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MODEL CIM-1000 DUALFORMAT ANI ENCODER

GE Star® AND MDC-1200® IDENTIFICATION ENCODER

Instruction Manual
Manual Number 05 40 1000
Rev 060828

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Manual revision CIM-1000 060828

T a b l e   o f   C o n t e n t s

C H A P T E R   1
Features and Capabilities

What Is the CIM-1000

The Cimarron Technologies' Model CIM-1000, ANI/Emergency ID Encoder is a dual format encoder. It can be programmed to operate in GE Star® or MDC-1200® modes. 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 other data messages as well.

Typically the unit is programmed to encode "Stuck-Microphone", "Emergency", and "Man-Down" messages but can be preprogrammed for any valid special message. The Model CIM-1000 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. Wiring connections to the host radio is the same for all available formats.

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
- Dual ID capability
- Flexible message coding allows special signaling capabilities
- Programmable with a hand-held programmer wirelessly
- Programmable by computer with a serial port adapter cable
- Capable of zero attack delay. Fastest possible encode
- Continuous data mode assists with system calibration
- Able to be used as a status encoder for both MDC-1200® and GE Star®
- Increased trunking flexibility compatible with latest trunking schemes
- Very low current consumption
- Extended ID range MDC-1200® ID's to DEEE and GE Star® to 16,383
- Software controlled output adjustment – no more potentiometer to fail.
- Sine wave output provides cleaner system functioning and compliance

In order to realize these capabilities the CIM-1000 must be correctly installed and programmed. Some features may require additional equipment not supplied. The CIM-1000 is programmed with "defaults" which allow compatibility with most installations when received from the factory. The device is programmed via the Cimarron Technologies CIM-IRP handheld IR programmer. Power must be applied to the CIM-1000 during programming. Programming is easily accomplished in installed devices. The CIM-1000 can also be programmed via the CIM-Cable and a computer running terminal emulation software like Hyperterm or Procomm. Using the CIM-Cable, the attached CIM-1000 is powered via the computer serial port.

Specifications

Data Format	GE Star®	MDC-1200®
Modulation Type	PSK (Phase Shift Key)	FSK
Rate	400 bps on 1600hz carrier	1200/1800 Hz
ID Range	0001 to 16,383	0001-DEEE
ID Locations	ANI at Beginning, End or Both	
Messages	PTT ANI, Emergency, Man-Down, TOT. Programmable to any allowable GE Star® message.	PTT ANI, Emergency. Programmable to any allowable MDC message bit pattern.
Sidetone	3.3VPP Square wave audible tones. Time Out Timer Notification Tone 515 Hz Emergency and Man Down Warnings 400 Hz Go-Ahead Tone 1.4 KHz Courtesy Tone 650 Hz	
Burst Length	280mS plus selected preamble time.	Fixed length 180mS
Preamble Length	Programmable 0 – 255 bits (Each bit adds 2.5mS)	Fixed length
Attack Delay	0 mS to 2550 mS programmable in 10 mS steps.	
ANI Repeat Timer	(Time since last PTT press. If less, don't send ANI) Programmable 0 S (Send every PTT); 0 to 255 S.	

Outputs	KEY – HiZ to Low. Open collector with 100 mA sink.
	Microphone Mute – HiZ to Low. Open collector with 100 mA sink.
	Tone Control – Many voltage levels possible via Jumpers.
	Sidetone – See above
	Data Out – Capacitively coupled.
	          Idle: >1 Megohm impedance.
	          Encode: adjustable 33 mV to 3,300 mV P/P in 1 dB steps
	Aux Output – HiZ to Low. Open collector with 100 mA sink.	

Inputs Emergency Man-Down PTT Aux Input	10K pull up to 3.3VDC, current limited with Max voltage 16VDC. Logic: below 0.9v is 0, above 1.9 is 1. PTT input is via on-chip analog to digital converter. Below 1.5v is 0, above is 1	
Programming	The device is programmed via wireless IR technology using Cimarron Technologies CIM-IRP programming device. Programming can also be done via the CIM-CABLE which connects to a computer running terminal emulation software like Hyperterm.	
Radio Interface	Wired interface between CIM-1000 pads and radio components	
Supply Voltage	3.3 to 3.6 VDC regulated or 4.0 to 16.5 VDC unregulated	
Supply Current	5 mA constant.	
Temperature	Operating: -30°C to +60°C.	
Humidity	0% to 95% RH (non-condensing).	
Dimensions	17.0mm x 18.0mm x 2.0mm. 17.0mm x 22mm x 2.7mm with IR prog dev	

C H A P T E R   2
Installation

Typical Radio Installation

INSTALLATION IN TYPICAL 2-WAY RADIO
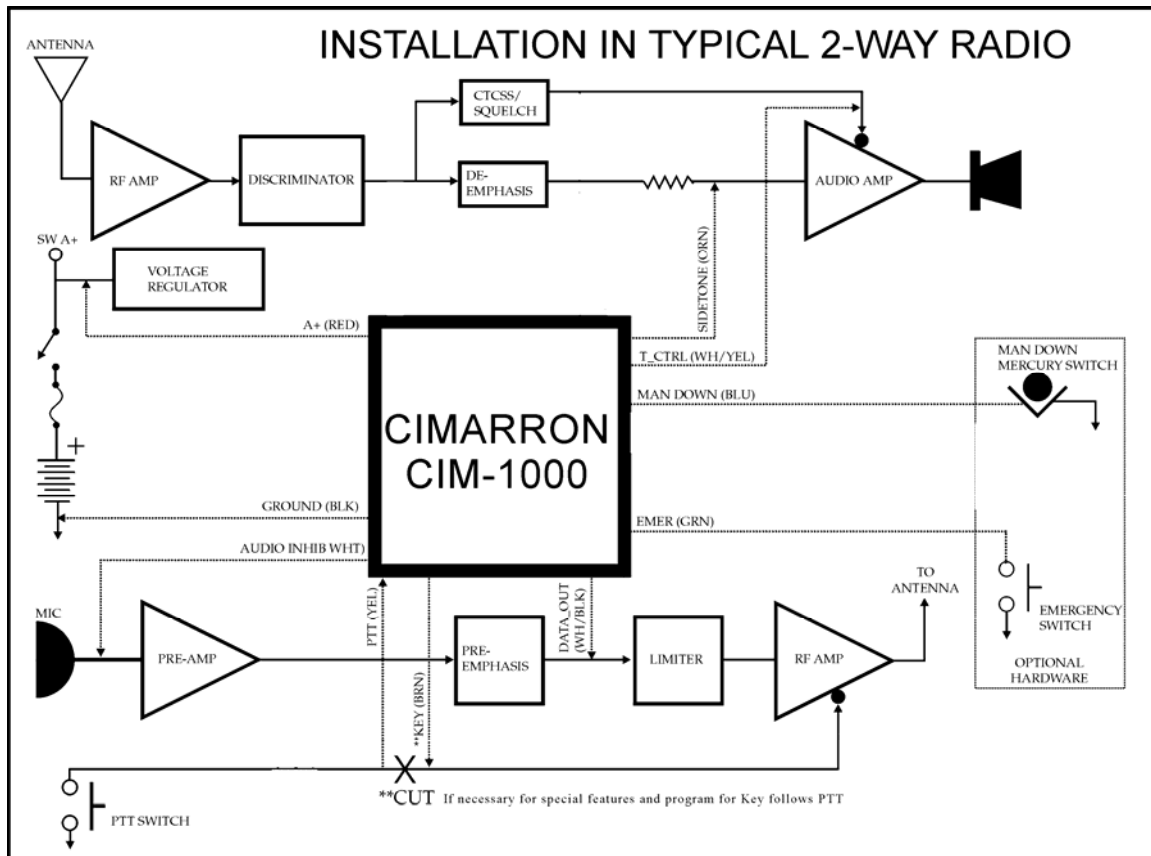
Quick Start Installation

Typical Radio Tx Section

SwA+
Pwr
A+
A-
MIC
AGC
Pre-Emphasis
Limiter
Transmitter
PTT Switch
○A   ○B   ○C   ○D   ○E   Radio Interface Points

Ground	A+	Audio Inhibit	Data	PTT	Signal Description
(BLK)	(RED)	(WHT)	(WHT/BLK)	(YEL)	QE-2 wire color
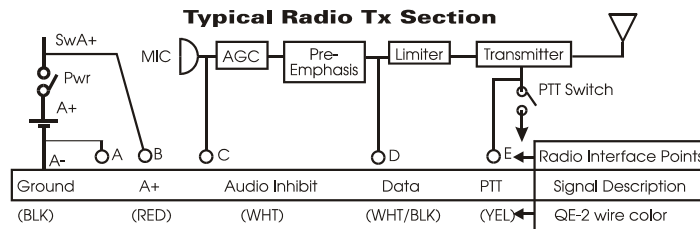
The block diagram above illustrates a simple five wire radio installation that provides PTT ANI. The audio inhibit line disables the radio microphone during data transmission. Data is injected into the microphone circuit right after pre-emphasis. The PTT line senses when the radio is keyed and (because jumper K is installed) holds the radio keyed during the transmission of data.

Cimarron Technologies maintains installation notes on many radios and may have one which could help in isolating exact connections to your host radio.

The CIM-1000 is a full featured ANI encoder and can also accommodate installations which include Emergency, Man-Down, status reporting, home channel revert, warning tones, go-ahead tones, trunking and many other specialized applications. The full extent of the CIM-1000 capabilities is described in this manual. Applications notes (The ANI Cookbook Volumes I and II) are available at www.cimtechcorp.com.

Physical Installation

Find a location in the radio for the Model CIM-1000, preferably away from the transmitter output amplifier stage. Place the insulating sleeve over the CIM-1000 module. Locate the interface points for the CIM-1000 interface wiring, cut wires to the appropriate length and solder between the radio interface points and the CIM-1000 interface pads. Keep all wires as short as possible to avoid RF and noise interference.

The CIM-1000 is programmed using wireless invisible IR technology. However, the IR portion of the circuit board has been manufactured in a way that permits it to be snapped off, reducing the physical size of the device. If the IR is removed, the CIM-1000 can still be reprogrammed via the three conductor programming cable.

Radio Connections

Teflon insulated wires are included in the CIM-1000 package to interface the device to the host radio. Use only the wires required and keep all used wires as short as possible. A wire stripping tool is essential for the correct stripping of Teflon coated wires. Conductors will be nicked or cut if an appropriate stripping tool is not used.

