

ANI for “Smarties”

The Automatic Number Identification Cookbook

Volume II

***A Collection of Application Notes, Hints and
Tricks***



ANI for "Smarties" - The Automatic Number Identification Cookbook Volume II
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What is ANI?

ANI is short for Automatic Number Identification. Its basic function is to send a short data burst every time the user pushes the PTT on a two-way radio. The data burst contains a 4 or 5 digit number. The number tells the receiving end who keyed the radio. ANI's expanded functions allow short messages to be sent and received. Emergency, Man-Down, Select Calls, and Radio Disable are a few of the popular uses. There are countless variations for how to use ANI to improve the operation of a radio system or business. The most common uses are listed below. And the rest of this book addresses some uncommon ones.



Eliminate Radio System Mis-use

Profanity, catcalls, Rude Noises, and Jamming occur on radio systems on any frequency, in any language, and in any country. The act occurs only because the perpetrator remains anonymous. The presence of an ANI burst gives the system operator a very good chance at catching the perpetrator. In many cases, the presence of an ANI burst is enough to stop radio mis-use cold.



Increase Radio User Safety

Adding an ANI based Panic Button to a radio is a very useful and often vital feature. There are many situations that a radio user has only time to quickly press a button to request immediate help. The highly reliable ANI burst will be sent immediately to the dispatcher. Due to the high reliability of the ANI burst, the user needing help will be correctly identified.



Increase Radio Dispatch Efficiency

Dispatchers are often plagued by difficult to understand voice communications. Much air time is wasted in requests to repeat who is talking. Cimarron ANI decoders insure that the caller is always identified even under harsh radio conditions.



Improve Job Safety

Many plants and railroads are requiring workers' radios to be equipped with Emergency and Man-Down capability in case of accident. Workforce reductions result in more men working solo with an ANI equipped 2-way radio as the "buddy".



Taxis and Limos Benefit

Taxis and Limos often use ANI to determine who is assigned to a particular pick-up. By using ANI in as "first-come-first-serve" tool, pick-ups are assigned on a fair basis.



Time and Date Stamped Communications

Knowing the precise time that a call was sent or received is very important in today's legal world. Many public agencies now require that time and date information be stored indefinitely. All Cimarron decoders output the time and date for every ANI burst. Many managers are finding the time and date data invaluable for determining which drivers are the most efficient.

Summaries

DTMF Status Reporting for Dispatch Consoles

Computer and console serial interface outputs (like Bed 31/1207, CML and Cimarron Multichannel) report the actual status character received in DTMF signaling. This application describes how to take advantage of this feature.

Dual ID from one QE-2

So, you share a vehicle between two drivers and you need to know which driver is using the radio. The QE-2 has a feature where you can program two different ID's and the user decides which ID to use.

Encoding GE Star® ID's Greater than 9999

GE Star® Signaling actually has a maximum ID range to 16383. But if you are using the QE-2, QE-1 or CDEU-1 with ANIPROG programming software (or the old CPF hand-held), the largest ID acceptable is 9999. This application describes how to use ANIPROG to program the encoder for ID's between 10000 and 16383. The Cimarron Technologies C Plus can recognize and display all valid ID's.

Manipulating the DTMF Status Table

The C Plus allows the user to define how received DTMF status messages are displayed. As an example, the user arrives at the job site and presses DTMF button 1. The C Plus will display **AT SITE**. This feature can be combined with another ANI protocol like MDC-1200® and you will have PTT ID and Status reporting.

The status table is also used to assign OUT1/OUT2 activation to particular DTMF Status messages and assign message priorities and sounder characteristics.

Manual DTMF Status Reporting

The C Plus can be programmed to decode manually entered single character status messages. This application allows a radio user to press DTMF buttons to describe his status. The C Plus will display the programmed status relating to the digit sent. As an example, the user arrives at the job site and presses DTMF button 1. The C Plus will display **AT SITE**. This feature can be combined with another ANI protocol like MDC-1200® and you will have PTT ID and Status reporting.

Resource Mapping

So, you need a relay output instead of an open collector activation on decoding emergencies. Normally, an emergency message activates OUT1, which is an open collector transistor. If your application calls for relay contact closure, Resource Mapping will allow you to redirect the C Plus resources to accommodate unique needs.

Scrolling Display

Scrolling is a display mode used with the C Plus III multiple window display. It allows the dispatcher to see the most recently received ID in the main display and a series of the previously received messages. It is also the

display mode that is most compatible with the C Plus II single window display. The serial output is also affected by this display type selection.

Test Equipment uses of the C Plus

The C Plus can be used as test equipment for the testing of radio systems, individual radios and even other decoders. This application uses a computer to generate encode commands which are executed by the C Plus. This allows any valid ID to be targeted for the test.

