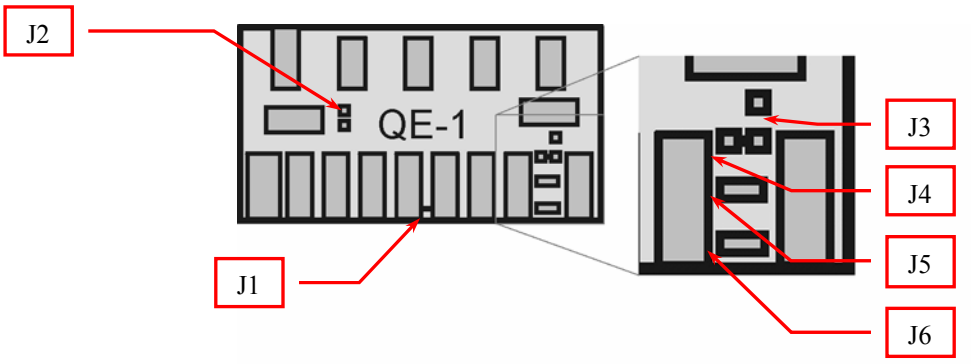


Deviation Adjustment
While repeatedly keying the radio into a service monitor, adjust VR1 (10 K Ohm potentiometer) so data deviation is just below voice deviation. Attaching Jumper J2 will increase the QE-1 output level.



Pad Information
There are eleven pads on the back of the QE-1 to solder radio interface wires. Wire color is described as well as pad signal definition.

Jumper Information
The QE-1 is supplied with jumper J1 installed. To install any other jumpers, use a fine tip soldering iron and solder a small single strand of wire between the jumper pads to create a solder bridge. To remove J1, use a sharp fine tip "Xacto" blade. Slice at an angle to undercut the circuit trace. Do not cut straight down or damage to the circuit could result.



Jumper Definitions

Jumper	Usage
J1	PTT/KEY jumper. Install to connect PTT and Key lines.
J2	Data Output level boost. Install jumper M = Data Output 0 to 5vpp Remove jumper M = Data Output 0 to 150mVpp
J3, J4, J5, J6	Aux I/O output configuration jumpers, see the table below for information

Jumper Selection				Aux I/O Output	
J-3	J-4	J-5	J-6	Inactive	Active
Out	Out	Out	In	Low	+5vdc
Out	In	Out	Out	HiZ	Low
In	In	Out	Out	+5vdc	Low
In	Out	In	Out	HiZ	+5vdc

Aux I/O Output

This mult-purpose output is very handy for controlling various circuits in a radio. The above table defines the many functions it provides. Refer to the Inactive/Active columns for the desired output then set the jumpers accordingly.

Jumper Examples

Example #1: Simple ANI. PTT and KEY are the same point in the radio resting at +5vdc and going to an active low when keyed, no Time Out Timer, no Sidetone.

Install: J1. (as supplied, J1 is a circuit trace) Remove all other jumpers. (As supplied, no other jumpers are made)

Example #2: Simple ANI with Sidetone. PTT and KEY are the same point in the radio resting at +5vdc and going to an active low, no Time Out Timer. Radio audio amp control signal needs ground to turn it on. QE-1 must not load down the logic circuit when not sending ANI, so a High Impedance is needed at rest.

Install: J1 and J4. (J1 is installed as supplied)

Jumper J1 Configuration

Of all of the jumpers on the QE-1, this jumper will cause the most confusion. This jumper connects the PTT and KEY lines together. Most applications will require J1 to be installed. As shipped from the factory, jumper J1 is a circuit board trace connecting the PTT pad with the KEY pad. Extreme care must be taken when removing this jumper. With a sharp "xacto blade" scrape away the trace with a flat sideways motion. Do not attempt to cut straight down or circuit board damage will result. When installed, the KEY wire is not needed. The PTT wire now serves the dual function of PTT and KEY.

Time out timer applications
Jumper J1 is removed on applications which require the QE-1 to serve as the transmit Time Out Timer (TOT). In this configuration, the radio keying function is routed through the QE-1. When the user pushes the PTT switch on the radio, the request goes to the QE-1. The QE-1 will immediately key or un-key the radio as requested by the user. If the PTT is held too long, the TOT will un-key the radio even if the user holds the PTT active. Once the user releases the radio PTT switch, the QE-1 TOT is reset and operation returns to normal.