Signal	Pad #	Color
A+	T13	Red
A-	T9,T14	Black
Mic Mute	T11	White
KEY	T4	Brown
PTT	T6	Yellow
Sidetone	T2	Orange
Emergency	T5	Green
Man-Down	T8	Blue
Aux Out	T3	Gray
Aux In	T7	Violet
Tone Control	T1	Wh/Yel
Data Out	T12	Wh/Blk
Sleep	T10	Gray
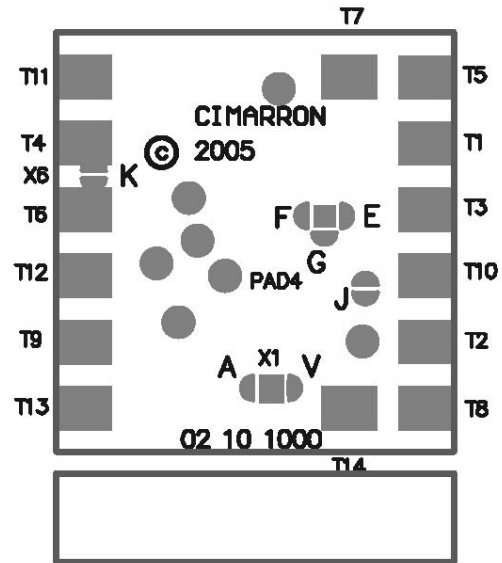
Radio connection Definitions

A+

Red

> Positive supply voltage to the CIM-1000. Unregulated +3.6 to +16.5 VDC or regulated 3.3 to 3.6 VDC. If using regulated 3.3 to 3.6 VDC, install jumper J. *Note: If J is installed, there is no reverse voltage protection!!*

A-

Black

> Supply ground

Microphone Mute Output

White

> This line is used to disable the microphone during data transmission. This is an open collector output and is at high impedance when idle and sinks to within 1 volt of system ground (100 mA max) during attack delay and data transmission. Usually interfaced to Mic High.

KEY Output

Brown

> This line keys the radio when required by the CIM-1000. This is an open collector output and is high impedance when idle and sinks to within 1 volt of system ground when active. It can be isolated from the PTT input line by removing Jumper K. It should be connected to a point on the radio which when grounded will key the radio.

PTT Input

Yellow

> This line is used by the CIM-1000 to detect when the radio has been keyed. The line is pulled up to 3.3 VDC with 10K Ohms and is current limited. Maximum voltage allowable is 16 VDC. PTT input is conditioned via an on-chip analog to digital converter. As shipped a signal level above 1.5VDC is interpreted as un-keyed. A level below 1.5VDC is interpreted as keyed. The input threshold and logic can be software programmed.

Sidetone Output

Orange

Capacitively coupled square wave 3.3 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 CIM-1000 microprocessor activates this tone line under the following circumstances:

If programmed for tone on Emergency or Man-Down, this line will be active to warn the user that an alarm message has or will be transmitted.

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 (go-ahead) when the ANI burst is finished and un-clipped speech is possible. The "tone on PTT" application will require the addition of a series resistor to lower the amplitude.

Tones are defined as follows:
Time Out Timer Notification Tone	515 Hz
Emergency and Man Down Warnings	400 Hz
Go-Ahead Tone	1.4 KHz
Courtesy Tone	650 Hz

Emergency Input

Green

This line is used by the CIM-1000 to detect a manual emergency condition. The line is pulled up to 3.3 VDC with 10K Ohms and is current limited. Maximum voltage allowable is 16 VDC. As shipped a level below 0.9VDC is interpreted as active. The input can be software programmed for reverse logic. This line can alternately be used as a status or canned message.

Man-Down Input

Blue

Man-Down activation input from external sensor or switch. This line is normally pulled high and grounding it activates the Man-Down condition. The line is pulled up to 3.3 VDC with 10K Ohms and is current limited. Maximum voltage allowable is 16 VDC. As shipped a level below 0.9 VDC is interpreted as active. The input can be software programmed for reverse logic. This line can alternately be used as a status or canned message.

Aux Output

Gray

This dual function line can be programmed to perform one of the following two functions:
1. Transmit Control. Idle state is 3.3VDC. Active state occurs during all data burst transmissions. When active, it sinks to within 1 volt of system ground (100 mA max). Typically used to control a transmitter CTCSS, turning it off during ANI transmissions.
2. Critical Channel Revert. Similar to Data control but is active only during Emergency and Man-Down data transmissions. Typically used to change the radio channel to a "Home" channel before sending the Emergency or Man-Down message. Becomes active 50 mS before the Key line is activated. When active, it sinks to within 1 volt of system ground (100 mA max).

Sleep Input

Gray

An input to the CIM-1000 microprocessor. Will stop the CIM-1000 from modulating data when active. The line is pulled up to 3.3 VDC with 10K Ohms and is current limited. Maximum voltage allowable is 16 VDC. As shipped a level below 0.9 VDC is interpreted as active. The input can be software programmed for reverse logic. This is useful if ANI is desired on selected channels only.

Aux Input

Violet

In trunking mode this line is used as channel acquired and 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.

Tone Control Output

White/Yellow

This line is used to activate a radio amplifier or audio pass gate when Sidetone is being generated by the CIM-1000. Sidetone is not powerful enough to drive a radio speaker directly so the radio's amplifier must be used. This multi-level output is very handy for controlling audio amplifier circuits in a radio. If sidetone is desired, the radio audio amp will need to be turned on for the duration of the tone. The following table defines the available output conditions. Refer to the Inactive/Active columns for the desired output then set the jumpers accordingly.

Jumper Selection					Tone Control	
E	F	G	A	V	Inactive	Active
Out	Out	In	In	Out	Low	+3.3vdc
In	Out	Out	Out	Out	HiZ	Low
In	Out	Out	In	Out	A+	Low
In	Out	Out	Out	In	+3.3vdc	Low
Out	In	Out	In	Out	HiZ	A+
Out	In	Out	Out	In	HiZ	+3.3vdc

Caution:
Never connect jumpers A and V simultaneously! Damage will occur.
Never connect jumpers E, F, and G simultaneously.

Data Output

White/Black

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 0.03 to 3.3 VPP.

Pad Information

In the radio connections table, wire color is described as well as pad numbers. Attach only the wires required for your particular radio installation. The drawing below provides pad locations and numbers.

Jumper Information

The CIM-1000 is supplied with jumper E installed. To install other jumpers, use a
fine tip soldering iron and create a solder bridge. To remove a jumper, use the
fine tip soldering iron and solder wick to wipe the jumper off.

Jumper Definitions

Jumper	Usage
A	Supplies A+ voltage to Tone Control circuit.
E	Tone Control NPN open collector output. Additionally, install jumper A or V to obtain a 1Kohm pull up resistor. Tone Control output will be pulled up to A+ or 3.3vdc depending on jumpers A and V.
F	Tone Control PNP voltage output enable. Must also install jumper A or V to select between A+ or 3.3 VDC output.
G	Tone Control direct output. Install jumper G if radio requires a simple 0 to 3.3v logic swing.
J	CIM-1000 supply voltage select. Install jumper J if CIM-1000 is to be supplied by regulated 3.3vdc. Remove jumper J if CIM-1000 is to be supplied by un-regulated +3.6vdc or greater.
K	PTT/KEY jumper. Install to connect PTT and Key lines.
V	Supplies 3.3v to Tone Control Circuit.
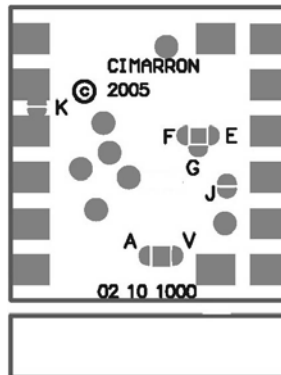
Jumper K Configuration

Of all of the jumpers on the CIM-1000, this jumper will cause the most confusion.
Jumper K connects the PTT and KEY lines together. Most applications will
require K to be installed. When installed, the KEY wire is not used. The PTT wire
now serves the dual function of PTT and KEY.

Time out timer applications

Jumper K is removed on applications which require the CIM-1000 to serve as the
transmit Time Out Timer (TOT). In this configuration, the radio keying function is
routed through the CIM-1000. When the user pushes the PTT switch on the
radio, the request goes to the CIM-1000. The CIM-1000 will immediately key or
un-key the radio as requested by the user. If the PTT is held too long, the TOT
will send the radio identification and then un-key the radio even if the user holds
the PTT active. Once the user releases the radio PTT switch, the CIM-1000 TOT
is reset and operation returns to normal. To enable the TOT feature, program

"Key follows PTT" as YES and choose the desired TOT time in the radio interface section of the programming tree.

Deviation Adjustment

The CIM-1000 deviation is adjusted by a software selection. Under the "Radio Interface" programming function, locate the "Output Level" screen. The value can be programmed between 1 and 255. A value of 1 provides an output of 0.033 VPP and a value of 41 provides an output of 3.3 VPP. Values greater than 41 provide no additional output. To facilitate level setting, The device can be programmed to continuously send data when the PTT switch is depressed and held. Modify the value of *Output Level* until data deviation is just below voice deviation. It is most appropriate to start at a deviation that is much lower than voice and then adjust up until the correct point is reached. This method ensures that the radio limiter circuitry is not affecting the CIM-1000 generated data.

