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MODEL CDEU-1 ANI ENCODER/DECODER

GE Star® ANI ENCODER/DECODER

Instruction Manual

Rev 030701

CDEU-1 ANI Encoder/Decoder Module Instruction Manual

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Manual revision CDEU-1 030701

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C H A P T E R 1
Features

What Is the CDEU-1

The Cimarron Technologies' Model CDEU-1, Universal ANI/Emergency, Select Call, Multi-function Encoder-Decoder provides for digital identification of a specific radio transmitter each time the microphone press-to-talk (PTT) switch is pressed. It offers a digital emergency signal when a momentary switch is activated and a Man-Down message after a radio transmitter is placed in a horizontal position for a brief period. If the microphone PTT switch is pressed for a duration longer than desired, a stuck Microphone message is transmitted, an audible local alarm is sounded and the PTT switch is disconnected from the key line until the switch is released. The unit also provides decoding of interrogations for radio check, selective calls, group calls and all calls. A data mute cpability is provided to silence a portion of the received data burst. The Radio Kill feature disables the transmit and receive functions of the radio in the event the radio is stolen. The radio can be brought back to life again by over-the-air commands from the dispatch center.

Capabilities

- Identify every transmission source
- Reduce nuisance and obscene transmissions
- Emergency and Man-Down situations instantly identified with ack and alert tone
- Microphone monitoring mode
- Trunking compatible
- Stuck microphone identification with ack and alert tone
- Time-Out-Timer with alert tone
- ANI identification at beginning, End or Both
- Audible Man-Down alert
- Remote unit interrogate with ack
- Selective Unit, Group and All-Call with alert tone
- Over-The-Air radio disable and enable with ack
- Timed Open-Mic-Monitor on demand with ack
- Automatic Data mute

In order to realize these capabilities the CDEU-1 must be correctly installed and programmed. Some features may require additional equipment not supplied. The CDEU-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

Transmission Method
Phase Shift Keying at 400 BPS, GE Star® with all known variations.

Identification Range
Numeric 0001 through 9999.

Data Messages Transmitted
Automatic Numeric Identification (ANI), Emergency, Man-Down, Stuck-Mic. Vehicle Status and Canned messages may be programmed in lieu of ANI, Emergency, Man-Down and Acknowledgments to received messages

Data Messages Received
Selective (unit) call, Group Call, All Call, Interrogation, Open Mic Monitor, Radio Kill On, Radio Kill Off, base Acknowledgments to transmitted messages.

Identification Storage
E^2Prom, reprogrammable.

Automatic Numeric Identification (ANI) Message
Initiated by a momentary (>50mS) or sustained activation of the PTT switch. Transmitted upon PTT switch activation, deactivation or both.

Sidetone Alternative
Provides a local tone during ANI-ID data burst

Silent Emergency Alarm Message
Initiated by a momentary (>50mS) or sustained input from an external N.O. or N.C. switch.

Man-Down Alarm Messsage
Initiated by a momentary (>50mS) or sustained input from an external N.O. or N.C. switch. Accepts programmable initial delay, local initiation tone, and secondary delay before transmission. Unique Man-Down message differentiates from Emergency.

Stuck Mic Message and Action
If the PTT switch is activated continuously in excess of 60 seconds, the Stuck-Mic mode is entered. Programmable to either repeat the Stuck-Mic message every 10 seconds or to unkey the transmitter.

Status and Canned Message
Status and Canned Messages may be programmed instead of the Emergency and Man-Down.

"Radio Kill" Command
Dispatch can issue a Radio Kill command that deactivates the radio key line and receive audio. Will remain in effect even if the radio is unpowered. Radio Enable re-establishes normal radio operation. The CDEU-1 acknowledges both commands.

Open Mic Monitor Command
Dispatch can issue a Mic Mon command which causes open microphone transmission of ambient noise for 15 seconds.

Burst Length
ANI ID message is programmable for 1(120mS), 2(200mS), 3(280mS) or 4(360mS) messages (Default is 3). All other messages are programmable for 3 (280mS) or 4 (360mS) messages (Default is 3).

Local Audible Alert Tone
Sidetone is applied to radio receiver audio circuit. Programmable On/Off.