Radio PTT sense high but KEY to ground
If the interface requires the QE-1 to detect when the radio is keyed by the presence of a voltage above 2.5 VDC, remove jumper J1 and program the PTT Input for ActHigh input sense. In this situation, also interface the Brown "KEY" wire to a point in the radio which goes to ground when keying the radio.

Channel Busy/Channel Acquired

In conventional mode, the Channel Busy line (Violet wire) is only used to qualify critical message transmissions. If *emergency message repeat* is programmed for *5 times*, the only transmissions that will count towards the 5 repeats are messages sent while the channel busy line is inactive. So if a radio channel is busy when the operator presses the emergency button, the QE-1 will immediately attempt to send out the message. It will continue to send out emergency messages every 10 seconds until it has sent out five that were transmitted when the channel was not busy.

In trunking mode, channel busy becomes "Channel Acquired". This line is interfaced to a point in a trunking radio that changes state when granted access. The line is programmable for input sense (active high or active low). Some trunking radios have channel acquired logic which pulses while attempting to be granted access and then remain in a state showing access is granted. For this reason, the line is also programmable to set the debounce time so that pulsing is ignored. The unit will not transmit data until the specified time period has been exceeded

C H A P T E R 3
Programming

Programming
Programming Alternatives (via QPF-2 Programmer)

ANI ID MESSAGE

TRANSMIT TIME: Beginning, End, or Both.

BEGINNING BURST LENGTH: 1½, 2½, 3½, or 4½ messages.(GE Star® only)

END BURST LENGTH: 1½, 2½, 3½, or 4½ messages.(GE Star® only)

MESSAGE TYPE: Any other in lieu of ANI ID. (GE Star® only)

SIDETONE:
Produces audible 1 KHz alert tone via receiver speaker during transmission of ANI-ID data burst.

EMERGENCY ALARM MESSAGE

MESSAGE TYPE:
Can be programmed to any message type in lieu of the Emergency code.

BURST MODE:

Single Message:
The message is transmitted only once when the channel is clear. Generally used if the message is programmed as a Status or Canned Message.

Repeat Message:
W/PTT ANI-ID, W/Out Monitor Mic: The Emergency message is transmitted 5 times and only when the channel is clear.

W/PTT EM-ID, W/Out Monitor Mic: Transmits Emergency every 10 seconds, even if the Channel is busy. The transmitter is un-keyed during the 10 Second pauses. A count is made of clear Channel transmissions. After a count of 5 clear channel transmissions, the Emergency cycle is concluded. Voice can be used during the 10 Sec pauses.

This protocol increases the probability of an early decode and increases the reliability of decoding at the dispatch decoder.

Continuous Cycle:
Regardless of PTT alternative or whether the channel is busy or clear, the Emergency Message is transmitted every 10 seconds with un-keyed pauses between transmissions until power is removed from the radio.

PTT INITIATED MESSAGE:

Normal PTT ANI-ID Message:

During a Repeat or Continuous cycle, each activation of the PTT input results in a normal ANI-ID Message.

Emergency Cycle PTT EM-ID Message:

During an Emergency Repeat or Continuous cycle, each PTT switch actuation will result in the transmission of an additional Emergency Message in lieu of the ANI ID Message.

Continuous PTT EM-ID Message:

After an Emergency cycle is initiated, each PTT actuation will result in an additional Emergency Message until power is removed from the radio.

INPUT POLARITY:

The Emergency switch input is programmable for either a normally open (N.O.) or normally closed (N.C.) switch.

MONITOR OPEN MICROPHONE MODE:

During the Emergency Repeat Cycle the radio is keyed continuously with an open microphone between the five, ten-second spaced Emergency Bursts. NOTE: As the radio is keyed between data bursts, the Channel/Busy circuit will not be operative, and the PTT input is not monitored. A total of five Emergency bursts will be transmitted.

If the Monitor Open Microphone Mode is selected in conjunction with the Continuous Emergency Cycle, the activated radio will first continuously transmit microphone audio between five Emergency bursts (Channel/Busy inoperative, PTT input not monitored). The unit then provides unkeyed pauses between Emergency bursts until a count of five clear channel bursts is made (Channel busy operative and PTT is monitored). The unit then reverts to continuously transmitting between five Emergency bursts, and alternates between these modes until power is removed.

This mode of operation will provide 40 seconds of open-mike monitoring, followed by at least 40 seconds in which emergency bursts with un-keyed pauses will be transmitted, thereby alternately allowing open-microphone monitoring, and possible voice transmissions between bursts on the radio channel.

LOCAL AUDIBLE ALERT TONE:

Tone output is applied to the radio receiver's audio circuit. Programmable On/Off. If On, causes a 1 second tone each time the Emergency Burst is transmitted. If Off, no tone is sounded during the Emergency Mode.