Data deviation to match voice

Service Monitor Display
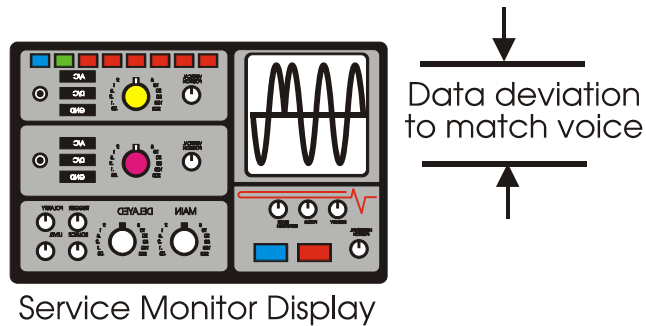
CHAPTER 3
Programming

Many functions and features of the CIM-1000 are user programmable. In addition to signaling type, ID and radio interface parameters, the device can be optimized for the application's particular needs. The CIM-1000 is programmed with the Cimarron Technologies hand-held portable programmer which uses invisible IR communications technology so the programming is accomplished without actually connecting to the programmer. Power, however, must be applied to the CIM-1000 during programming. This allows the CIM-1000 to be programmed even when it is installed in the host radio.
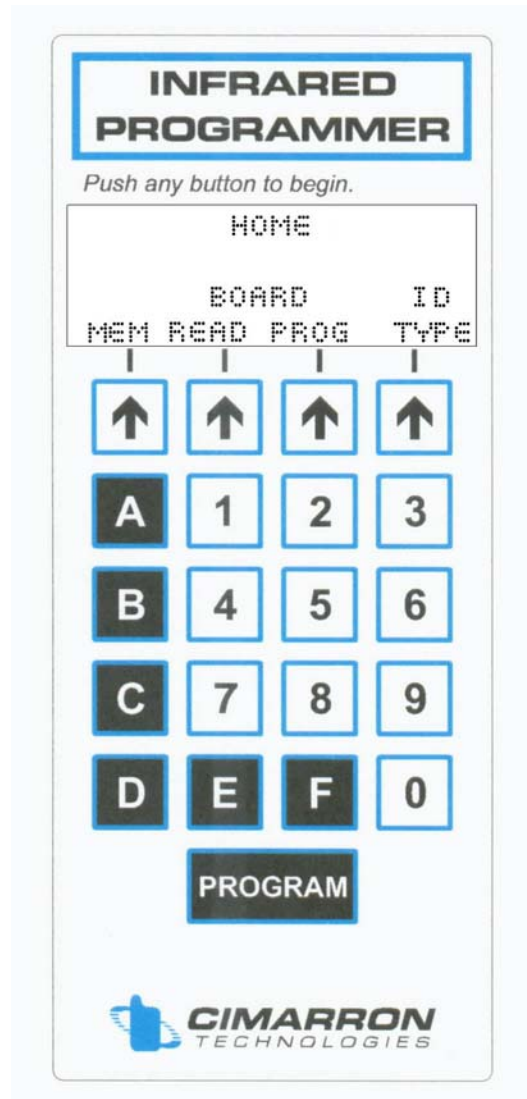
In addition to wireless IR connectivity, the handheld programmer can be connected to the CIM-1000 with the use of a three-wire programming cable. This cable also provides power to the CIM-1000 and is very useful for pre-programming multiple boards prior to radio installation. Connections are made from the RJ-11 connector on the programmer to the three programming feed-throughs on the CIM-1000.

RJ-11 Pin #   Signal
        1   3.6 VDC
        2
        3   Prog I/O
        4
        5
        6   GND

RS-232 Connector - pin numbering
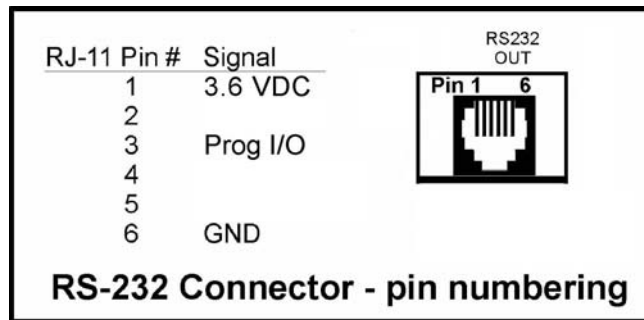
Some radio installations require the removal of the IR portion of the CIM-1000 circuit board. Boards that have had the IR removed can be reprogrammed via the three wire programming cable.

Navigating the Portable Programmer Display Screens

The portable programmer leads the user through parameter selections by using menu screens which are described in this section. The Top row of keys on the programmer are soft keys and are defined by the bottom row of the display. Some entries are made using the soft keys for selection while other entries will be made directly using the keypad that is labeled 0 through F.

Menu screens allow movement through the programming tree by assigning navigation actions to the soft keys located on the top row of the keypad. The table below explains the actions.

Navigation Actions	
BACK	Moves you to the left
PREV	Moves you up
NEXT	Moves you down
HOME	Moves you to the Home menu
CHG	Changes the value of the parameter
SEL	Moves you to the right

Once the user preferences are entered, they may be stored in one of sixteen memory locations for later reference. In this manner, a radio shop could store different user personalities for rapid retrieval. Then, only the ID would need to be entered to program additional boards for the same radio system.

Programming Tree

```
STORE MEMORY

ENTER LOCATION # 0-F
                 CANX
RECALL MEMORY
ENTER LOCATION # 0-F

DEFAULTS      CANCEL
```

```
    MEMORY

            RE-
BACK STORE  CALL
```

```
   H O M E

DEV  DEV  CON-
MEM READ PROG  FIG
```

```
------ID TYPE------
     >GE-STAR
            MDC   GE
BACK NEXT 1200 STAR
```

```
GE STAR
       02047
   *B*   PRI
BACK FMT ANI  SEL
```

```
MDC-1200
   1234   000
      PRI  GROUP
BACK ANI   ID  SEL
```

```
GE STAR ID

   MORE 024
BACK ID'S PREAM MSG
```

```
MDC-1200 MORE ID'S
   1234 1234
      SEC  EMR
BACK ANI  ID  MSG
```

```
GE STAR MORE ID'S
  2047 2047 0000
    EMR   SEC  GRP
BACK  ID  ANI   ID
GE STAR MESSAGE
       00-7F
09   01   07   0F
TOT  PTT  EM   MD
```

```
MDC-1200 MESSAGE

   8001 8000  8000
BACK ANI  EMR  MAN
```

```
ANI REPEAT
  ENTER VALUE 0-255
        >000
BACK NEXT HOME
ANI LOCATION
   BEG-END-BOTH
      [BEG]
PREV NEXT HOME  CHG
PTT SIDETONE
     YES-NO
      >NO
PREV NEXT HOME  CHG
PTT COURTESY TONE
     YES-NO
      >NO
PREV NEXT HOME  CHG
CRITICAL PTT MSG
     YES-NO
      >YES
PREV NEXT HOME  CHG
PREAMBLE FILLS ATTK
     YES-NO
      >NO
PREV NEXT HOME  CHG
```

```
-------COMMON-------

PREV NEXT HOME  SEL
```

```
--RADIO INTERFACE---

PREV NEXT  HOME  SEL
```

```
ATTACK DELAY
  ENTER VALUE 0-2550
       >0300 MS
BACK NEXT  HOME
TIME-OUT-TIMER
  ENTER VALUE 0-255 S
       >060
PREV NEXT  HOME
CRITICAL CHAN REVERT
     ONCE-ALL
       [ALL]
PREV NEXT  HOME  CHG
KEY FOLLOWS PTT
     YES-NO
       >NO
PREV NEXT  HOME  CHG
DEFINE AUX OUT
REV-MM-TXC-MUT-SC-DI
  [CRITICAL REVERT]
PREV NEXT  HOME  CHG
DEFINE MIC MUTE
MM-SC-DIS-TCTL-REV
    [MIC MUTE]
PREV NEXT  HOME  CHG
DEFINE TONE CTL OUT
TCTL-KEY-MUTE-SC-DIS
  [TONE CONTROL]
PREV NEXT  HOME  CHG
TX DATA OUT LEVEL
  ENTER VALUE 0-41
       >030
PREV NEXT  HOME
PTT INPUT ACTIVE
     HIGH-LOW
       >LOW
PREV NEXT  HOME  CHG
PTT INPUT THRESHOLD
ENTER VALUE 0-3100
     >1500 MV
PREV NEXT  HOME
SLEEP INPUT ACTIVE
     HIGH-LOW
       >LOW
PREV NEXT  HOME  CHG
CONTINUOUS DATA
     YES-NO
       >NO
PREV NEXT  HOME  CHG
```

```
KEY TIME
  ENTER VALUE 0-25500
       >03000 MS
BACK NEXT  HOME
TRUNK DEBOUNCE
  ENTER VALUE 0-25500
       >00300 MS
PREV NEXT  HOME
TRUNK TIME OUT
  ENTER VALUE 0-25500
       >03000 MS
PREV NEXT  HOME
TRUNK ACQ ACTIVE
     HIGH-LOW
       >LOW
PREV NEXT  HOME  CHG
```

```
---TRANSMIT MODE---
  [CONVENTIONAL]

PREV NEXT  CHG
```

```
------EMERGENCY-----

PREV NEXT  HOME  SEL
```

```
EMERGENCY REPEATS
  ENTER VALUE 0-255
       >005
BACK NEXT  HOME
EMERG REPEAT DELAY
  ENTER VALUE 0-255
       >010
PREV NEXT  HOME
EMERG ACTIVE DELAY
  ENTER VALUE 0-255
       >000
PREV NEXT  HOME
EMERG WARNING TONE
     YES-NO
       >NO
PREV NEXT  HOME  CHG
EMERG INPUT ACTIVE
     HIGH-LOW
       >LOW
PREV NEXT  HOME  CHG
EM OPEN MIC TX TIME
  ENTER VALUE 0-7S
       >000
PREV NEXT  HOME
EM OPEN MIC RX TIME
  ENTER VALUE 0-7S
       >000
PREV NEXT  HOME
```

```
------MAN DOWN------

PREV NEXT  HOME  SEL
```

```
MD REPEAT DELAY
  ENTER VALUE 0-255 S
       >010
PREV NEXT  HOME
MD INPUT ACTIVE
     HIGH-LOW
       >LOW
PREV NEXT  HOME  CHG
MD WARNING DELAY
  ENTER VALUE 0-255
       >005
PREV NEXT  HOME
       >005

BACK NEXT  HOME
MD OPEN MIC TX TIME
  ENTER VALUE 0-7S
       >000
PREV NEXT  HOME
MD OPEN MIC RX TIME
  ENTER VALUE 0-7S
       >000
PREV NEXT  HOME
```

```
--DECODE FEATURES--

PREV NEXT  HOME  SEL
```

```
SEL CALL OUT
  PULSE-CONTINUOUS
       [PULSE]
BACK NEXT  HOME  CHG
ALLOW ACKS
     YES-NO
       >YES
PREV NEXT  HOME  CHG
ACK DELAY
  ENTER VALUE 0-2550
       >0000 MS
PREV NEXT  HOME
UNMUTE ON SEL CALL
     YES-NO
       >NO
PREV NEXT  HOME  CHG
```

Home and the Primary Functions

The programmer powers up displaying the Home screen which allows the user to select memory functions (load from memory or store to memory); read or program a board; or move on to selecting desired parameters with CONFIG. Primary functions are ID Type, Common, Radio Interface, Transmit Mode, Emergency and Man Down. When "READ" is selected, line two of the display flashes "READING" while the device is being read. When reading is completed, you are moved to the ID TYPE screen. When "PROG" is selected, line two of the display flashes "PROGRAMMING" while the device is being programmed. When programming is completed, you are moved to the ID TYPE screen. If reading or programming fails, line two will flash "FAILED" and wait for the user to try again.

```
-------ID TYPe-------
      >GE-STAR
            MDC    GE
BACK NEXT 1200   STAR
```

```
--------COMMON-------

PREV NEXT   HOME   SEL
```

```
--RADIO INTERFACE---

PREV NEXT   HOME   SEL
```

```
---TRANSMIT MODE---
    [CONVENTIONAL]

PREV NEXT   CHG
```

```
-------EMERGENCY-----

PREV NEXT   HOME   SEL
```

```
------MAN DOWN------

PREV NEXT   HOME   SEL
```

```
--DECODE FEATURES---

PREV NEXT   HOME   SEL
```

The "ID TYPE" screen above shows that GE-STAR is the currently selected format type. From this screen, pressing BACK moves you to the left, back to the HOME screen. Pressing NEXT moves you down to the COMMON screen. Pressing PREV on any of the screens moves you up to the previous screen in the group. Note that the TRANSMIT MODE screen shows that the current selection is "Conventional". Pressing the CHG button opens selections pertinent to Trunking mode. The "DECODE FEATURES" screen is only applicable to the CIM-2000 and is ignored by the CIM-1000.