Call Progress Light Output
Source up to 5mA at 5VDC. Flashes on selective call decode. Solid (when programmed) upon initiation of message push button. Flashes if no message acknowledgment.

Attack Delay
Programmable for 125, 325, 625 or 1300mS.

Preamble Length
Programmable for 16, 24, 32 or 40 bits.

Sidetone Output
PTT Sidetone = 1.6KHz, all others 1KHz. 1KÙ capacitively coupled. High Z when inactive.

Sidetone Control Output
Enables receiver audio circuit allowing audio sidetones from CDEU-1 to be amplified and sent to receiver s speaker.

Data Output
Adjustable 0 to 4.5VP-P. Capacitively coupled. 50 Ohm encoding, 10 Meg Ohm when inactive.

Data Input
250mV p-p. Nominal 10 K Ohm impedance.

Keying Output
Open collector transistor. 300mA sink to within 0.7V of system ground.

Receiver Data Mute Output
2.0mA sink to within 0.7 V of system ground.

Programming
Via QPF-2 programming pod and ANIPROG software.

Supply Voltage
6.5 to 16.0VDC or 5VDC direct (bypassing on-board regulator).

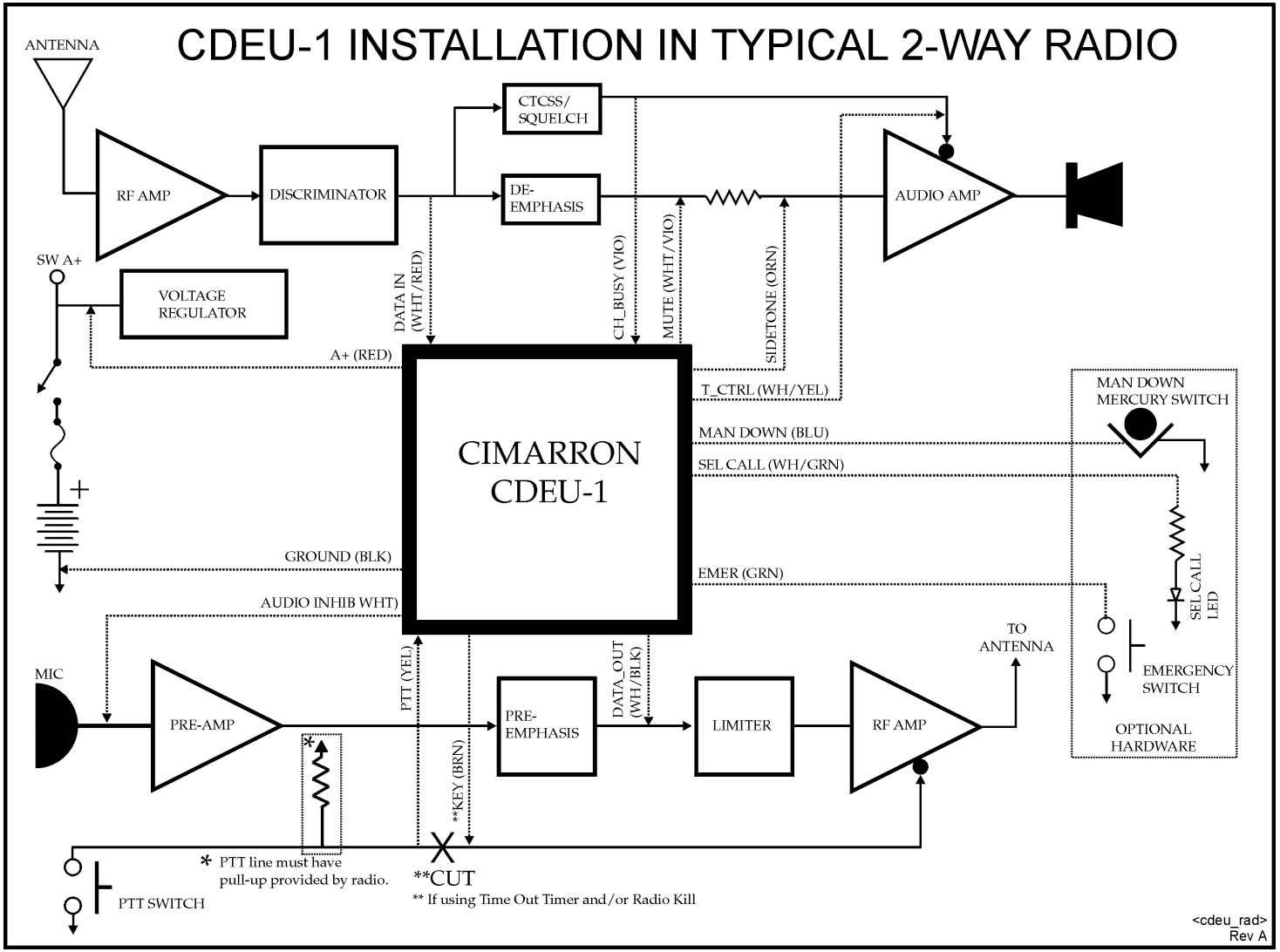
Supply Current
6.0 mA Standby, 45 mA Encoding (at 12VDC).