Timing – C Plus by the Numbers

The C Plus is full of timers. Normally, the default settings are just right. But what are all of these timers for? Why are they important and when should they be changed? This note sheds some light on the numbers associated with the C Plus.

Using the QE-2 to test ANI decoders

QE-2 ANI encoders can be used to make test equipment specifically for testing C Plus decoders. One QE-2, a handful of parts and a project box is all you need. This equipment will test the decode function and verify that the C Plus responds to acknowledgeable messages. It is also capable of testing the mute circuits and Out1 and Out2.

DTMF Status Reporting for Dispatch Consoles

Computer and console serial interface outputs (like Bed 31/1207, CML and Cimarron Multichannel) report the actual status character received in DTMF signaling. This application describes how to take advantage of this feature.

Serial Definition of DTMF Status

The following table shows the definitions for computer interface serial outputs of the C Plus with the DTMF Status character highlighted and underlined:

If this feature is not enabled, the status characters shown to the right will report zero and may not be compatible with existing software.

Output Type	Definition
Bed 31/1207	<lf>iiiiitsSm <u>Mc</u> <cr>
CML	<lf>iiii <u>m</u> thhmm<cr>
Cimarron Multichannel	\$CR,iiii, <u>mm</u> ,cc<cr><lf>

In these output types, for MDC-1200® and GE Star®, a PTT ANI is reported as a 1 and an emergency is reported as a 7. To have DTMF compatible with MDC-1200® and GE Star®, the transmitted status must be 1 for PTT ANI and 7 for emergency.

Programming the Encoding Radio:

As an example, say you are programming a radio for an ID of 5678 and you want it to report PTT ANI and emergency. In this case, you would program the ID for 15678 and you would program the emergency ID as 75678. With the C Plus programmed for first character status reporting, this radio would be decoded as ID 5678 (PTT ANI) and 5678 (Emergency). This would permit DTMF and GE Star® and MDC-1200® to all report the same. A dispatcher would not be able to distinguish which signaling format was actually decoded.

Enabling the Feature:

In the C Plus personality programming, select “*Select Format Type*” then select “*DTMF*”, “*Status Reporting*” and then “*First/Last/Disable*”. Then select whether your transmitting equipment is sending the status as the first DTMF character or the last DTMF character. To work with the example described above, you would select “*First*”.

Additional Information

If this feature is not enabled, the status characters of the output string will report 0 (zero) and may not be compatible with existing software. Likewise, if enabled, any valid status character sent will be correctly represented in the serial output string.

See Also:

Communicating with the C Plus using Hyperterm

Dual ID from one QE-2

So, you share a vehicle between two drivers and you need to know which driver is using the radio. The QE-2 has a feature where you can program two different ID's and the user decides which ID to use.

How it works:

Turn on the radio like normal, and the first ID is used. This is the ID programmed into the QE-2 as "Unit ID".

To select the second ID, with the radio off, hold down the PTT button and then turn on the radio. The second ID will be used for all transmissions until the power of the radio is cycled.

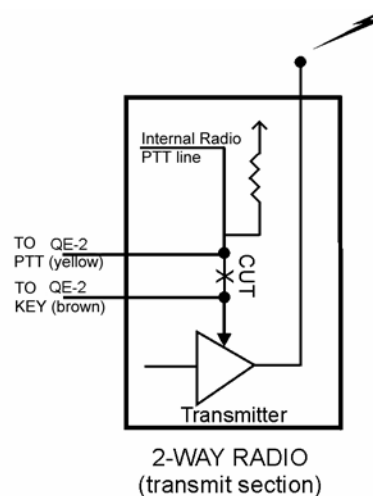
Enabling the Feature:

"Dual ID" must be selected in the programming software ANIPROG. This is located under the "Program" tab. There is a place to designate the second ID just under the Dual ID selection box. "Key Follows PTT" must also be enabled. This is located under the PTT Options tab of ANIPROG.

Special Requirements:

For Dual ID to function, PTT and KEY lines must be split (by removing Jumper K) and the PTT line of the radio must be cut. The QE-2 yellow wire (PTT In) must be attached to the PTT switch side of the radio cut. The QE-2 brown wire (KEY Out) must be attached to the opposite side of the radio cut. In some cases, a "pull-up" resistor must be attached between the PTT switch and radio A+. With the radio on and in receive mode, measure the voltage on the QE-2 yellow wire. If the voltage is below 4.7VDC, the "pull-up" resistor should be added.

The above radio modification is not always needed. Some radios separate PTT and KEY when the personality is programmed for the presence of an ANI board. Contact Cimarron Technologies for details.



Encoding GE Star® ID's Greater than 9999

GE Star® Signaling actually has a maximum ID range to 16383. But if you are using the QE-2, QE-1 or CDEU-1 with ANIPROG programming software (or the old CPF hand-held), the largest ID acceptable is 9999. This application describes how to use ANIPROG to program the encoder for ID's between 10000 and 16383. The Cimarron Technologies C Plus can recognize and display all valid ID's.