ID Type and Memory Functions

From the default Home screen, the user may select MEM or CONFIG or be moved to ID TYPE after successfully reading or programming a target device. When the ID Type is selected, the user will be moved to the selected primary ID entry screen. The current ID is displayed. From there, the ID can be changed by pressing the PRI ANI button and entering the new ID. Once the PRI ANI button is pressed, the existing ID flashes and is replaced by the new button presses. Flashing stops when the ID is entered and the ID button is again pressed. By default, the primary ID, secondary ID and emergency ID are linked and will all change with the changing of the primary ID. To make the secondary ID and emergency ID different, you must navigate to the related screen and change it directly. To facilitate rapidly programming multiple boards, pressing the "PROGRAM" key on the keypad from the PRI ANI screen will program a board, then the ID can be changed and again another board programmed by pressing the "PROGRAM" key.

GE Star® format is changed by pressing the FMT button. Each press increments the format type by one. The current format display changes with the button presses. Existing ID's that do not conform to the format type selected are changed to default. ID entries are limited to the range that is allowable for the format selected.

GE Star® message values are selected at the GE STAR MESSAGE screen. Selecting the message type to change causes the current entry to flash. While the value is flashing, enter the new value using the keypad. Completing the entry moves you back to the previous screen.
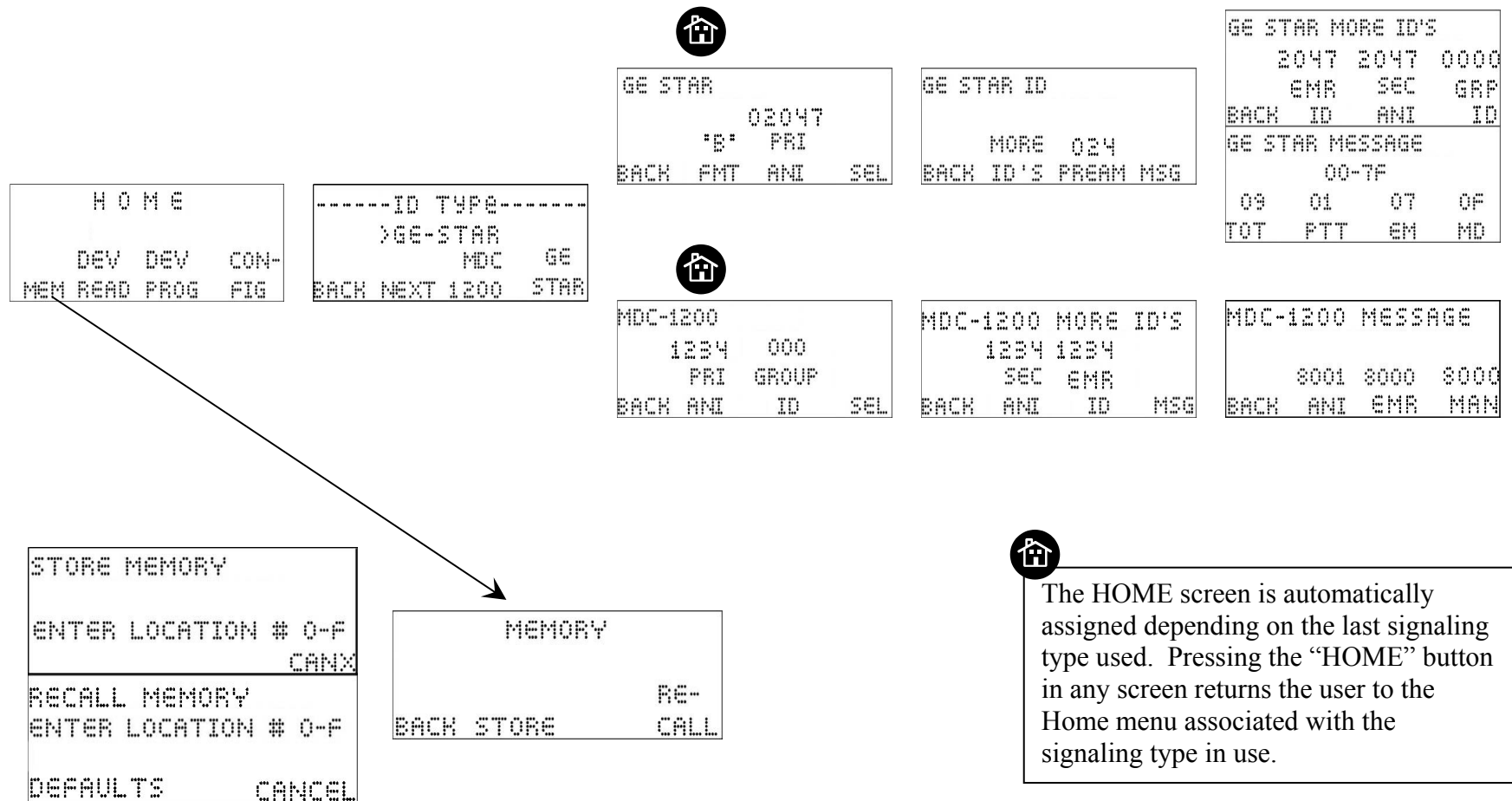
MDC-1200® message values can be changed at the MDC MESSAGE screen. These values should not be changed without a thorough knowledge of the MDC signaling system and the impact a new message will have on the targeted radio and radio system.

WARNING:

Retrieving data from memory overwrites the existing configuration.

Selecting MEM from the home screen allows the user to store the current programming information into memory locations 0 through F or to retrieve previously stored information. Pressing CANX returns the user to the HOME screen. Entering the location retrieves or stores the data and then moves the user to the HOME screen.

When the programmer is first turned on, configuration information that was last used is loaded. To overwrite the information with default selections, go to the main HOME menu and select MEM. Then select RECALL and DEFAULTS.

```
                                                 🏠                                    ┌──────────────────────────┐
                                                                                      │GE STAR MORE ID'S         │
                                                                                      │   2047 2047 0000         │
                ┌─────────────────────┐   ┌─────────────────────┐                     │    EMR   SEC   GRP       │
                │GE STAR              │   │GE STAR ID           │                     │BACK  ID   ANI    ID      │
                │        02047        │   │                     │                     ├──────────────────────────┤
                │      "B"  PRI       │   │     MORE   024      │                     │GE STAR MESSAGE           │
                │BACK  FMT  ANI   SEL │   │BACK  ID'S PREAM MSG │                     │      00-7F               │
┌──────────────┐ ┌──────────────────────┐└─────────────────────┘                     │  09    01    07    0F    │
│    H O M E   │ │-------ID TYPE--------│                                             │TOT   PTT    EM    MD     │
│              │ │  >GE-STAR            │                                             └──────────────────────────┘
│  DEV  DEV CON-│ │         MDC     GE   │                                    🏠
│MEM READ PROG  FIG│ │BACK NEXT 1200   STAR │                                             ┌──────────────────────────┐
└──────────────┘ └──────────────────────┘  ┌─────────────────────┐   ┌─────────────────┐ │MDC-1200 MESSAGE          │
                                            │MDC-1200             │   │MDC-1200 MORE ID'S│ │                          │
                                            │   1234   000        │   │   1234 1234      │ │     8001 8000 8000       │
                                            │     PRI   GROUP     │   │     SEC  EMR     │ │BACK  ANI  EMR   MAN      │
                                            │BACK ANI   ID   SEL  │   │BACK  ANI   ID  MSG│ └──────────────────────────┘
                                            └─────────────────────┘   └─────────────────┘
```

```
┌─────────────────────────┐
│STORE MEMORY             │
│                         │
│ENTER LOCATION # 0-F     │
│                   CANX  │
├─────────────────────────┤          ┌─────────────────────────┐
│RECALL MEMORY            │          │       MEMORY            │
│ENTER LOCATION # 0-F     │          │                   RE-   │
│                         │          │BACK  STORE        CALL  │
│DEFAULTS       CANCEL    │          └─────────────────────────┘
└─────────────────────────┘
```

🏠

The HOME screen is automatically assigned depending on the last signaling type used. Pressing the "HOME" button in any screen returns the user to the Home menu associated with the signaling type in use.