MAN-DOWN ALARM MESSAGE:

MESSAGE TYPES:

Emergency Message:

For decoders which cannot recognize the Unique Man-Down code the unit may be programmed to transmit the Emergency code during the Man-Down cycle.

Unique Man-Down Message:

The unit can be programmed to transmit a unique "Man-Down" message in lieu of the Emergency Message. NOTE: The

decoder-display must be capable of recognizing the unique message.

Other Message Codes:

May be programmed to be any message type in lieu of Emergency or unique Man-Down codes.

NOTE: If the Emergency and Man-Down inputs are to be used for other messages or as a combination of status (or canned message) and an Emergency, be advised that initiation of the Man-Down input will preempt any message transmissions from the Emergency input. Therefore, if a status (or canned message) and an Emergency are to be used, program the status (or canned) for the Emergency input and the Emergency message for the Man-Down input.(GE Star® only)

BURST MODE:

Single Message:

The message is transmitted only once. Used if the message is programmed as a Status or Canned Message.

Repeat Message:

W/PTT ANI-ID, W/Out Monitor Mic: The man-down message is transmitted 5 times and only when the channel is clear.

W/PTT MD-ID, W/Out Monitor Mic: Transmits man-down every 10 seconds, even if Chan is busy. Transmitter is un-keyed during 10 Sec. pauses. A count is made of clear Channel transmissions. After a count of 5, the man-down cycle is concluded. Voice can be used during 10 Sec pauses.

This protocol increases the probability of an early decode and increases the reliability of decoding at the dispatch decoder.

Continuous Cycle:

Regardless of whether the channel is busy or clear, the Man-Down Message is transmitted every 10 seconds with un-keyed pauses between transmissions until power is removed from the radio.

PTT INITIATED MESSAGE:

Normal PTT ANI-ID Message:

During a Repeat or Continuous cycle, each activation of the PTT input results in a normal ANI-ID Message.

Man-Down Cycle PTT MD-ID Message:

During a Man-Down Repeat or Continuous cycle, each PTT switch actuation will result in the transmission of an additional Man-Down Message in lieu of the ANI ID Message.

Continuous PTT MD-ID Message:

After the Man-Down state is entered, all further PTT closures will result in a Man-Down Message until power is removed from the radio.

INPUT POLARITY: The input is programmable for either a N.O. or N.C. switch.

MONITOR OPEN MICROPHONE MODE:

During the Man-Down Repeat Cycle the radio is keyed continuously with an open microphone between the five, ten-second spaced Man-Down Bursts. NOTE: As the radio is keyed between data bursts, the Channel/Busy circuit will not be operative, and the PTT input is not monitored. A total of five Man-Down bursts will be transmitted.

If the Monitor Open Microphone Mode is selected in conjunction with the Continuous Man-Down Cycle, the activated radio will first continuously transmit microphone audio between five Man-Down bursts (Channel/Busy inoperative, PTT input not monitored). The unit then provides unkeyed pauses between Man-Down bursts until a count of five clear channel bursts is made (Channel busy operative and PTT is monitored). The unit then reverts to continuously transmitting between five Man-Down bursts, and alternates between these modes until power is removed.

This mode of operation will provide 40 seconds of open-mike monitoring, followed by at least 40 seconds in which Man-Down bursts with unkeyed pauses will be transmitted, thereby alternately allowing open-microphone monitoring, and possible voice transmissions from other units between data bursts on the radio channel.

MAN-DOWN INITIATION PERIODS: Eight (8) initiation time periods are programmable:

Initiation Time	Tone Time	Pause Time
.05 Sec.	N/A	N/A
5.0	1 Sec.	2 Sec.
5.0	1	5
10.0	1	10
10.0	1	20
10.0	1	30
10.0	1	45
10.0	1	60

The first selection would be used if the Man-Down input is used to initiate a status or canned message.

LOCAL AUDIBLE ALERT TONE:
Output is applied to radio receiver audio circuit. Programmable On/Off.

STUCK-MIC TRANSMISSION:

MESSAGE TYPES:

ANI-ID Message:

For decoder/display units which do not recognize the Unique Stuck-Mic code, the ANI ID code may be programmed for the Stuck-Mic cycle.

Unique Stuck-Mic Message:

A unique "Stuck-Mic" message code may be transmitted in lieu of the ANI ID Message code. NOTE: The decoder-display in use must be compatible with the unique message code.