By The Bits

A GE Star® signal contains 21 bits in the “payload”. When the signaling was first designed, eleven bits were dedicated to the ID, two were “tag bits”, four were for status and 4 were for message description. With only eleven ID bits, the maximum ID was 2047. As the signaling evolved, ultimately, the two tag bits and one status bit was redefined for use as ID bits and programmers were modified to accept the maximum ID with four digits – 9999. But, with 14 bits available, the actual maximum number is 16383. Programmers still only permit a four digit ID, but there is a work-around.

Making it Work

Today, nearly all GE Star® systems use GE Star® Format B. This uses all 14 bits for ID – but limits the high number to 9999. We will, instead, use format A which uses only 11 ID bits – but permits you to assign states to the T1, T2 and S1 bits. Here's how it works:

In ANIPROG software, go to the “Format Options” tab and change GE Star® Format to A:Custom and then check the box to “Enable Manual Editing”.

The screenshot shows the ANIPROG software interface for configuring G-Star signaling. The 'Unit ID' is set to 0000. The 'Format Type' is 'G-STAR A: Custom'. The 'G-Star Format' is set to 'A: Custom'. The 'Enable Manual Editing' checkbox is checked. The 'Option Summary' section shows 'Format Type: G-STAR A: Custom'. The 'Bit Value' section shows the bit values for various signaling types, with arrows pointing to the 'Tag' and 'Stat' bits.

Type	Low ID	Tag	Stat	Msg
PTT	000000000000	0 0	0 000	0001
Emergency ID	000000000000	0 0	0 000	0111
Man Down ID	000000000000	0 0	0 000	1111
Stuck Mic ID	000000000000	0 0	0 000	1001
Dual ID	000000000000	0 0	0 000	0001

Annotations in the image:

- Bit Value, add 8192 (points to the Low ID field)
- Bit Value, add 4096 (points to the Tag bits)
- Bit Value, add 2048 (points to the Stat bits)

Note that this area permits access to the two “Tag Bits” and the “Stat” bits. The figure above shows the value these bits signify if set to “1”. Now to do the math.

Say you want to encode ID 12583. The number is larger than 8192 so subtract 8192 from 12583. This results in 4391. Change the left most Tag bit to a 1. Now 4391 is larger than 4096 so subtract 4096 from 4391. This results

in 295. Change the right most Tag bit to a 1. Now 295 is smaller than 2048 so go to the Unit ID box and enter 0295. The “Low ID” bits will automatically change to match the binary value of 0295. Now go back to the “Program” tab and program your device.



The figure above shows the completed formatting. If your application also uses “Emergency” and/or “Man Down”, change the appropriate bits to match the “PTT” definition.

Manipulating the DTMF Status Table

The C Plus allows the user to define how received DTMF status messages are displayed. As an example, the user arrives at the job site and presses DTMF button 1. The C Plus will display **AT SITE**. This feature can be combined with another ANI protocol like MDC-1200® and you will have PTT ID and Status reporting.

The status table is also used to assign OUT1/OUT2 activation to particular DTMF Status messages and assign message priorities and sounder characteristics.

Editing the Status Table:

The C Plus has a default status table programmed into it at the factory. This table can be retrieved, edited and reloaded. Editing is accomplished using a text editor like Notepad or Wordpad. After constructing the table, a last line that only contains a dollar sign (\$) must be added. This is the end of file designator and must be present. Retrieval and reloading is accomplished in program mode with a terminal emulator like Hyperterm. Table entries are defined as follows:

N,C,SSSSSSS,B,O

Where:

N	Single digit number that was received as the status character. This number is removed from the ID and is not displayed.
C	Single character abbreviated status (used in the C Plus III scrolling display). This is equivalent to the "S" in the C Plus Message table
S	Eight character status. This is equivalent to the "M" in the C Plus Message table.
B	Audible alert selection. Messages with B = 2 through 5 are classified as critical statuses. See "Editing the Message Table" for further information.
O	Assigns an open collector output to function when the status is received.
0	none
1	Out1 becomes active for 2 seconds
2	Out2 becomes active for 2 seconds

Retrieving a Status Table from the C Plus:

In the C Plus personality programming, select "Select Format Type" then select "DTMF", "Status Reporting" and then "Edit Status Table", "Receive a table from the C Plus". The C Plus will prompt you to open the file that will capture the output to the terminal emulator. At this point, on the Hyperterm menu bar, select *Transfer* and then *Capture Text*. A window opens to allow you to enter the path and name of the file you will capture text to. This should normally be *a:status.txt*. Be sure to have a disk in drive a:. Press *Start*. You will be brought back to Hyperterm. Press "y" to begin

the download. When completed, again go to *Transfer - Capture Text* and then select *Stop*. You will be brought back to Hyperterm. Press “\” to return to the programming menu. Press “\” again to get to the main menu. Selection “7” returns the C Plus to normal operation.