Temperature/Humidity
Operating -30□C to +70□C at 0-90% non-condensing humidity.

Size
Approximately 1.15 X 1.15 X 0.12 . 0.22 Oz.

CHAPTER 2
Installation

Simplified Radio Block Diagram



Quick Start Installation

Before a CDEU-1 will work in a radio, the device must be programmed. The Cimarron QPF-2 programming pod (with blue 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 CDEU-1. After selecting the correct version, 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

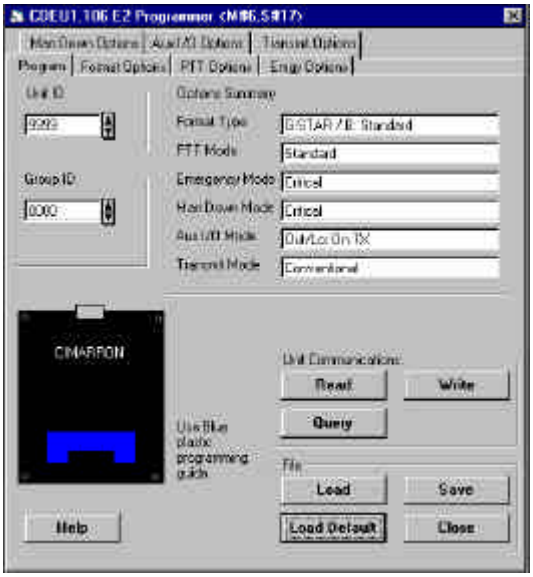


Figure 2

The QPF programming pod should be connected to COM1 with a fully populated one-to-one serial cable. Hold the CDEU-1 onto the QPF and press the Write button. Remember that you must load new CDEU-1 s with defaults before they will work. If you are just changing ID s on a CDEU-1 that has already 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. Page 8 shows a simplified radio block diagram and generic installation points for the CDEU-1 wire harness. 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 must be adjusted so it is just below that of voice deviation.

Radio Connections

Signal	Color	Description
A+	Red	Positive supply voltage to the CDEU-1. Regulated or Unregulated +6 to +16.5 VDC. If using regulated 5 VDC, install jumper J11. *Note: If J11 is installed, there is no voltage regulation!!*
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 CDEU-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 to detect when the radio has been keyed. The signal is buffered before being sent to the microprocessor. As shipped, a signal of between 4.5 VDC and 16.5 VDC is interpreted as unkeyed. A level below 4.5 VDC is interpreted as keyed. If the radio line is near or below 4.5 VDC when unkeyed, and drops to below 1 volt during PTT, install Jumper J3, remove J2, remove R19 and set PTT for "Active Open". This brings the interface directly to the microprocessor. Remember +5 VDC MAXIMUM!!
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 CDEU-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. If the CDEU-1 receives a call command, this line becomes active for 5 seconds to alert the local user. It then sounds for one second every 10 seconds until receipt of a call cancel or the local microphone PTT is activated.
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 CDEU-1 as desired. If the switch is greater than 6" from the CDEU-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 CDEU-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 CDEU-1 microprocessor. Will put the CDEU-1 to "sleep" when active. Active state is programmable for logic 1 or 0.
Chan Busy	Violet	Channel Busy input. Provides the CDEU-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 CDEU-1 handles the Emergency and Man-Down transmissions. 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.
ToneCtl	Wh/Yel	Tone control output. Used to activate a radio amplifier or audio pass gate when Sidetone is being generated by the CDEU-1. Sidetone is not powerful enough to drive a radio speaker directly so the radio's amplifier must be used. Voltage levels and logic states are determined by Jumpers. See "Jumpers" section of this manual for details.
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.
Data In	Wh/Red	Capacitively coupled data input. To be connected to the radio discriminator.
Sel Call	Wh/Grn	Source up to 5mA at 5VDC. Pulses on selective call