Other Message Codes:

May be programmed to be any message type in lieu of ANI ID or unique Stuck-Mic codes.

STUCK-MIC PROTOCOL:

The Stuck-Mic protocol is disabled during the Emergency and Man-Down cycles.

Ten-Second Repeat:

The Stuck-Mic message is transmitted every 10 seconds until either the PTT switch is released or power is removed from the radio. If the tone output is interfaced to the radio receiver's audio circuit, a one second tone will be sounded each time the ANI burst is transmitted.

Time-Out-Timer:

If the PTT line is wired through the identifier, the unit may be programmed such that after 60 seconds of continuous keying the unit will transmit one digital message, the PTT line will be opened, and if the tone output is applied to the receiver's audio circuit, an audible tone will be sounded for one second. The PTT line will remain open until the PTT switch is released, an Emergency or Man-Down mode is entered, or power is removed from the radio.

BURST LENGTH

In general, the longer the burst length the higher the probability of decoding a digital message, thereby resulting in better reliability of data transfer. However, a long burst for beginning ANI ID may cut-off a voice syllable. A compromise can be made by using a short burst for a "beginning" ANI-ID and a long burst for an "end" ANI-ID.

The burst length is independently programmable for ANI ID at beginning, ANI ID at end, and one setting for Emergency, Man-Down, and Stuck Mic.

ANI-ID BURST LENGTH:

The Burst Length may be independently programmed for beginning and end ANI-ID to 1½, 2½, 3½, or 4½ messages.

BURST LENGTH FOR ALL OTHER MESSAGES:

Either 3½ or 4½ messages as a group.

ATTACK DELAY

The attack delay provides time for a transmitter to reach full power and for all system audio circuits to open prior to transmission of data. Programmable to 125, 325, 625, or 1300 milliseconds.

PREAMBLE LENGTH

The message preamble aids in bit synchronization. Shorter preambles are used in good signal conditions, while longer preambles allow synchronization in marginal signal conditions. Programmable for 16, 24, 32, or 40 preamble bits.

BUSY/CLEAR CHANNEL INPUT

INPUT SENSE: Input sense for Channel Busy, programmable for logic Hi or Low.

MULTI-FUNCTION I/O

CTCSS CONTROL OUTPUT:

Controls a radio transmitter's CTCSS Encoder "On-Off" to provide "digital muting" in some systems. It can also be used Idle state is +5 ± 0.1 VDC at 39 K Ohm impedance. Active state occurs during all data burst transmissions and sinks up to 10 ma from a 5 volt source to within 1 Volt of ground.

ALTERNATE CHANNEL OUTPUT:

Provides an output which can change the radio channel in some transceivers during Emergency and Man-Down data transmissions. Idle state is +5 ±0.1VDC at 39 K Ohm impedance. Active state sinks up to 10 ma from a 5 Volt source to within 1 Volt of ground.

SIDETONE CONTROL OUTPUT:

Provides an output for transceivers which require a signal to enable the receiver's audio circuits. Idle state is +5 ±0.1VDC at 39 K Ohms impedance. Active state occurs during sidetone outputs and sinks up to 10 ma from a 5 Volt source to within 1 Volt of ground.

INHIBIT DATA ENCODE INPUT:

The signal for this input is typically taken from the radio transceiver's channel selector or channel switch (when possible) in order to inhibit data transmissions when in a simplex "Talk Around" mode or on a channel which does not accommodate data. Can also be used to hold ANI data transmissions when a scrambling module is installed in the radio. Input provides pull-up (+5 ±0.1 VDC) and is programmable to accommodate either an active high or active low input to inhibit data encoding.

ANI-ID Message

ANI (Automatic Numeric Identification) provides for digital identification of a transmission initiated by a transmitter's microphone switch ("Press-To-Talk" or "PTT" switch). This "digital burst" can occur when the switch is first pressed, or when the switch is released, or at both times. The burst time for most identifiers is approximately 1/3 second and, if transmitted upon pressing the PTT switch, may obliterate the first one or two syllables of spoken speech. To overcome this annoyance, the Model QE-1 is programmable to produce the burst either at the beginning or at the end of the voice transmission, or (better yet) at both times. If programmed for both times, typically the burst at the beginning is programmed to be short, while the burst at the end is programmed to be longer and therefore more reliable. Although the probability of decoding the short burst is decreased, under average signal conditions the probability is still quite high.

To further guard against voice-syllable clipping, the user may program a "PTT Sidetone". When programmed and interfaced to receiver audio, this feature will provide an audible tone during the beginning transmission of the ANI-ID burst to alert the operator that data is being transmitted.