Common Functions

```
ANI REPEAT
  ENTER VALUE 0-255
         >000
BACK NEXT   HOME
ANI LOCATION
     BEG-END-BOTH
          [BEG]
PREV NEXT   HOME   CHG
PTT SIDETONE
        Yes-No
          >NO
PREV NEXT   HOME   CHG
 PTT COURTESY TONE
        Yes-No
         >NO
PREV NEXT   HOME   CHG
CRITICAL PTT MSG
        Yes-No
         >YES
PREV NEXT   HOME   CHG
 PREAMBLE FILLS ATTK
        Yes-No
         >NO
PREV NEXT   HOME   CHG
```

```
-------COMMON-------


PREV NEXT   HOME   SEL
```

Radio Interface Functions

```
ATTACK DELAY
 ENTER VALUE 0-2550
     >0300 mS
BACK NEXT   HOME
TIME-OUT-TIMER
 ENTER VALUE 0-255 S
     >060
PREV NEXT   HOME
CRITICAL CHAN REVERT
      ONCE-ALL
       [ALL]
PREV NEXT   HOME   CHG
KEY FOLLOWS PTT
      Yes-NO
       >NO
PREV NEXT   HOME   CHG
DEFINE AUX OUT
REV-MM-TXC-MUT-SC-DI
  [CRITICAL REVERT]
PREV NEXT   HOME   CHG
DEFINE MIC MUTE
MM-SC-DIS-TCTL-REV
      [MIC MUTE]
PREV NEXT   HOME   CHG
DEFINE TONE CTL OUT
TCTL-KEY-MUTE-SC-DIS
   [TONE CONTROL]
PREV NEXT   HOME   CHG
TX DATA OUT LEVEL
 ENTER VALUE 0-41
     >030
PREV NEXT   HOME
PTT INPUT ACTIVE
      HIGH-LOW
       >LOW
PREV NEXT   HOME   CHG
PTT INPUT THRESHOLD
ENTER VALUE 0-3100
     >1500 MV
PREV NEXT   HOME
SLEEP INPUT ACTIVE
      HIGH-LOW
       >LOW
PREV NEXT   HOME   CHG
CONTINUOUS DATA
      Yes-NO
       >NO
PREV NEXT   HOME   CHG
```

```
--RADIO INTERFACE---


PREV NEXT   HOME   SEL
```

Note 1   Note 2   Note 3

Note 1: For the CIM-1000, only selections REV (Critical Channel Revert) and TXC (Transmit Control) are valid.

Note 2: For the CIM-1000, only MM (Mic Mute) is valid.

Note 3: For the CIM-1000, only TCTL (Tone Control) is valid.

Transmit Mode

There are two transmit modes to select from; conventional and trunking. If conventional mode is selected, there are no additional selections to be made. Trunking mode, however, requires the definition of various timers.

```
---TRANSMIT MODE---
    [CONVENTIONAL]


PREV NEXT   CHG
```

```
KEY TIME
 ENTER VALUE 0-25500
      >03000 MS
BACK NEXT   HOME
```

```
TRUNK DEBOUNCE
 ENTER VALUE 0-25500
      >00300 MS
PREV NEXT   HOME
```

```
---TRANSMIT MODE---
     [TRUNKING]

PREV NEXT   CHG     SEL
```

```
TRUNK TIME OUT
 ENTER VALUE 0-25500
      >03000 MS
PREV NEXT   HOME
```

```
 TRUNK ACQ ACTIVE
     HIGH-LOW
      >LOW
PREV NEXT   HOME   CHG
```

Emergency Functions

```
EMERGENCY REPEATS
  ENTER VALUE 0-255
       >005
BACK NEXT  HOME
```

```
EMERG REPEAT DELAY
  ENTER VALUE 0-255
       >010
PREV NEXT  HOME
```

```
EMERG ACTIVE DELAY
  ENTER VALUE 0-255
       >000
PREV NEXT  HOME
```

```
 EMERG WARNING TONE
       YES-NO
        >NO
PREV NEXT  HOME   CHG
```

```
EMERG INPUT ACTIVE
      HIGH-LOW
        >LOW
PREV NEXT  HOME   CHG
```

```
 EM OPEN MIC TX TIME
  ENTER VALUE 0-75
       >000
PREV NEXT  HOME
```

```
 EM OPEN MIC RX TIME
  ENTER VALUE 0-75
       >000
PREV NEXT  HOME
```

```
-------EMERGENCY------


PREV NEXT  HOME   SEL
```

Man-Down Functions

```
------MAN DOWN------


PREV NEXT   HOME   SEL
```

```
MAN DOWN REPEATS
  ENTER VALUE 0-255
       >005
BACK NEXT   HOME
```

```
MD REPEAT DELAY
 ENTER VALUE 0-255 S
       >010
PREV NEXT   HOME
```

```
MD INPUT ACTIVE
      HIGH-LOW
       >LOW
PREV NEXT   HOME   CHG
```

```
MD WARNING DELAY
  ENTER VALUE 0-255
       >005
PREV NEXT   HOME
```

```
 MD ACTIVATION DELAY
  ENTER VALUE 0-255
       >005
PREV NEXT   HOME
```

```
 MD OPEN MIC TX TIME
   ENTER VALUE 0-75
       >000
PREV NEXT   HOME
```

```
 MD OPEN MIC RX TIME
   ENTER VALUE 0-75
       >000
PREV NEXT   HOME
```

Programming using the CIM-CABLE

The programming cable, CIM-CABLE, supports connection via a computer serial port with any computer running terminal emulation software. One such program that is included in most Microsoft operating systems is called Hyperterm. Hyperterm is usually accessed under "Programs", "Accessories" and "Communications" in the windows start menu.

Start the Hyperterm program on your computer by double clicking on *Hyperterm.exe* or selecting *Hyperterm* under the Communications menu selection. A *New Connection* window will open. Name the new connection "CIM1000", select one of the available icons and click the "OK" button. A *Connect To* window will open. Under *Connect Using,* select "*Direct to COM1*" and click the "OK" button. A *Port Settings* window will open. Adjust the settings to match the below table and then click the "OK" button:

Parameter	Value
Bits per Second	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Once you have made the changes above, reset the connection by disconnecting and reconnecting using the icons in the toolbar. To disconnect, click the icon with the phone having the lifted handset. To connect, click the icon with the phone having the cradled handset. Be sure to save your selections under "File".

The CIM-Cable consists of a DB-9 connector that connects to the computer serial port, and three "micro-grabbers" that connect to three programming holes on the CIM-1000. Note that on the component side of the board, the holes are labeled (-), (+) and (SIG). Attach the Black grabber to (-), the Red grabber to (+) and the White grabber to (SIG).
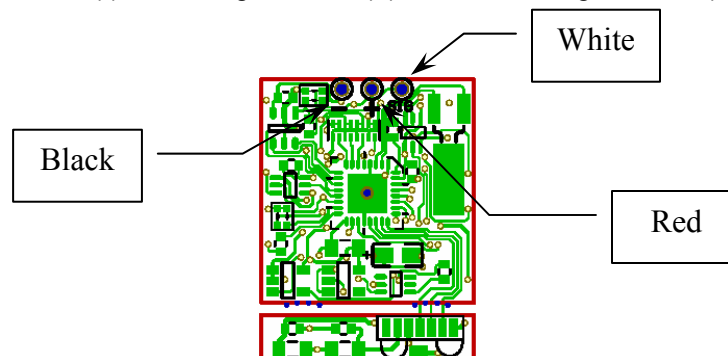
Typing **$CIM** will cause the CIM-1000 to connect with the terminal emulation software and it will output the following top level menu.

```
Config v128
1.Manual
2.Upld
3.Dnld
0.Default
X.Exit

>
```

- Press '1' to enter Group menu level display and view the first group settings.
- Press '2' to upload all parameters in hexadecimal to be stored by Hyperterm.
- Press '3' to download all parameters through Hyperterm.
- Press '0' to reset all parameters to their factory defaults.
- Press 'X' to return the device to normal operate mode.

Group Menu Level

Entering a "1" selects Manual configuration, and the CIM-1000 outputs the first group programming menu:

```
SIGNALING = GESTAR
      ID Type : B
       ANI ID : 2047
    AuxANI ID : 2047
      EMR ID : 2047
     ANI Msg : 01
     EMR Msg : 07
     TOT Msg : 09
     MAN Msg : 0F
    Preamble : 024 bit
```

This first group defines the signaling type and parameters specific to the selected type. Pressing 't' will "toggle" between GE Star® and MDC-1200®.

```
 SIGNALING = MDC1200
         ANI ID : 1234
      AuxANI ID : 1234
        EMR ID : 1234
       ANI Msg : 8001
       EMR Msg : 8000
       MAN Msg : 8000
```

 Pressing the 'space' bar selects the first item on the displayed group menu for editing. Additional presses of the 'space' bar, moves you down the list to the next item.

To change an item, space to the item and enter the new desired setting. Changes take effect after pressing the <TAB> or <CR> button. The group will be re-displayed to confirm the changes have been made. If power is removed before moving away from the edited group, the

changes will not be stored. To move to the next group, press the <TAB> or <CR> button again.

```
    COMMON
                Start ANI : YES
                  End ANI : NO
              ANI RepDly : 000 Sec
            PTT Sidetone : NO
            PTT Courtesy : NO
       ANI becomes Crit : YES
            Preamb w/Atk : NO


    RADIO INTERFACE
                   Attack : 300 mS
                      TOT : 060 Sec
               Cont.Data : NO
           KeyFollowsPTT : NO
                   AuxOut : CritChOnce
                 TxLevel : 030 dB
                    PttIn : actLOW
                 SleepIn : actLOW

    TX MODE = CONVENTIONAL
```

Pressing 't' will toggle between Conventional mode and Trunking mode. If trunking is selected, trunking related parameters are made available for editing.

```
    TX MODE = TRUNK
                  KeyTime : 3000 mS
                 Debounce : 300 mS
                  Timeout : 3000 mS
                 TrunkAck : actLOW

    EMER
                   RepQty : 005
                   RepDly : 010 Sec
               ActiveDly : 000 Sec
                WarnTone : NO
                       In : actLOW
                 OpnMicTx : 000 Sec
                 OpnMicRx : 000 Sec

    MAN-DOWN
                   RepQty : 005
                   RepDly : 010 Sec
               ActiveDly : 005 Sec
                 WarnDly : 005 Sec
                       In : actLOW
                 OpnMicTx : 000 Sec
                 OpnMicRx : 000 Sec
```

Programmable Parameter Definitions

Signaling Type and ID Selection

Signaling Type Selection

The CIM-1000 is programmable to encode one of two signaling types. These types are GE Star® and MDC-1200®.

Secondary ANI ID's

Secondary ANI ID's are used if the CIM-1000 is turned on while the radio PTT is pressed. If dual ID's are not desired, program the primary ID and secondary ID with the same number.

GE Star®

GE Star® format type

 (A through P) This selection defines which of the sixteen GE Star® formats are in use.

GE Star® PTT ID, Emergency ID

(1 – 16383) The actual maximum value depends on the GE Star® format type selected. Generally, the PTT ID, Emergency ID and Man-Down ID in GE Star® are the same; however, they could be programmed different if desired.