After retrieval, the *a:* drive will have a text file titled “*status.txt*”. This is the table from the C Plus. Using a text editor, make the desired changes.

Reloading the Status table:

Once the table has been edited, it needs to be reloaded back into the C Plus. In the C Plus personality programming, select “*Select Format Type*” then select “*DTMF*”, “*Status Reporting*” and then, “*Edit Status Table*”, “*Send a table to the C Plus*” . Press “y” to continue or “\” to abort. Wait about 5 seconds and the C Plus prompts “*Please send the Status table now*”.

On the Hyperterm Menu bar, select *Transfer* and then *Send Text File*. A window opens to allow you to locate and designate the file to send. Using standard windows convention, find and select the previously created file and then press *Open*. The file will begin to be loaded into the C Plus.

When completed, the C Plus will report “*Status Table built. Press \ to continue.*” Continue pressing “\” until you arrive back at the main menu. There, selection “7” returns the C Plus to normal operation.

Defining a PTT ANI

In the message table, any message that has the “S” field (see above) all spaces will be reported as a PTT ANI when in Cimarron Standard or Cimarron Classic Serial output format. Computer and console serial interface outputs (like Bed 31/1207, CML, and Cimarron Multichannel) report the actual status character received in DTMF signaling.

Priority assignments:

The “*Beep*” field of the Status table assigns the type of audible alert that sounds when the status is received.

Additional Information:

Refer to the C Plus manual, Chapter 3 “*Programming*” for standard Status table assignments.

See Also:

Manual DTMF Status Reporting

Communicating with the C Plus using Hyperterm

External Alarm Activation

Manual DTMF Status Reporting

The C Plus can be programmed to decode manually entered single character status messages. This application allows a radio user to press DTMF buttons to describe his status. The C Plus will display the programmed status relating to the digit sent. As an example, the user arrives at the job site and presses DTMF button 1. The C Plus will display **AT SITE**. This feature can be combined with another ANI protocol like MDC-1200® and you will have PTT ID and Status reporting.

Enabling the Feature:

Prepare your status table before beginning the programming described below. This table provides the legends to be displayed on the C Plus when a DTMF status is received. Refer to [Manipulating the DTMF Status Table](#) for specific assistance.

In the C Plus personality programming, select “*Select Format Type*” then select “*DTMF*”, “*Status Reporting*” and then “*First/Last/Disable*”. Then select “*First*”. Press the \ backslash twice and you arrive at menu screen #1215. Select “*ID Qualifying*”, “*Total Digit Quantity*” and then enter 1. Press the \ backslash twice and you return to menu screen #1215. Now, select “*Status Reporting*”, “*Edit Status Table*”, “*Send a table to the C Plus*” and upload the previously prepared status table. Use the \ backslash to get back to the main menu and press 7 to return to operate mode.

How to use it:

You can program all of the DTMF characters, 0 through F to represent different status messages. The user doesn’t need an expensive status control head for this simple one way status reporting. The below sample Status table would greatly help dispatchers:

0,L,LOADING,1,0
1,D,DEPART,1,0
2,A,ARRIVE,1,0
3,P,POUR,1,0
4,R,RETURN,1,0
5,F,FLATTIRE,4,2
6,B,AT BREAK,1,0
9,E,EMRGENCY,5,1

With this example, the user presses the 0 (zero) DTMF button and dispatch sees his status as **LOADING**. Other buttons track him through the task. Button 9 in this case would sound an alarm and also enable an external alarm.

Combine this status reporting with PTT ANI and the C Plus serial port will provide you with the ID of the person reporting their status. A radio with MDC-1200® or FleetSync™ ANI and a DTMF pad will do the trick. Pressing the radio PTT identifies the user, pressing the DTMF button describes their status.

Special Requirements:

If you are combining PTT ANI and Status reporting, you will need to purchase the optional feature "Dual Format Decode". Contact Cimarron Technologies for information.

See Also:

Manipulating the DTMF Status Table

Communicating with the C Plus using Hyperterm

External Alarm Activation

Connecting the C Plus to a Printer or Computer

Resource Mapping

So, you need a relay output instead of an open collector activation on decoding emergencies. Normally, an emergency message activates OUT1, which is an open collector transistor. If your application calls for relay contact closure, Resource Mapping will allow you to redirect the C Plus resources to accommodate unique needs.

Using Resource Mapping:

Resource mapping allows you to map the output functions of OUT1, OUT2, KEY and MUTE between each other. If an individual wanted the mute relay to act like OUT1, they would enter `$$MAP OUT1 TO MUTE`. If it is desired to use OUT2 as the mute function, enter `$$MAP MUTE TO OUT2`.