Stuck-MIC ID Message

When a mobile or portable radio is inadvertently keyed due to a stuck microphone switch, it generally means that the radio frequency is unusable for communications. Unfortunately, this activity is sometimes deliberately caused by a field operator. By incorporating a Stuck-Mic-ID Message in the Model QE-1's repertory, each time a microphone switch is held closed for more than a minute either the offending unit's identification is transmitted and a local tone is sounded every ten seconds, or the unit can be programmed to transmit the unit's ID once, sound a local tone, and then automatically open the key line until the microphone switch is released.

Emergency ID Message

The Emergency-ID message is generally used by law enforcement, security agencies, and fire departments to automatically signal a life-threatening situation where it is difficult, impossible, or impractical to use voice. The emergency message is also frequently used by business and industrial users to signal a critical situation, such as a mechanical failure, over or under temperature (pressure, etc.), or extraordinary event.

The Model QE-1 allows for programming the burst length, and whether the message should be a single burst, repeated five times at ten second intervals, or repeated continuously at ten second intervals. In addition, during the emergency cycle the microphone of the sending radio can be monitored, and in the continuous mode can alternate between monitoring and allowing the channel to be used for voice communications. This, too, is a unique benefit of the Model QE-1.

Man-Down ID Message

The Man-Down ID message is primarily for use by law enforcement, security agencies, and fire departments. However it also finds uses in business and industry where individuals can be overcome by toxic fumes, lack of oxygen, etc.

The Man-Down ID is generally initiated by closure of a mercury switch located within a hand-held radio when the radio is continuously tipped greater than 60 degrees from vertical. To guard against false "man-down" transmissions an initial pause of a few seconds during which the closure must be constant is provided. After this duration a short tone is produced via the radio's speaker. A second pause follows the tone to allow the radio to be placed in an upright position (in the event no actual "man-down" is occurring). Following the second pause the "Man-Down-ID" data burst is transmitted in the same manner as the "Emergency-ID", and depending upon programming, providing either a single, repeat, or continuous burst transmission. The Man-Down mode also can include the microphone monitoring alternative. Transmission of a unique coding for the Man-Down message (in lieu of a general Emergency coding), and multiple choices of initiation, tone, and final pause times are special features of the Model QE-1.

Status Messages

Status messages typically relate to the status of the field unit, such as "In Service", "Out Of Service", "On Break", etc. The format can include up to eight of these messages, and their coding configurations can be interpreted as having any meaning at the decoding site. The QE-1 is capable of transmitting two status messages (or a combination of two status and canned messages) in lieu of the Man-Down and Emergency.

Canned Messages

"Canned" messages handle such communications as "Request-To-Talk", "Priority-Request-To-Talk", "Repeat Last Transmission", "Repeat Address", "10-4", "Roger", and other routine requests and responses. The format can include several of these messages, and their coding configurations can be interpreted as having any meaning at the decoding site. The QE-1 is capable of transmitting two canned messages (or a combination of two status and canned messages) in lieu of the Man-Down and Emergency.

C H A P T E R 5
Technical Information

GE Star Format Selections

T1, T2 and S1 are individual bits of the GE-STAR binary message. The differences in formats relate to the functions and/or identification values assigned to the Tag Bits (T1 and T2) and the first bit of the "status" group (S1). T1 and T2 can be used for extended ID's over 4095 or for mobile and portable recognition.

Format	Description	T1	T2	S1	Comments
A	IDs to 2047 (1st 11 bits).	X	X	X	T1, T2, and S1 ignored
*B	IDs to 9999 (14 bit ID)	8	4	2	Expanded-ID STAR #1.
C	IDs to 9999 (14 bit ID)	4	8	2	GE-STAR #3.
D	IDs to 9999 (14 bit ID)	4	2	8	Compatible with GE-STAR #4
E	IDs to 4095 (12 bit ID, T2 = "0")	2	M0	X	GE-STAR #1. T2 = "0" for Mobile.
F	IDs to 4095 (12 bit ID, T2 = "1")	2	P1	X	GE-STAR #1. T2 = "1" for Portable.
G	IDs to 8191 (13 bit ID, T2 = "0")	4	M0	2	GE-STAR #2. T2 = "0" for Mobile.
H	IDs to 8191 (13 bit ID, T2 = "1")	4	P1	2	GE-STAR #2. T2 = "1" for Portable.
I	IDs to 4095 (12 bit ID), Tags="00"	S0	S0	2	System "0"
J	IDs to 4095 (12 bit ID), Tags="01"	S0	S1	2	System "1".
K	IDs to 4095 (12 bit ID), Tags="10"	S1	S0	2	System "2".
L	IDs to 4095 (12 bit ID), Tags="11"	S1	S1	2	System "3".
M - P	IDs to 2047 (11 bit ID)			X	Identical to I - L with capability only to program IDs to max of 2047.