ANI Message

This selection defines the four message bits and three status bits in the GE Star® payload. An ANI PTT ID message is hex 01. This could be changed to accommodate unique applications. Other message definitions are listed on page 39.

Emergency Message

This selection defines the four message bits and three status bits in the GE Star® payload. An emergency message is hex 07. This could be changed to accommodate unique applications. Other message definitions are listed on page 39.

TOT Message

This selection defines the four message bits and three status bits in the GE Star® payload. A TOT (Time-out-timer) message is hex 09. This could be changed to accommodate unique applications. Other message definitions are listed on page 39.

Man-Down Message

This selection defines the four message bits ant three status bits in the GE Star® payload. A Man-down message is hex 0F. This could be changed to accommodate unique applications. Other message definitions are listed on page 39.

Preamble Length

The original GE Star® format specified 16 preamble bits. However, it was determined that a 24 bit preamble significantly improved data muting reliability and 24 bits eventually became the standard. Some installations have opted to increase the preamble length while decreasing the attack delay. So the length can be programmed from 0 bits to 255.

MDC-1200®

MDC-1200® PTT ID, Emergency ID

(1 – DEEE) Generally, the PTT ID and the Emergency ID are the same; however, they could be programmed different if desired. A radio ID cannot contain the character F nor can it begin with the character E as these are defined as wildcards.

ANI Message

To increase flexibility of the CIM-1000 and enhance compatibility with existing communications systems, the format of encoded MDC-1200® messages can be modified. The default message type for a PTT ANI is represented by 0x8001

Emergency Message

To increase flexibility of the CIM-1000 and enhance compatibility with existing communications systems, the format of encoded MDC-1200® messages can be modified. The default message type for an Emergency ANI is 0x8000.

Common

The common section handles parameters that will be used in all available signaling formats.

Location:

If programmed "Beginning", the ID will be transmitted when the user keys the radio. If programmed "End", the ID will be transmitted when the user un-keys the radio. If programmed "Both", the ID will be transmitted both at the beginning and end of transmission

PTT ANI repeat timer:

Used to reduce the amount of data transmissions during a conversation. If the selected time since the last PTT press is not exceeded, data is not transmitted with that PTT press.

Sidetone with PTT ANI:

If programmed "Yes", a tone will sound through the local speaker to advise the user to hold off talking. The tone helps to prevent "voice syllable clipping" which could occur if the user speaks during data transmission.

Un-key courtesy tone:

>If programmed "Yes", a tone will be transmitted when the user un-keys to inform listeners that they may now transmit.

PTT Message Becomes Critical

>If enabled, whenever the device is in critical mode (emergency cycle or Man-Down cycle), and the PTT button is pressed, the ANI message to be transmitted will be the associated critical message instead of a PTT ANI message.

Preamble Fills Attack Delay

>Typically, the attack delay is filled with silent carrier. If this selection is enabled, the attack delay period will be filled with the signaling format preamble and there will be no silent attack delay. After the programmed attack delay, one more duration of preamble will be transmitted to ensure reliable decoding.

Radio Interface

>The Radio Interface section handles parameters that relate to the correct interfacing of the board to the radio electronics.

Attack Delay:

>The period of time from when the user keys the radio and when the data begins to be transmitted is called the attack delay. This delay allows the communications system to stabilize and be ready for transmission.

Time out timer:

>If the radio is held keyed up for greater than the selected time, the ID is transmitted and the radio is automatically un-keyed.

Critical Channel Revert:

>If enabled, 50 mS prior to keying up to transmit an Emergency or a Man-Down, the Auxiliary output line (If it also is programmed for "Critical Channel Revert" will go low and stay low for the duration of the attack delay and data transmission.

Key Follows PTT

>Enabling Key Follows PTT makes the CIM-1000 key line echo the condition of the PTT line. So if the PTT line goes low, the key line will follow and stay in the condition until the PTT line again changes state. This is especially useful if you desire the CIM-1000 to un-key the radio at the expiration of the Time-Out-Timer time.

Multiple Function Output

>The multiple function output line can be programmed to serve one of two purposes as listed.

Transmit Control Output

>Transmit control output is typically used to control a transmitter CTCSS, turning it off during ANI transmissions. Idle state is 3.3VDC. When

active, it sinks to within 1 volt of system ground (100 mA max). Active
state occurs during attack delay and all data burst transmissions.

Critical Channel Revert

Alternate channel control is similar to Data control but is active only
during Emergency and Man-Down data transmissions. It is used to
change the radio channel to a "Home" channel before sending the
Emergency or Man-Down message. This line becomes active 50 mS
before the Key line is activated for emergency and man-down
transmissions. When active, it sinks to within 1 volt of system ground
(100 mA max).

Output Level

The data output level of the CIM-1000 is software adjustable. This level
can be set by entering a number between 0 and 41. The default setting
is 20. Although the configuration routine will permit an entry of between
0 to 255, the maximum output is achieved at a setting of 41. A setting of
21 provides approximately 0.33 Vpp unloaded. A setting of 41 provides
the maximum of 3.3 VPP.

PTT Input Active Level

PTT input is used to detect when the attached radio is busy transmitting.
This line is programmable for an input sense of active high or active low.

Sleep Input

This is useful if ANI is desired on selected channels only or when not
desired on talk-around channels. This is an input to the CIM-1000
microprocessor. If the line becomes active, it will put the CIM-1000 to
"sleep" preventing ANI activity. The active state is programmable for
logic 1 or 0. It is normally pulled up to VCC.

Transmit Mode

Conventional

If Conventional is selected, data is transmitted after the programmed
attack delay.

Trunked

If trunked mode is selected, the Channel Acquired input line of the CIM-
1000 is used to detect when the trunking channel has been acquired and
transmission is possible. In LTR systems, Trunk Key Time and Trunk
Timeout should be the same. In MPT-1327, this timer allows the
transmitter to be keyed and then un-keyed in order to request channel
access. The time selected is the period the unit stays keyed for the
request. The CIM-1000 will wait for the period designated in Trunk
Timeout for a channel acquisition indication. When received, the unit will
again key up and send out data.

Trunk Debounce

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 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.

Trunk Key Time

Trunk Key sets the time the unit is keyed while awaiting channel acquisition.

Trunk Time Out

Trunk Timeout sets the maximum amount of time that the unit will attempt to acquire a trunk. Once exceeded, the unit will quit attempts.

Trunk Channel Acquired Active Level

This line is interfaced to a point in a trunking radio that changes state when granted access. The input is used to detect when the trunking channel has been acquired and transmission is possible.

Emergency

Number of repeat emergency transmissions:

The number of times that an emergency message is to be repeated.

Repeat Delay:

When in the emergency mode, if the number of repeat emergency transmissions is not "Zero", this is the time that will be waited between emergency transmissions.

Activation Delay

This timer designates the amount of time the emergency input must be held active before it is recognized by the board.

Emergency TX warning tone:

If programmed "Yes", a warning tone will sound through the local speaker to advise the user that an emergency message is being transmitted.

Active State

The active state is programmable for logic 1 or 0. It is normally pulled up to VCC.

Open Microphone Monitor on Emergency TX time

If not set to zero, once an emergency is activated, the radio will key up and transmit ambient noise for this period of time. It will then un-key and remain un-keyed for a programmed amount of time and then repeat the process. It will alternate between TX and RX throughout the emergency cycle. The length of the cycle is determined by the settings of "Number of repeat emergency transmissions" and "Time between emergency repeats". If the value is set to zero, there will be no open microphone monitor.

Open Microphone Monitor on Emergency RX time

If open microphone monitor on emergency TX time is not set to zero, the radio will remain unkeyed for this period of time between TX times.

Man-Down

Number of repeat Man-Down transmissions

(0 to 255 repeats) The Man-Down message transmission will be repeated a programmed number of times with a programmed period between transmissions. The repeats will be transmitted regardless of radio status. A warning tone is sounded at the local radio speaker each time a man-down message is transmitted, unless man-down activation delay is set to zero.

Repeat Delay

(0 to 255s) Repeated Man-Down transmissions will be separated by a programmed delay period between transmissions.

Active State

The active state is programmable for logic 1 or 0. It is normally pulled up to VCC.

Man-Down Warning Delay

(0 – 255 S) Once the CIM-1000 senses a Man-Down situation, this timer begins to run. If the radio is not up righted within this period of time, a warning tone lasting 1 second is sounded. If the radio is up righted, the warning timer resets. If the warning delay is set to zero, there will be no audible warning and the man-down message will be transmitted at the expiration of the man-down activation delay.

Man-Down Activation Delay

(0 – 255 S) If the warning delay timer succeeds to complete its countdown and the warning tone is sounded, the activation delay timer begins to run. The activation delay timer is programmable 0 to 255 seconds. If the radio is not up righted within this period of time, the radio will key up and send a message to the base.

Open Microphone Monitor on Man-Down TX time

(0s to 55s, 5s steps) If not set to zero, once a Man-Down is activated, the radio will key up and transmit ambient noise for this period of time. It will then un-key and remain un-keyed for a programmed amount of time and then repeat the process. It will alternate between TX and RX throughout the Man-Down cycle. The length of the cycle is determined by the settings of "Number of repeat Man-Down transmissions" and "Time between Man-Down repeats". If the value is set to zero, there will be no open microphone monitor.

Open Microphone Monitor on Man-Down RX time

(0s to 55s, 5s steps) If open microphone monitor on Man-Down TX time is not set to zero, the radio will remain un-keyed for this period of time between TX times.

C H A P T E R   4
Operation

ANI-ID

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, and the user immediately begins to talk, may obliterate one or two syllables of spoken speech. To overcome this annoyance, the Model CIM-1000 is programmable to produce the burst either at the beginning or at the end of the voice transmission, or at both times. 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.

Time-out-timer

When a mobile or portable radio inadvertently remains 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. Whenever a microphone switch is held closed for more than the designated time-out-timer time the CIM-1000 will sound a local warning tone and send the ID of the offending radio. The unit can also be installed in a manner that will automatically open the key line until the microphone switch is released.

Emergency

The Emergency feature 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 CIM-1000 allows for programming whether the message should be repeated and at what intervals and for how long. In addition, during the emergency cycle the microphone of the sending radio can be monitored, and can alternate between monitoring and allowing the channel to be used for voice communications.

Man-Down

The Man-Down feature is primarily for use by law enforcement, security agencies, and fire departments. 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 is provided during which the closure must be constant. 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". 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 available.