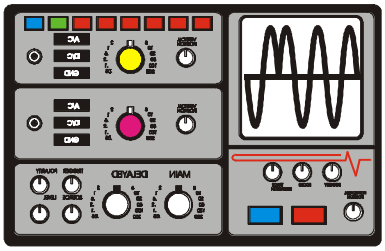
		decode. Continuous upon data initiation, inactivated upon receipt of an ack or local PTT activation. Pulses if ack for message is not received. This signal can be mapped (in ANIPROG) to the "Tone Control" line. This permits the use of the Tone Control transistors to more effectively drive external devices.
Mute	Wh/Vio	2.0mA sink to within 1 volt of system ground when active. Is active after receiving a valid data preamble. This line should be interfaced to a point in the radio which will quiet the speaker during data reception times. Note that the isnertion point must be after the Data-In insertion point. It can be used to activate a gate or to directly shunt the audio.
Call	Pad C0	Normally low, goes to 5v on receipt of of unit, group or all call. Stays in that state until receipt of call cancel or cycling of power
/Call	Pad C1	Normally high, goes low on receipt of unit, group or all call. Stays in that state until receipt of call cancel or cycling of power
/Kill	Pad SA	Normally high, goes low on receipt of radio disable command. Stays in that state until receipt of radio enable command. Not affected by cycling of power.
Kill	Pad SB	Normally low, goes high on receipt of radio disable command. Stays in that state until receipt of radio enable command. Not affected by cycling of power.

Physical Installation

Find a location in the radio for the Model CDEU-1, preferably away from the transmitter output amplifier stage. Place the insulating sleeve over the module. Locate the interface points for the CDEU-1 interface wiring, cut appropriate wires and solder to radio interface points. Remove interface wires which are not needed.

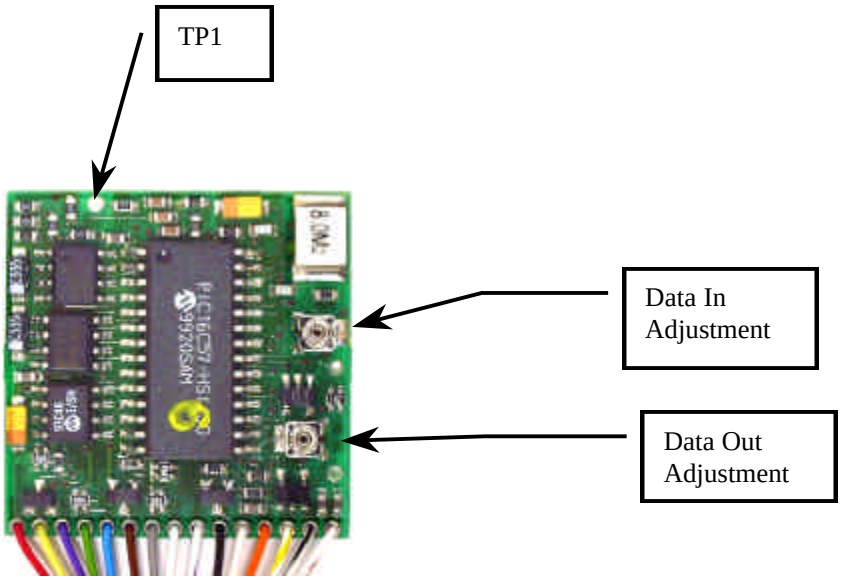
Deviation Adjustment

While repeatedly keying the radio into a service monitor, adjust the Data Out potentiometer so data deviation is just below voice deviation.