8=8192, 4=4096, 2=2048, X=ignore

When programming the QE-1 with the QPF-2 programming pod and ANIPROG software, you will need to select the appropriate GE Star® format in the *format options* tab. Nearly all existing systems have moved to format B which allows 9999 ID's. If you pick the wrong format, the decoded ID could be different from the programmed ID. The above table will assist you in isolating the problem.

GE Star Message Descriptions

The GE Star bits designated S2, S3, S4 and M1 through M4 are used to code various messages. You have the ability to enable manual editing and access (and change) the values of the messages assigned to PTT, Emergency, Man-Down and others. The table below describes the Star code and the corresponding message that can be decoded and displayed (depending on equipment being used to decode data bursts) at the base end of the communications system:

STAR CODE	DEFINITION
000-0000	Status 0
001-0000	Status 1
010-0000	Status 2
011-0000	Status 3
100-0000	Status 4
101-0000	Status 5
110-0000	Status 6
111-0000	Status 7
000-0001	ANI ID and Sel Call Ack
000-0010	Interrogate Ack
000-0011	Request to talk
000-0100	Canned Message C
000-0101	Canned Message D
000-0110	Taxi Bid
000-0111	Emergency
000-1000	Call Cancel Ack
000-1001	Stuck Microphone
000-1010	Open Mic Monitor Ack
000-1011	Canned Message F
000-1100	Canned Message G
000-1101	Canned Message H
000-1110	Canned Message J
000-1111	Man-Down
100-1010	Radio Disable Ack
101-1010	Radio Enable Ack

Trunking Operation

In LTR trunking mode, we will not transmit until we know that the user has been given permission. When the QE-1 is placed in Trunking mode, the channel busy (ChBsy) line becomes Channel Acquired (ChAqr In) and in ANIPROG software under Transmit Options tab, the Attack Delay timer grays out and the Trunk Select Debounce timer becomes available. Here are a couple of scenarios.

Emergency

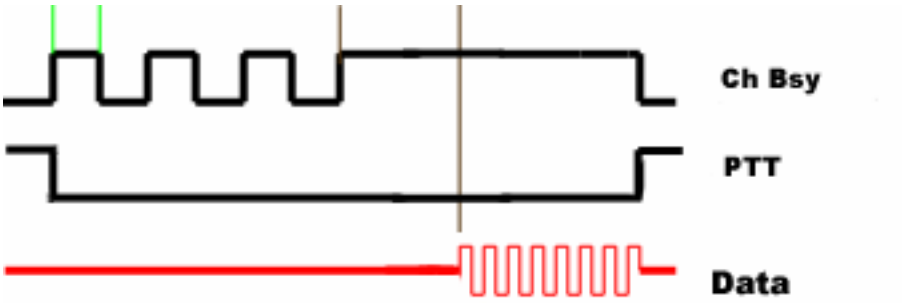
The radio operator has just pressed the emergency button. The QE-1 activates the radio PTT line and watches the Channel Busy line. It holds off modulating data until the Ch Bsy has become active and remained active for the duration of the time set in the trunk select debounce timer. It then sends out the data and unkeys the radio.

PTT at beginning

The user has just keyed up the radio to speak, he waits for the go-ahead beep from the radio speaker, and we start monitoring the Ch Bsy line. Once the line becomes active and stays active for the duration of the trunk select debounce timer, we send the PTT ANI data and the radio sends the go-ahead beep to the speaker so the user can begin talking.

PTT at end

The user has keyed the radio, received the go-ahead beep and has sent his voice message. The QE-1 detects that the radio unkeyed and we rekey it and wait for the Ch Bsy line to become active and remain active for the duration of the time set in the trunk select debounce timer. The QE-1 then sends out the PTT ANI data and unkeys the radio.



In this timing chart, the distance between green lines is 100mS and between brown lines is 200mS. *Trunk select debounce time* is set for 200mS and *channel busy* input is set for *trunk available when high*.

CHAPTER 6
Troubleshooting

Installation Hints

The QE-1 must be programmed with your desires before it will work in your system. The device does not contain an operational program personality as it is shipped from the factory.