Status

Status messages typically relate to the status of the field unit, such as "In Service", "Out Of Service", "On Break", etc. and their appropriate meaning can be displayed at the decoding site equipped with a Cimarron Technologies C Plus decoder. The CIM-1000 is capable of transmitting status messages in lieu of the Man-Down, Emergency and PTT ANI as required.

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. Their appropriate meaning can be displayed at the decoding site equipped with a Cimarron Technologies C Plus decoder. The CIM-1000 is capable of transmitting canned messages in lieu of the Man-Down, Emergency and PTT ANI as required.

Dual ID Capability

The CIM-1000 can be programmed for two independent ID's. If the radio is turned on with the PTT held down, the secondary ID is used until power is cycled on the radio. If the radio is turned on normally, without holding down the PTT switch, the first ID is used. This feature requires that the PTT line of the radio be split so that PTT operations are routed through the CIM-1000. The PTT line (Yellow) of the CIM-1000 will then be attached to the PTT button of the radio and the KEY line (Brown) of the CIM-1000 will be attached to the other side of the split. "Key follows PTT" must be programmed "YES" in the CIM-1000. Some radios have a zero ohm resistor or jumper that can be removed to split the PTT line. Others split the line with software programming. But some radios will need to have a trace cut to split the PTT line.

C H A P T E R   5
Technical Information

GE Star® Format Selections

Radio systems using GE Star® can define the T1, T2 and S1 bits to have different values or various meanings. Industry-wide, there are sixteen accepted variants with Format "B" being the industry defacto standard. The CIM-1000 is programmable for any of the sixteen variants.

Format Definitions

The following table defines the sixteen GE Star® formats.

Format	Description	T1	T2	S1	Comments
A	IDs to 2047 (1st 11 bits).	X	X	X	T1, T2, and S1 ignored
B	IDs to 16383 (14 bit ID)	8192	4096	2048	Expanded-ID STAR #1.
C	IDs to 16383 (14 bit ID)	4096	8192	2048	GE-STAR #3.
D	IDs to 16383 (14 bit ID)	4096	2048	8192	Compatible with GE-STAR #4
E	IDs to 4095 (12 bit ID, T2 ="0")	2048	M0	X	GE-STAR #1. T2 = "0" for Mobile.
F	IDs to 4095 (12 bit ID, T2="1")	2048	P1	X	GE-STAR #1. T2 = "1" for Portable.
G	IDs to 8191 (13 bit ID, T2 ="0")	4096	M0	2048	GE-STAR #2. T2 = "0" for Mobile.
H	IDs to 8191 (13 bit ID, T2 ="1")	4096	P1	2048	GE-STAR #2. T2 = "1" for Portable.
I	IDs to 4095 (12 bit ID), Tags="00"	0	0	2048	System "0"
J	IDs to 4095 (12 bit ID), Tags="01"	0	1	2048	System "1".
K	IDs to 4095 (12 bit ID), Tags="10"	1	0	2048	System "2".
L	IDs to 4095 (12 bit ID), Tags="11"	1	1	2048	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.

Value Assignment	Description
8192	If bit is set, add 8192 to ID
4096	If bit is set, add 4096 to ID
2048	If bit is set, add 2048 to ID
M0	If the bit is not set, originator is a Mobile
P1	If the bit is set, originator is a Portable
X	This bit is ignored

For System types I through P, the C Plus decoder looks for a match in the T1 and T2 bits. If the bits match then the C Plus decoder will react to the received message. If not, the message is ignored. This is for communications systems that have multiple unrelated users so that different users do not see ID's from other users.

GE Star® Message Descriptions

The GE Star® bits designated S2, S3, S4 and M1 through M4 are used to code various messages. The CIM-1000 can be programmed so that different message types are transmitted for PTT ANI, Emergency ANI, Man-Down and TOT ANI. The desired star code is selected in

programming. The table below describes the Star codes, the value to enter while programming and the corresponding decoder displayed message:

STAR CODE	GE Star Message code	C Plus Decoder display	REMARKS
000-0000	00	STATUS 0	Status
001-0000	10	STATUS 1	Status
010-0000	20	STATUS 2	Status
011-0000	30	STATUS 3	Status
100-0000	40	STATUS 4	Status
101-0000	50	STATUS 5	Status
110-0000	60	STATUS 6	Status
111-0000	70	STATUS 7	Status
000-0001	01	(none)	ANI ID and SelCall Ack
000-0010	02	INTG ACK	Interrogate Ack
000-0011	03	REQ TALK	Request to talk
000-0100	04	MSSAGE C	Canned Message
000-0101	05	MSSAGE D	Canned Message
000-0110	06	TAXI BID	Taxi Bid
000-0111	07	EMRGENCY	Emergency
000-1000	08	CNCL ACK	Call Cancel Ack
000-1001	09	STUCKMIC	Stuck Microphone
000-1010	0A	MNTR ACK	Open Mic Monitor Ack
000-1011	0B	MSSAGE F	Canned Message
000-1100	0C	MSSAGE G	Canned Message
000-1101	0D	MSSAGE H	Canned Message
000-1110	0E	MSSAGE J	Canned Message
000-1111	0F	MAN-DOWN	Man-Down
100-1010	4A	DSBL ACK	Radio Disable Ack
101-1010	5A	ENBL ACK	Radio Enable Ack
(not listed)	(not listed)	UNDEFINE	Undefined

MDC-1200® Message Type

To increase flexibility of the CIM-1000 and enhance compatibility with existing communications systems, the format of encoded MDC-1200® messages can be modified. The default message type for a PTT ANI is represented by 0x8001 and the default message type for an Emergency ANI is 0x8000. These parameters should not be changed without a thorough understanding of the signaling system and existing signaling codes.

Trunking Operation

In trunking mode, we will not transmit until we have been given permission. This is detected by the use of timers Trunk Debounce, Trunk Key Time and Trunk Timeout and sense line Aux IN. Here are a couple of scenarios that discuss operation.

Systems where Trunk Key Time and Trunk Timeout are set to the same value (LTR):

Emergency

The user has just pressed the Emergency button. The CIM-1000 activates the *KEY* line for the amount of time described by the timer *Trunk Key*. From the beginning of key time until the expiration of *Trunk Timeout*, the unit is checking *Aux IN* line and waits for the line to become true. Once it changes state, the CIM-1000 watches the line for the time described in *Trunk Debounce* and verifies that the state change remained unchanged for the entire *Trunk Debounce* time. The CIM-1000 then waits the *Attack Delay* time and then encodes and sends the message out the dataout line. If *Aux IN* does not change state (and remains changed for the entire *Trunk Debounce* time) for the duration of *Trunk Timeout* the call is dropped and the failed attempt does not count towards the programmed emergency repeats. If, during *Trunk Key Time*, *Aux IN* changes state, but changes state again before *Trunk Debounce* expires, the timer *Trunk Debounce* resets and waits for *Aux IN* to toggle active again and starts counting down again. In LTR systems, *Trunk Key Time* and *Trunk Timeout* must be set to the same value.
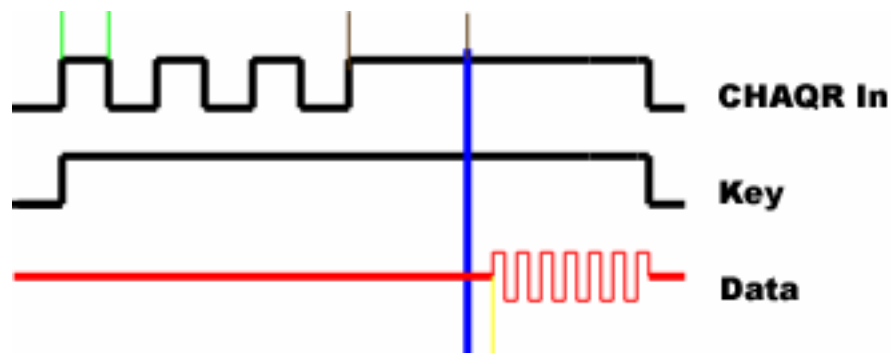
In this timing chart, the distance between green lines is 100mS, between brown lines is 250mS and from the Blue to the Yellow line is 50mS. The C Plus is programmed for *Aux IN* active High, *Attack Delay* of 50mS, *Trunk Debounce* of 250mS and *Trunk Key Time* and *Trunk Timeout* is set to 3 Seconds.

PTT ANI beginning send not "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "beginning send" ANI. The CIM-1000 starts monitoring the Aux IN line. Once the line becomes active and stays active for the duration of the trunk select debounce timer, the CIM-1000 activates the Key line, waits the attack delay and then sends the PTT ANI and then

deactivates the Key line. The radio remains keyed because the user is still pressing the PTT button. If the Aux IN line does not become active and remain active for the duration of the trunk select debounce timer, by the end of the Trunk Time out, the call is dropped.

PTT ANI end send not "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "end send" ANI. The CIM-1000 waits for the user to unkey the radio. The CIM-1000 then activates the *KEY* line for the amount of time described by the timer *Trunk Key*. From the beginning of key time until the expiration of *Trunk Timeout*, the unit is checking *Aux IN* line and waits for the line to become true. Once it changes state, the CIM-1000 watches the line for the time described in *Trunk Debounce* and verifies that the state change remained unchanged for the entire *Trunk Debounce* time. The CIM-1000 then waits the *Attack Delay* time and then encodes and sends the message out the dataout line. If *Aux IN* does not change state (and remain changed for the entire *Trunk Debounce* time) for the duration of *Trunk Timeout* the call is dropped. If, during *Trunk Key Time*, *Aux IN* changes state, but changes state again before *Trunk Debounce* expires, the timer *Trunk Debounce* resets and waits for *Aux IN* to toggle active again and starts counting down again.

PTT ANI beginning send with "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "beginning send" ANI. The CIM-1000 activates the key line and starts monitoring the Aux IN line. Once the line becomes active and stays active for the duration of the trunk select debounce timer, the CIM-1000 waits the attack delay and then sends the PTT ANI. The Key line remains active until the user releases the PTT button. If the Aux IN line does not become active within the time set in Trunk Timeout, the key line relaxes and the call is dropped. The user must rekey the radio to make another attempt. The value of Trunk Key (which is the same as the value of Trunk Timeout) is ignored.

PTT ANI end send with "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "end send" ANI. The CIM-1000 activates the key line and continues monitoring the PTT line. Once the line becomes inactive, the CIM-1000 sends the PTT ANI and then unkeys the radio. The values of Trunk Key Time, Trunk Timeout and Trunk Debounce time are ignored.