Service Monitor Display

Data deviation to match voice

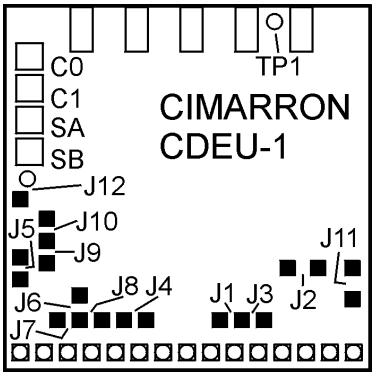


Receive Audio Adjustment

O scope TP1 and while receiving a GE Star® data burst, adjust The Data In potentiometer until you achieve a 2V PP data signal with receipt of data.

Jumper Information

On the back of the CDEU-1 there are jumpers as shown. Their purpose is described on page . A new CDEU-1 has traces that complete jumpers J1, J2, J5, J8, J9, and J12. The other jumpers are open. To install other jumpers, use a fine tip soldering iron and solder a small wire between the pads. To remove a factory jumper, use a very fine xacto knife and very gently under cut the trace and remove it. Applying too much pressure will damage the board.



Jumper Definitions

Jumper	Usage
1 (IN*)	PTT/KEY jumper. Install to connect PTT and Key lines.
2 (IN*)	Part of the PTT buffer transistor circuit. Applies 5vdc to the emitter of the PTT transistor
3 (OUT*)	PTT direct input. Install jumper 3 and remove CDEU R19 if radio PTT voltage ranges between 0 and +4.7vdc.
4 (OUT*)	Data Output level boost. Install jumper 4 = Data Output 0 to 5vpp Remove jumper 4 = Data Output 0 to 150mVpp
5 (IN*)	Removing J5 allows the addition of a series resistor in the data in line.
6,7,8,9,10	See the table below
11 (OUT*)	Shorts the onboard voltage regulator input to output, effectively bypassing the regulator. CDEU-1 red wire must then be operated at regulated five volts.
12 (IN*)	Removing J12 adds a 39K Ohm resistor in series with the Data In line

Jumper Selection					Tone Control Output	
J6	**J7**	**J8**	**J9**	**J10**	**Inactive**	**Active**
Out*	Out*	In*	In*	Out*	Low	+5vdc
In	Out	Out	Out	Out	HiZ	Low
In	Out	Out	In	Out	A+	Low
In	Out	Out	Out	In	+5vdc	Low
Out	In	Out	In	Out	HiZ	A+
Out	In	Out	Out	In	HiZ	+5vdc

(* = As Shipped condition)

*Caution: **Never** connect jumpers J9 and J10 simultaneously! Damage will occur.*

***Never** connect jumpers J6,J7, and J8 simultaneously.*

Jumper Example

Simple ANI with Sidetone. Radio supplies regulated +8vdc. PTT and KEY are the same point in the radio resting at +8vdc and going to an active low, no Time Out Timer. Radio audio amp needs +8vdc to turn it on. CDEU-1 must not load down the audio amp when not sending ANI, so a High Impedance is needed at rest.

Install: J7, and J9. Remove J8.

Jumper J1 Configuration

Of all of the jumpers on the CDEU-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. When installed, the KEY wire is not needed and should be removed (as with all unused wires). 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 CDEU-1 to serve as the transmit Time Out Timer (TOT). In addition, Key Follows PTT must be enabled. In this configuration, the radio keying function is routed through the CDEU-1. When the user pushes the PTT switch on the radio, the request goes to the CDEU-1. The CDEU-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 CDEU-1 TOT is reset and operation returns to normal. If the CDEU-1 receives a Radio Kill command, PTT activations will not be responded to, and the KEY output of the CDEU-1 will remain inactive. This lack of Key following PTT very effectively Kills the radio s transmit capability. See also SA and SB pad functionality.

Radio PTT sense high but KEY to ground

If the interface requires the CDEU-1 to detect when the radio is keyed by the presence of a voltage above 4.5 VDC, remove jumper J1 and program the PTT Input for ActOpn 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. Do not program Key Follows PTT .