The QE-1 will be keying the associated transmitter and injecting audio into the radio. This point should be after preemphasis. It is very important to adjust data out using VR1 to ensure the correct deviation level. The deviation level should be just marginally below that of voice. Keep in mind that most transmitters have limiter circuitry. Limiter circuits ensure that the radio will never over-deviate and violate FCC rules. The limiter does this by clipping the transmit audio. The output of the QE-1 must be adjusted to a point just below where limiter clipping occurs. If the limiter is allowed to function, the data will be distorted.

Isolating System Problems

Today's modern communication systems take advantage of many available resources. Voters, repeaters, various trunking protocols, scramblers and innumerable other devices make passing data substantially more difficult than it was in the "Simplex" days.

Timing is very important. If you have system problems, the first place to spend your energies is with timing issues. Check attack delay in repeater systems. Start with a long delay that gives you 100% decode and then shorten it up.

If you have trunking system problems using the QE-1, review the trunking information located on page 25 of this manual.

Equipment Problems

Radio Keys and Stays Keyed

If the radio sends ANI data and then stays keyed even after releasing the PTT button, verify the condition of jumper J1 on the QE-1 and the programming parameter "Key follows PTT". If you have "Key Follows PTT" enabled or jumper J1 connected when they should not be, this symptom could occur.

Radio Keys up but stays Keyed only for Duration of ANI

This symptom is also caused by incorrect conditions on the "Key follows PTT" parameter and QE-1 jumper J1.

Radio Randomly Keys up and sends out EM's or MD's

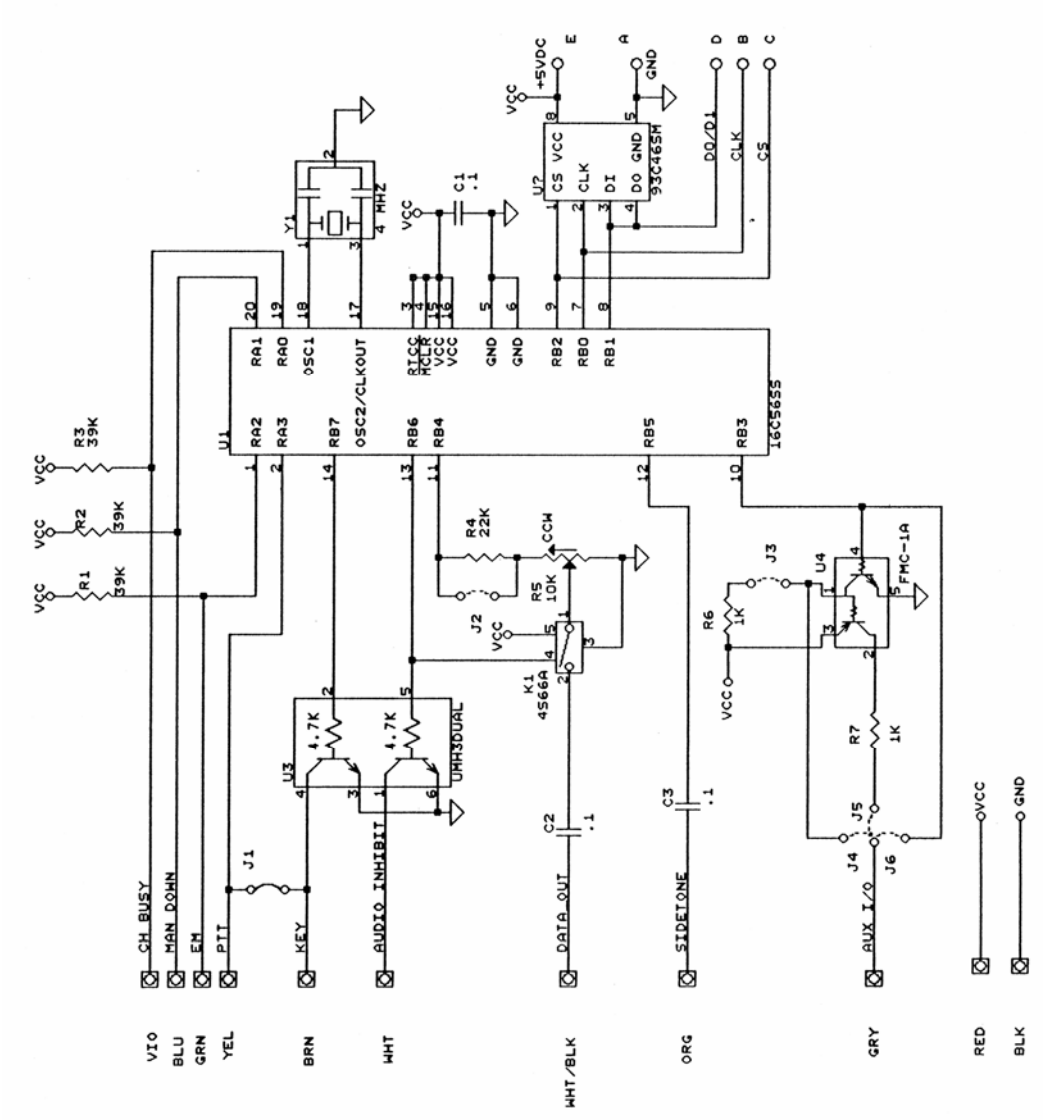
This symptom usually occurs when the QE-1 has been subjected to pressure inside a closed radio. If the space is tight, constant pressure on the QE-1 microprocessor will cause pin 1 or pin 20 to pop up from the circuit board. This effectively removes the pull-up resistor from the line and the microprocessor detects that the line has transitioned low. The QE-1 interprets this as a Man-Down or an emergency and it sends out the appropriate message. This symptom can be intermittent depending on the severity of the solder crack on the pin. Reflowing pins 1 and 20 usually cures the problem.