Systems where Trunk Key Time and Trunk Timeout are not set to the same value (MPT and others):

Emergency

The user has just pressed the Emergency button. The CIM-1000 activates the *KEY* line for the amount of time described by the timer *Trunk Key*. From the beginning of key time until the expiration of *Trunk Timeout*, the unit checks *Aux IN* line and waits for the line to become true. Once it changes state, the CIM-1000 watches the line for the time described in *Trunk Debounce* and verifies that the state remains

unchanged for the entire *Trunk Debounce* time. It then rekeys, waits the *attack delay* and sends out data. If *Aux IN* does not change state for the duration of *Trunk Timeout* the call is dropped and the failed attempt does not count towards the programmed emergency repeats.

In this timing chart, the distance between green lines is 100mS, between blue lines is 50mS and between brown lines is 200mS. The C Plus is programmed for *CHAQR* active High, *Attack Delay* of 200mS, *Trunk Debounce* of 50mS, *Trunk Key Time* of 100mS and *Trunk Timeout* to 3 Seconds.

PTT ANI beginning send not "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "beginning send" ANI. If the values of Trunk Key Time and Trunk Timeout are not the same, the CIM-1000 starts monitoring the Aux IN line. Once the line becomes active, the CIM-1000 begins monitoring the PTT line. When the PTT line becomes active, and the Aux IN line is still active, the CIM-1000 activates the Key line, waits the attack delay and then sends the PTT ANI and then deactivates the Key line. The radio remains keyed because the user is still pressing the PTT button. If the Aux In line and the PTT line do not both become active within the programmed Trunk Timeout time, the call is cancelled.

PTT ANI end send not "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "end send" ANI. If the values of Trunk Key Time and Trunk Timeout are not the same, the CIM-1000 monitors the Aux IN line and the PTT line. When both lines become active, the CIM-1000 waits for the PTT line to become inactive and then The CIM-1000 activates the *KEY* line for the amount of time described by the timer *Trunk Key*. From the beginning of key time until the expiration of *Trunk Timeout*, the unit checks *Aux IN* line and waits for the line to become true. Once it changes state, the CIM-1000 watches the line for the time described in *Trunk Debounce* and verifies that the state remains unchanged for the entire *Trunk Debounce* time. It then rekeys, waits the *attack delay* and sends out data. If *Aux IN* does not change state for the duration of *Trunk Timeout* the call is dropped

PTT ANI beginning send with "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "beginning send" ANI. The values of Trunk Key Time and Trunk Timeout are not the same. The CIM-1000 key line follows the action of the radio PTT line. The CIM-1000 starts monitoring the Aux IN

line. Once the line becomes active the CIM-1000 waits for the PTT line to again become active, waits the attack delay and then sends the PTT ANI. The Key line follows the action of the radio PTT line. If the radio PTT line does not become active within Trunk Timeout of when the AUX IN line became active, the call is dropped.

PTT ANI end send with "Key follows PTT"

The user has just keyed the radio to speak and the CIM-1000 is programmed for "end send" ANI. The values of Trunk Key Time and Trunk Timeout are not the same. The CIM-1000 key line follows the action of the radio PTT line. The CIM-1000 starts monitoring the Aux IN line. Once the line becomes active the CIM-1000 waits for the PTT line to again become active, then waits for the line to relax. When the radio PTT line relaxes, the CIM-1000 Key line remains active and sends the PTT ANI. The Key line then relaxes. If the radio PTT line does not become active within Trunk Timeout of when the AUX IN line became active, the call is dropped.

Schematic
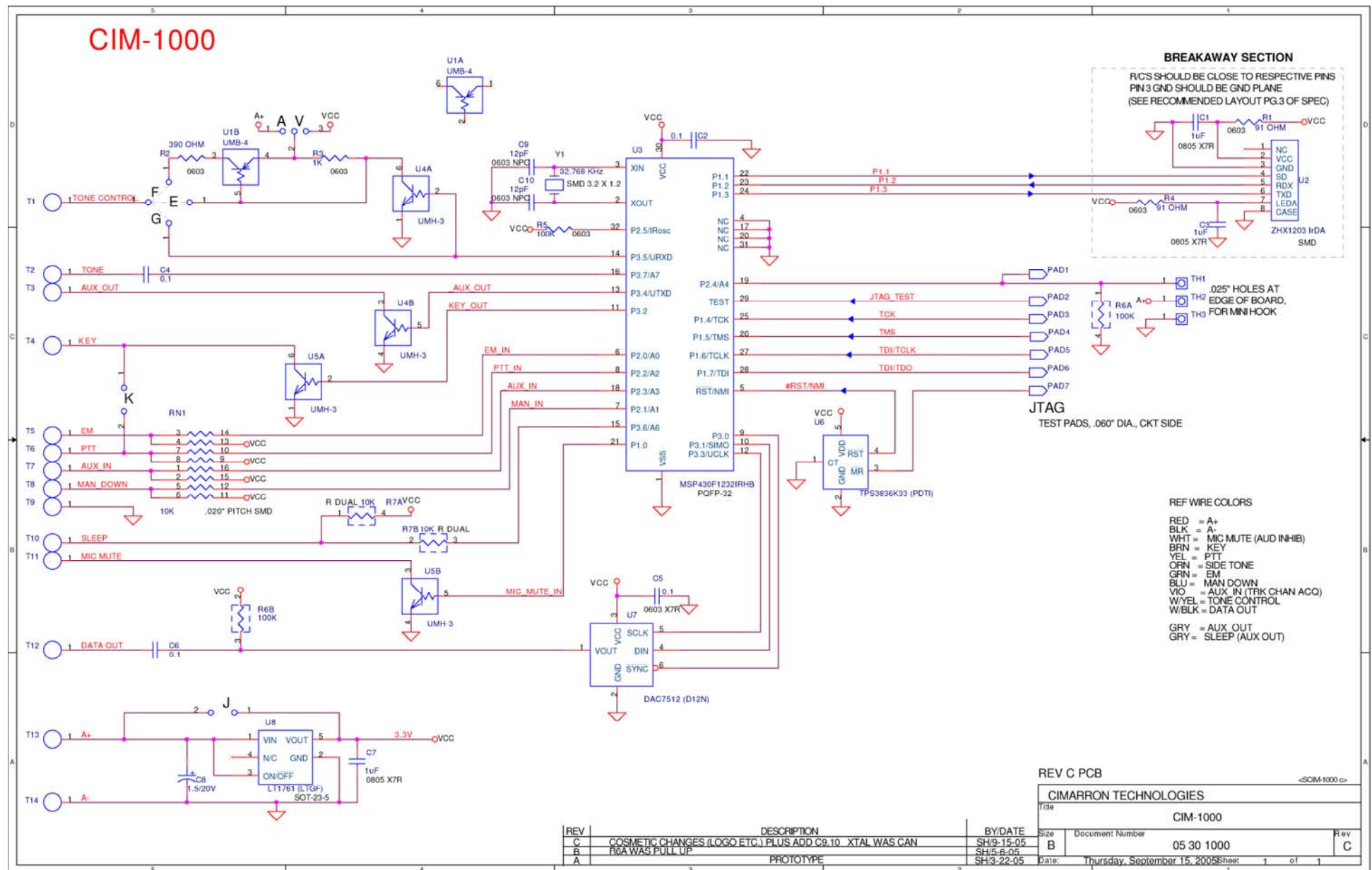
Parts List

Qty	Ref	Part		Pkg	MFR	Man. P/N
1	U3	IC	MSP430F1232	PQFP-32	TI	MSP430F1232IRHB
1	U6	SUP CKT	TPS3836K33 3.3V	SOT-23-5	TI	TPS3836K33DBVT
1	U7	IC	DAC7512	SOT-23-6	TI	TI DAC7512N/250
1	U8	V REG.	LT1761	SOT-23-5	LIN TECH	LT1761ES5-3.3
2	U4,5	TRANS. NETWORK	NPN UMH3N	UM-6	ROHM	
1	U1	TRANS. NETWORK	PNP UMB4N	UM-6	ROHM	
1	U2	IR XCVR	(IrDA) ZHX1203SIDE VIEW	SMD	ZILOG	ZHX1203MB115THTR
4	C2,4-6	CAP	CER X7R 10% .1uF	0603	ANY	
3	C1,3,7	CAP	CER X7R 10% 1uF	0805	ANY	
1	C8	CAP	TANT 20% 1.5uF/20V3216	CASE A	ANY	
2	C9,10	CAP	CER NPO 5% 12pF	0603	ANY	
1	RN1	RES	CHIP ARRAY .020" PITCH 10K 8 RES	SMD	CTS	741X163103J
1	R7	DUAL RES	10K	DUAL 0603	KAMAYA	162D103JAT
2	R6	DUAL RES	100K	DUAL 0603	KAMAYA	162D104JAT
2	R1,4	RES	1/16W 5% 91 OHM	0603	ANY	
1	R2	RES	1/16W 5% 390 OHM	0603	ANY	
1	R3	RES	1/16W 5% 1K	0603	ANY	
1	R5	RES	1/16W 5% 100K	0603	ANY	
1	Y1	CRYSTAL	12.5pF 50K ESR 32.768kHz	SMD	QVS	QV3X-7XCF12.5pF32.768R

C H A P T E R   6
Troubleshooting

Installation Hints

The CIM-1000 must be programmed with your desires before it will work in your system. The CIM-1000 will be keying the associated transmitter and injecting audio into the radio. This point should be after pre-emphasis. It is very important to adjust data out 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 CIM-1000 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 CIM-1000, review the trunking information located on page 41 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 CIM-1000 and the programming parameter "Key follows PTT". If you have "Key Follows PTT" enabled or jumper K connected when they should not be, this symptom could occur.

Radio Keys up but stays Keyed only for Duration of ANI

This symptom is usually caused by incorrect conditions of the "Key follows PTT" parameter and CIM-1000 jumper K.

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 1.9VDC and go low when keyed if active low. It should rest below 0.9VDC and go above 1.9VDC when active if active high.

ID Decoded is not the same as Programmed

This occurs when the unit is in GE Star® mode and the CIM-1000
"format" is not set the same as the decoder. See page 39 for details.

C H A P T E R   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

Cimarron Technologies Corporation makes no other warranty, either expressed or implied, with respect to this product. Cimarron Technologies Corporation specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

The remedies provided herein are customer's sole and exclusive remedies. In no event shall Cimarron Technologies Corporation be liable for any lost profits, direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory
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