Jumper J2 and J3 Configuration

Default jumper J2 is installed at the factory and routes PTT information through a PNP transistor. This buffers the input line and protects the microprocessor from overvoltage. It also causes the transition point to be about 4.5 (±.3)VDC. This means that if the yellow (PTT) wire is below 4.5(±.3)VDC, the CDEU-1 will assume that the line is active and the radio is keyed. However, some radios may have PTT line voltages not compatible with this. An example would be a radio whose PTT line rests at 4.6VDC unkeyed. This would cause operation to be unstable. In this case, jumper J2 should be removed and jumper J3 installed. Additionally, resistor R19 must be removed from the circuit board. This will connect radio PTT directly to the CDEU-1 microprocessor and permit a transition point of about 2.5VDC.

Only one of these jumpers can be installed at a time. If jumper J3 is installed, the PTT sense detected by the microprocessor will be opposite of that which is detected when the buffer transistor is in circuit. This is because of the signal inversion created by the transistor. Therefore, if you are using jumper J3 and the line goes low when keyed, you will actually have to program the PTT sense for active high.

There is no protection of the microprocessor when using jumper J3. If the voltage ever goes above 5.0VDC on the yellow (PTT) wire, the micro on the CDEU-1 will be destroyed.

Tone Control Output

This mult-purpose output is very handy for controlling various circuits in a radio. The jumper configuration table defines the many functions it provides. Refer to the Inactive/Active columns for the desired output then set the jumpers accordingly. The CDEU-1 programming also permits this line to respond similar to that of the Sel Call line. This is especially helpful if the device to be controlled by Selective Call requires more than the Sel Call line can provide. The CDEU-1 Tone Control Output circuitry consists of two transistors and multiple voltage levels/states.

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 CDEU-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.

C0 and C1 Pads

You will find these pads on the back of the CDEU-1. Pad C0 is normally low and goes to 5v on receipt of of unit, group or all call. The pad stays in that state until receipt of a call cancel or cycling of power. Pad C1 is normally high and goes low on receipt of unit, group or all call. The pad stays in that state until receipt of call cancel or cycling of power.

SA and SB Pads

You will find these pads on the back of the CDEU-1. Pad SA is normally high and goes low on receipt of a radio disable command. The pad stays in that state until receipt of radio enable command. It is not affected by cycling of power. Pad SB is usable only with the removal of dual resistor pack R16. With the resistor removed, this pad is normally High Z and goes high on receipt of a radio disable command. If the resistor pack is not removed, the pad remains high (+5VDC) at all times. The pads stay in that state until receipt of radio enable command. Pads are not affected by cycling of power.

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.

END BURST LENGTH: 1½ 2½ 3½ or 4½ messages.

MESSAGE TYPE: Any other in lieu of ANI ID.

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.

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.

CHAPTER 4
Operation

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 CDEU-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 CDEU-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 CDEU-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 ModelCDEU-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 CDEU-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 CDEU-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 CDEU-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.

CHAPTER 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 CDEU-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 and Man-Down inputs. 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 CDEU-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

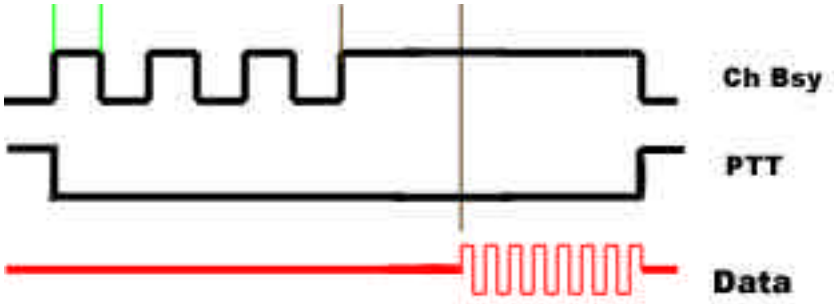
The radio operator has just pressed the emergency button. The CDEU-1 activates the radio PTT line and watches the Channel Busy line. It holds off modulating data until the Ch Bsy has become active and remained active for the duration of the time set in the trunk select debounce timer. It then sends out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