ID Decoded is not the Same as Programmed
This occurs when the unit is in GE Star® mode and the QE-1 "format" is not set the same as the decoder. See page 23 for details.

When PTT button is pressed, unit continuously sends ANI
Ensure that you have "Reverse Burst Detect" enabled on the QE-1. This is found under the "Transmit Options" tab of the ANIPROG programming software. Some radios, when unkeyed, rekey and send out a "reverse burst" of CTCSS tone. The QE-1 detects this as a new occurrence of PTT, holds the radio keyed and sends out PTT ANI. When the QE-1 unkeys, the radio again keys up to send out a reverse burst, and the QE-1 again detects this as a new occurrence of PTT. Enabling "Reverse Burst Detect" on the QE-1 or disabling "Squelch Tail Removal" in the radio will cure this symptom.

Pod Not Found Error when programming
Check the voltage of the 9V battery on the programming pod. It must be at least 9.0VDC. Also, turn the pod over and locate the "Active" LED on the back of the circuit board. This LED should illuminate only when the software is attempting to read or write to the pod. If the light never turns on, verify that the cable being used is attached to the correct COM port of the computer, and that the cable is fully populated (pin 1 to pin 1 through pin 9 to pin 9). Ensure that no other software has captured the computer COM port refusing to release the resource to ANIPROG.

Data Found Corrupt Error when programming
Check the voltage of the 9V battery on the programming pod. It must be at least 9.0 VDC. Clean the spring contacts of the POD and the programming pads of the QE-1 with alcohol and try again. If the program still fails, click the override button and then try again.


VIO
BLU
GRN
YEL
BRN
WHT
WHT/BLK
ORG
GRY
RED
BLK
CH BUSY
MAN DOWN
EM
PTT
KEY
AUDIO_INHIBIT
DATA_OUT
SIDETONE
AUX I/O
VCC
GND
U1
16C5655
U2
93C46SM
U3
UMH3DUAL
U4
FMC-1A
K1
4S66A
Y1
4 MHZ
R1
39K
R2
39K
R3
39K
R4
22K
R5
10K
CCW
R6
1K
R7
1K
C1
.1
C2
.1
C3
.1
J1
J2
J3
J4
J5
J6
+5VDC
A
B
C
D
E
DO/DI
CLK
CS

CHAPTER 7
Product Support

If you have any questions or comments about Cimarron products, please make use of our technical support hotline at (760) 738-3285.

Cimarron Technologies Corporation

934 South Andreasen Drive, Suite G

Escondido, CA 92029

Technical Support Hot-Line (760) 738-3285

service@cimtechcorp.com

www.cimtechcorp.com

WARRANTY

Cimarron Technologies Corporation warrants this product to be free from defects in material and workmanship for a period of three years from date of shipment. If a malfunction occurs due to defective material or workmanship, the product will be repaired or replaced (Cimarron's discretion) without charge if returned to the factory

This warranty does not apply to any failure or damage caused by accident, neglect, unreasonable use, improper installation, or to alterations or modifications to the unit. Nor does the warranty extend to damage incurred by force majeure (natural causes) such as lightning, fire, floods, or other such catastrophes, nor to damage caused by environmental extremes, power surges and/or transients

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