The command structure is: `$$ MAP <function> TO <output>`

You can map one function to multiple outputs. The original <function> remains intact unless it is also mapped.

You can also map the C Plus input "CLEAR" to the function "CHBSY" (Channel Busy) by entering `$$MAP CHBSY TO CLEAR`. In this case, if the clear button is pressed, the display is cleared and the C Plus responds as though the input Channel Busy had been toggled. This will only be useful in modes that monitor Channel Busy like *Authorize* mode.

Determining the condition of the Resources:

Once you have mapped a few outputs, you may lose track of just what goes where. Enter the command `$$MAP?` And the C Plus will output the following information:

<p>Output OUT1 is function OUT1</p> <p>Output OUT2 is function OUT2</p> <p>Output KEY is function KEY</p> <p>Output MUTE is function MUTE</p> <p>Function CHBSY is input CHBSY</p>
--

See Also:

Communicating with the C Plus using Hyperterm

Channel Busy

External Alarm Activation

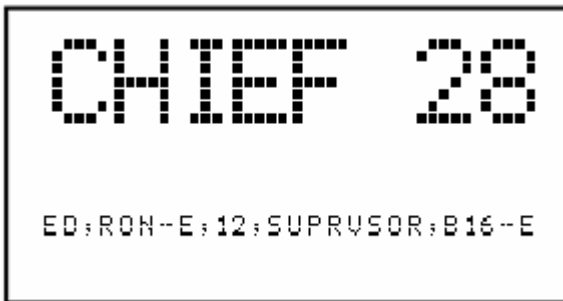
Mute Feature

Scrolling Display

Scrolling is a display mode used with the C Plus III multiple window display. It allows the dispatcher to see the most recently received ID in the main display and a series of the previously received messages. It is also the display mode that is most compatible with the C Plus II single window display. The serial output is also affected by this display type selection.

C Plus III Display

The secondary display area can be programmed for scrolling ID's. In this configuration, when a second ID is received, the first received ID or alias will scroll to the secondary position. Leading and trailing blanks will be suppressed. Thereafter, received ID's will scroll in a similar manner until they scroll off the secondary display. Redundant (identical subsequent) ID's of the same message type will not be displayed. Non-PTT messages will display the ID/Alias a dash (-) and the message type (abbreviated).



In this example, the C Plus also has the optional feature "Alias" installed. Note the secondary display. The ANI received just before "CHIEF 28" was from unit B16 and the message type was "E" (Emergency). The ANI received before B16 came from SUPRVSOR and the message type was a normal PTT ANI. The one before that was a PTT ANI from unit 12. If the Alias feature was not installed, all ANI would be numerical only.

C Plus II Display

The C Plus II does not have a secondary display. Because of this, if a C Plus II is not programmed for scrolling the message type is not displayed so the user will not know what type of message was received. The primary display will not alternate between received alias and message type unless Scrolling display type is selected.

Serial Output

If the C Plus serial output is programmed for Cimarron Standard, and the unit is in Message and Assignment mode, the output will include the assignment field. In the Scrolling display type, there is no assignment field to include in the serial output,

Enabling the Feature

The Scrolling Display type is enabled in the C Plus personality programming under *Select Display Type*.

See Also:

Alias

Communicating with the C Plus using Hyperterm

Message and Assignment Display

Test Equipment uses of the C Plus

The C Plus can be used as test equipment for the testing of radio systems, individual radios and even other decoders. This application uses a computer to generate encode commands which are executed by the C Plus. This allows any valid ID to be targeted for the test.

Testing other decoders:

Although C Plus Rev B and C units have the \$\$LOOP loop-back test to self-test encode and decode, you may have other ANI decoders (or systems) that do not have this capability. By connecting the Data output of the C Plus into the input of the target decoder, you can send known good data bursts to the target decoder. Data bursts that are the same as a radio PTT ANI or emergency can be generated as well as unique GE Star® messages and all FleetSync™ statuses. MDC-1200® Short Call Alert and radio check are also supported.

Testing Radios with decode capability:

Say you have a radio system that uses GE Star® signaling and incorporates the “radio kill” feature of GE Star®. You need to test the kill feature of the radio, or you received a radio from the field that no longer works and has been subjected to “radio kill” just before it had a casualty. Connect the C Plus Data Out to the external modulation in of a service monitor and connect the radio to the RF connection. Now, using a terminal program, send an encode string to the C Plus formatted with the target radio ID and the radio enable (or disable) command. If you switch the monitor from TX to RX, the C Plus will also decode the acknowledgment that is generated by the radio.

If the radio is inoperative and you need to enable a previously disabled Cimarron CDEU-1 (GE Star® Encoder/Decoder), you can inject the C Plus data output directly into the CDEU-1 data input. You can also connect the CDEU-1 output to the C Plus data input to complete the return data path and see the CDEU-1 acknowledgments.