PTT at beginning

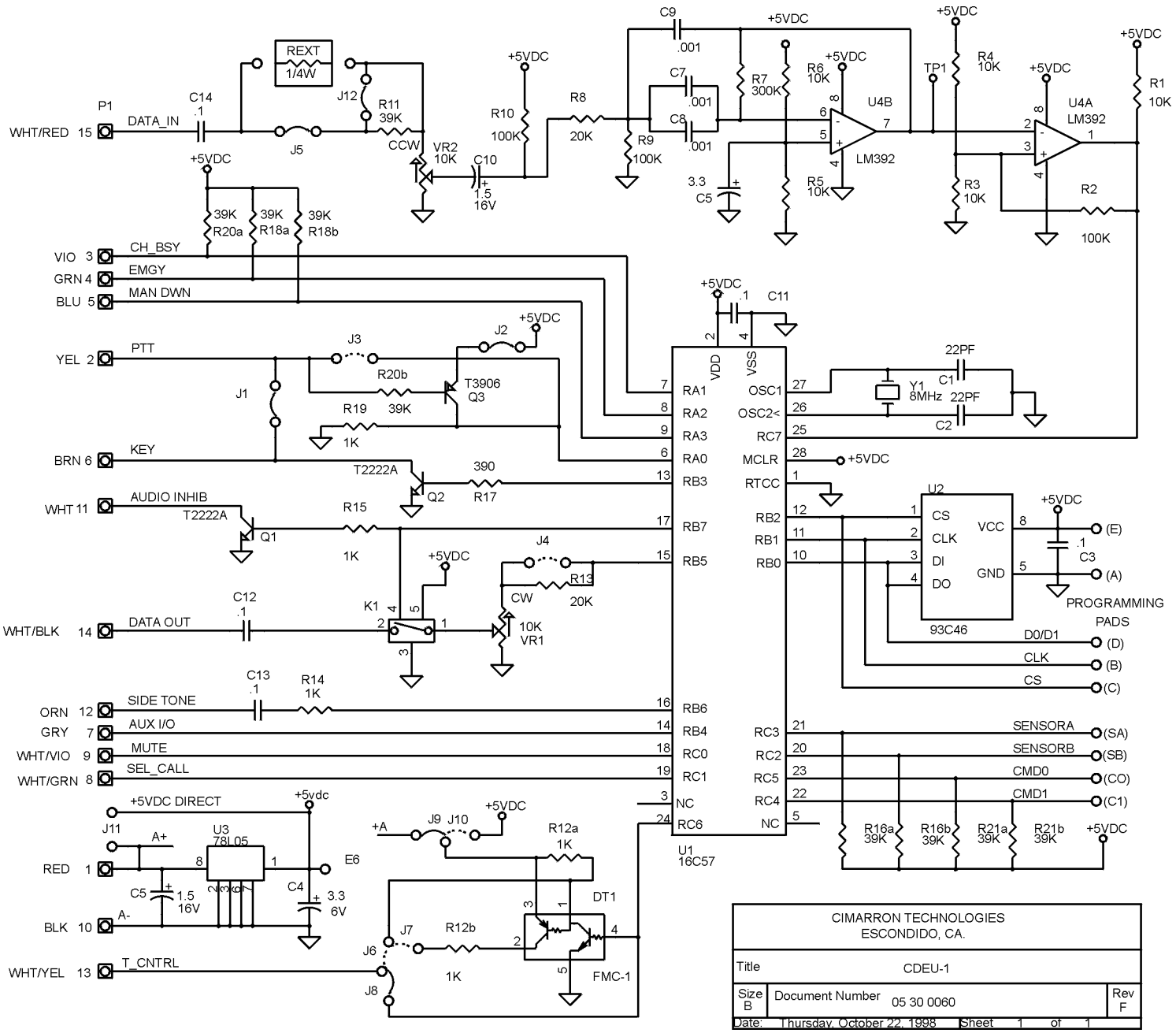
The user has just keyed up the radio to speak, he waits for the go-ahead beep from the radio speaker, and we start monitoring the Ch Bsy line. Once the line becomes active and stays active for the duration of the trunk select debounce timer, we send the PTT ANI data and the radio sends the go-ahead beep 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 CDEU-1 detects that the radio unkeyed and then rekeys it and waits 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 CDEU-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*.


P1
WHT/RED 15
DATA_IN
C14 .1
REXT 1/4W
J5
J12
R11 39K
CCW
VR2 10K
C10 1.5 16V
+5VDC
R10 100K
R8 20K
R9 100K
C9 .001
C7 .001
C8 .001
R7 300K
R6 10K
R5 10K
U4B
LM392
3.3 C5
TP1
R4 10K
R3 10K
U4A LM392
R1 10K
R2 100K
39K R20a
39K R18a
39K R18b
VIO 3 CH_BSY
GRN 4 EMGY
BLU 5 MAN DWN
C11 .1
YEL 2 PTT
J3
J2
R20b
T3906 Q3
J1
R19 39K
1K
BRN 6 KEY
T2222A
390
Q2
R17
WHT 11 AUDIO INHIB
T2222A
Q1
R15 1K
J4
R13 20K
CW
10K VR1
K1
C12 .1
WHT/BLK 14 DATA OUT
C13 .1
R14 1K
ORN 12 SIDE TONE
GRY 7 AUX I/O
WHT/VIO 9 MUTE
WHT/GRN 8 SEL_CALL
+5VDC DIRECT
+5vdc
J11
A+
U3 78L05
E6
RED 1
C5 1.5 16V
C4 3.3 6V
A-
BLK 10
J9 J10
+A
R12a 1K
DT1
J7
R12b
J6
J8
1K
FMC-1
WHT/YEL 13 T_CNTRL
VDD
VSS
RA1
RA2
RA3
RA0
RB3
RB7
RB5
RB6
RB4
RC0
RC1
NC
RC6
OSC1
OSC2<
RC7
MCLR
RTCC
RB2
RB1
RB0
RC3
RC2
RC5
RC4
NC
U1 16C57
22PF C1
Y1 8MHz
22PF C2
U2
93C46
CS
CLK
DI
DO
VCC
GND
C3 .1
(E)
(A)
PROGRAMMING PADS
D0/D1 (D)
CLK (B)
CS (C)
SENSORA (SA)
SENSORB (SB)
CMD0 (CO)
CMD1 (C1)
R16a 39K
R16b 39K
R21a 39K
R21b 39K
CIMARRON TECHNOLOGIES
ESCONDIDO, CA.
Title CDEU-1
Size B
Document Number 05 30 0060
Rev F
Date: Thursday, October 22, 1998
Sheet 1 of 1

CHAPTER 6
Troubleshooting

Installation Hints

The CDEU-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 CDEU-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 CDEU-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 CDEU-1, review the trunking information located on page 27 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 K on the CDEU-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 CDEU-1 jumper J1.

ANI goes out at “End” Regardless of programming

This symptom is usually caused by the PTT Sense being programmed opposite of how it should be or the voltage swing is insufficient. Use an O scope to measure the level at the yellow (PTT) line when at rest and then when active (Keyed). The line should rest above 4.8VDC and go low when keyed if active low. It should rest below 1VDC and go above 4.8VDC when active if active high. Note that 4.8VDC is very important. In either case, if the voltage is 4.7 or 4.6 VDC, the unit will be confused because the

stable state voltage rests within the transition area. If this is the case, consider removing jumper J2 , removing resistor R19 and adding jumper J3 . This will place the yellow (PTT input) line directly into the microprocessor and move the transition point to about 2.5VDC.

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

This symptom usually occurs when the CDEU-1 has been subjected to pressure inside a closed radio. If the space is tight, constant pressure on the microprocessor will cause pin 8 or pin 9 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 CDEU-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 the micro pins usually cures the problem. This symptom is also common when the installation procedure did not include completely removing unused wires. Clipping off unused wires at the board is essential.

ID Decoded is not the Same as Programmed

This occurs when the CDEU-1 GE Star® format is not set the same as the decoder. See page 25 for details.

When PTT button is pressed, unit continuously sends ANI

Ensure that you have Reverse Burst Detect enabled on the CDEU-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 CDEU-1 detects this as a new occurrence of PTT, holds the radio keyed and sends out PTT ANI. When the CDEU-1 unkeys, the radio again keys up to send out a reverse burst, and the CDEU-1 again detects this as a new occurrence of PTT. Enabling Reverse Burst Detect on the CDEU-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 CDEU-1 with alcohol and try again. If the program still fails, click the override button and then try again.

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.

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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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