Formulating the RS-232 data strings:

The following is a string that would send a data burst that is the same as a radio emergency:

```
$CT,1234,07,01^M^J
```

Where:	\$CT	=	Command to Transmit
	1234	=	Target radio ID
	07	=	Message type (07 = Emergency)
	01	=	Channel Number
	^M	=	Carriage Return
	^J	=	Line Feed

The C Plus will react only if its assigned channel number is the same as the channel number in the \$CT string. To find out what channel number is assigned to the C Plus use the command \$\$chan. Refer to the manual for a

complete list of supported message types.

Additional Information:

The Cimarron CDT can be used in place of computer running Hyperterm. They can be purchased from Cimarron Technologies. The CDT supports all ID's but the types of messages available are limited. The \$\$LOOP command can be used to generate alternating emergency and PTT ANI messages. The ID is not changeable with this command.

Special Requirements:

The optional feature "Encode" must be purchased and activated. Contact Cimarron Technologies for information.

The C plus must be interfaced to a computer running a terminal emulation program like Hyperterm or to a Cimarron CDT.

See Also:

Encode Capability

Connecting the C Plus to a Printer or Computer

Communicating with the C Plus using Hyperterm

Timing – C Plus by the Numbers

The C Plus is full of timers. Normally, the default settings are just right. But what are all of these timers for? Why are they important and when should they be changed? This note sheds some light on the numbers associated with the C Plus.

DTMF Timing

There are two timers used exclusively in DTMF signaling mode.

Minimum Character Duration

Minimum Character Duration is the shortest acceptable length of a DTMF character. If the character length is less than the definition, then the character is discarded. This allows an ability to adjust sensitivity. Valid DTMF tones can occur naturally in very short duration. This “noise” will decode if not discarded. The default *Minimum Character Duration* is 50mS. Any occurrence of DTMF that is shorter than 50mS will be treated as noise and discarded. The programmable range is from 25mS to 5000mS. For manual DTMF number entry via a DTMF pad, set this number high.

Inter-Character Maximum

Inter-Character Maximum is the maximum allowable time between DTMF characters. Subsequent received characters are assumed to be components of the same string only if they occur before the *Inter-Character Maximum* has elapsed. The default is 100mS. Any character received after 100mS will be considered a new string of characters and the display will be cleared to prepare for the new string. The programmable range is from 50mS to 9999mS. For manual DTMF number entry via a DTMF pad, set this number high.

Radio Timing

In a two-way radio system, timing is very important to successfully transmit data.

Attack Delay. Used in Conventional, Trunk and Tone Remote mode. This timer sets the time delay between start of transmit (or channel acquisition in trunking) and data transmission. If too small of a value is selected in conventional mode, the transmit mechanism of the radio may not be ready (stabilized frequency, max power out, repeater accessed, etc.) to effectively transmit data. Available time selections are 0ms to 9999ms in Conventional and Trunk mode. In Tone Remote mode, available time selections are 0ms to 3000ms.

Trunk Debounce. Used only in trunk mode. Some trunking radios have channel acquired logic which pulses while attempting to be granted access and then remain in a state showing access granted. This timer sets the debounce time so that pulsing is ignored. The unit will not transmit data until the specified time period has been exceeded. Available time selections are 0ms to 9999ms.

Trunk Timeout. Used only in trunk mode. This timer sets the maximum amount of time, which the unit will attempt to acquire a trunk. Once exceeded, the unit will quit attempts. See also *Trunk Key*. Available time selections are 0ms to 9999ms.

Trunk Key Time. Used only in trunk mode. This timer sets the time the unit is keyed while awaiting channel acquisition. In LTR systems, Trunk Key Time and Trunk Timeout should be the same. In more elaborate trunking schemes (e.g. MPT-1327) this timer allows the transmitter to be keyed and then unkeyed in order to request channel access. The time selected is the period the unit stays keyed. The Cimarron equipment 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. Available time selections are 0ms to 9999ms.

Post Dec. Many radios must “relax” after receiving before permitting transmission. The C Plus waits a fixed 800ms after receiving an acknowledgeable message before it sends a response.

Other C Plus Times:

12 Hours	The amount of time the clock will keep its time without power.
6 Minutes	The amount of time it takes to load new flash into the C Plus using the serial port.
16 Seconds	How long the C Plus sends alternating emergency and PTT messages when given the \$\$LOOP command.
10 Seconds	How long the C Plus sends pseudo-data to assist adjusting TX deviation when given the \$\$KEYT command.
10 Seconds	The amount of time the C Plus “listens” at 9600,N,8,1 when first powered up. After that, it reverts to the user programmed parameters.
2 Seconds	The amount of time Out1/Out2 remain active once triggered.
1 Second	How soon you must press the clear button a second time to erase the secondary display in a C Plus III.
250 mS	The length of the annoying beep that goes off whenever a PTT ANI is received (default value).

Using the QE-2 to test ANI decoders

QE-2 ANI encoders can be used to make test equipment specifically for testing C Plus decoders. One QE-2, a handful of parts and a project box is all you need. This equipment will test the decode function and verify that the C Plus responds to acknowledgeable messages. It is also capable of testing the mute circuits and Out1 and Out2.

Assumptions:

The proper functioning of this test set assumes that the C Plus is programmed for the same signaling type as the QE-2. The output level of the QE-2 must be adequate to be detected by the C Plus, and not so high that it is distorted by the C Plus input circuits. The loaded message table of the C Plus must map either Out1 or Out2 to the emergency message.

What is a good test?

In the first test, press and release the "PTT" button. The C Plus will detect the data burst generated by the QE-2 and activate the mute relay. This will cause the test set LED attached to "RX MUTE" to change condition (if off, it will turn on, if on, it will turn off) for a short period.

In the second test, press and release the "EMERGENCY" button. As before, there will be activity on the "RX MUTE" LED followed by the "OUT1" or "OUT2" LED. Then the "TXCTL" and the "KEY" LED will become active.

Additional Information:

The test set can be customized for your particular applications. You may need only OUT1 or you will need Man Down (GE Star® only) capabilities tested. Add pushbuttons for C Plus channel busy, PTT, RX Inhibit and Remote Clear and you will be able to exercise the "reasoning abilities" of the C Plus.

Reasoning Abilities?

If the C Plus senses an active RX Inhibit, then it will not react to received data.

If the C Plus senses that the PTT line or the Channel Busy line is active, it will hold off on sending an acknowledgment until the line becomes inactive. (The box is polite!)

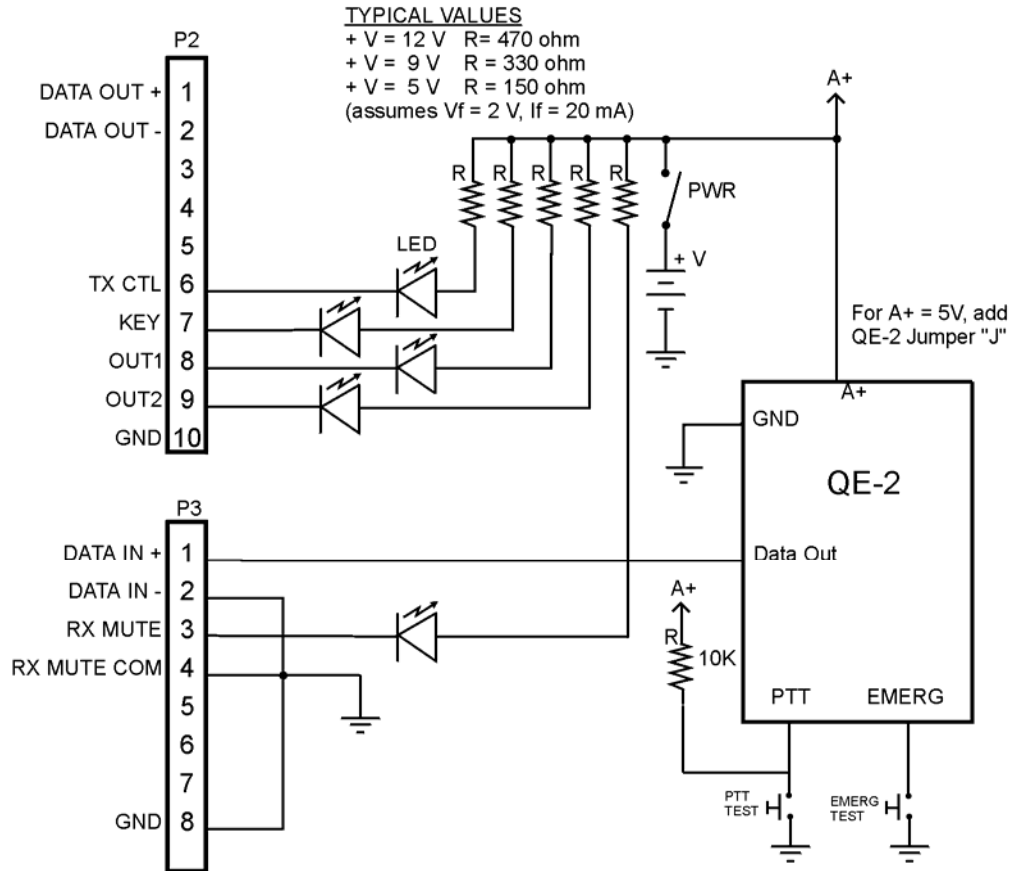
Remote Clear acts the same as the front panel "Clear" button.

Acquiring the hardware:

The QE-2 and spare connectors for the C Plus can be ordered by calling Cimarron Technologies. Resistors, LED's and switches are easily available from your junk box or your local electronics supply store.

Test Fixture:

The diagram below describes the simple test fixture required to perform tests described above. The QE-2 is programmed with defaults.



Appendix A Summaries of topics in Volume I

Alias

The Alias feature is an extra option that allows the user to create a table that is used by the C Plus to display an alphanumeric "Alias" instead of the actual received numeric ID. The created Alias Table is stored in the C Plus and has a maximum of 4000 individual entries. The alias table also is used to define unique "Enunciate" beeps and a nineteen character extended alias referred to as the assignment field.

Ambush

The "Ambush" feature allows the preparation of messages to be sent to radios capable of two way signaling when the target radio is turned off or out of communication range. When the C Plus next hears from the target, it waits until the user unkeys and then sends the designated message.

Authorize Feature used for Repeater Access Control

The C Plus can be programmed to filter out unauthorized users of repeater systems. In this mode, the C Plus monitors channel busy for activity and looks for ANI. If the ANI ID is present and is in the authorized users list (alias table) then the C Plus will toggle Out1 and/or Out 2 to unlock the repeater transmitter stage. The lock out will return when the channel busy line shows lost activity.

Channel Busy

The Channel busy line is interfaced to the host radio at a point that changes state when the radio receiver is actively receiving carrier. The point can be active when high or active when low. This enables the C Plus to monitor the condition of the receiver and use that information to more accurately make decisions. Specifically, the Channel Busy line is used: a) To hold off transmissions until the channel is free; b) To remute the receiver when in COS qualified mute mode; c) In the implementation of the Authorize feature.

Connecting the C Plus to a Printer or Computer

The C Plus has a serial communications port located on the back panel. The connection is an RJ-11 ("Modular") connector. Cimarron Technologies offers a computer interface cable and a printer interface cable. These cables permit the direct connection of the RJ-11 serial port to either a serial printer or the COM port of a computer. The cables can be manufactured by the customer, and pin-outs are provided here.

COS Qualified Mute

Have you ever wanted to completely mute the ANI signal? To eliminate the annoying data burst at the radio attached to the C Plus, COS Qualified Mute mutes the radio speaker all of the time. When the C Plus receives an ANI data burst, it waits until the data has completely passed, and then un-mutes the speaker. The speaker remains un-muted until the receiver ceases receiving the RF signal.

Data Input

Data input is the signal input to the C Plus. Data In + is the high side and Data In - is the low side. Data input is jumper selectable for high impedance single ended, high impedance balanced and 600 ohm balanced.

Data Output

Data output is the signal out of the C Plus. Data Out + is the high side and Data Out - is the low side. Data output is jumper selectable for single ended or balanced configurations. In non-balanced configurations, Data Out - is referenced to ground. However, note that it is not directly shorted to ground. In balanced systems, it is signal return. Always attach an independent station ground to the rear panel P3 pin 8 or P2 pin 10.

Encode Capability

The C Plus is capable of encoding certain two-way signaling messages in GE Star®, MDC-1200® and FleetSync™. These “Outbound” messages include the entire GE Star® message set, all FleetSync™ status messages (Stat 10 to Stat 99), and MDC-1200® Voice Selective Call, Radio Check, Short Call Alert and Long Call Alert. Commands are sent to the C Plus via the Cimarron CDT, a compatible dispatch console or a computer running a terminal emulation program like Hyperterm.

Enunciate

The “enunciate” feature allows a dispatcher to be alerted when selected individuals are talking. A police department dispatcher wants to be alerted any time that the chief of police is talking on the radio. Using Enunciate, whenever the C Plus decodes the chief’s radio ID, the C Plus will sound a preselected series of beeps.

External Alarm Activation

An external alarm can be connected to the C Plus so that when a particular type of message is received, like an emergency message, the external alarm sounds or a visual indicator illuminates.

GE Star® Format Selections

If you have used the Cimarron Technologies C Mark family of ANI decoders, then you are probably familiar with their ability to decode different formats of GE Star®. The C Plus is also capable of correctly decoding all existing formats of GE Star®.

Communicating with the C Plus using Hyperterm

The C Plus has built-in programming software that only requires a terminal emulation program to access. 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.

Limit Radio Usage Using CDEU-1 and C Plus

Are your radio users filling the available airtime chatting amongst themselves? Need to control radio usage? This is a solution used widely in the transit industry. Any user can communicate with dispatch, but without approval, no one can talk to any other user.

Message and Assignment Display

Message and assignment is a display mode used in conjunction with the Alias feature and the C Plus III multiple window display. The serial output is also affected by this display type selection.

Message Table Manipulation

The C Plus allows the user to redefine how a received message is displayed. As an example, say that a CDEU-1 encoder/decoder is being used to report the status of a water pump. If the pump is on, an emergency is sent and if the pump is off, a man down is sent. With message table manipulation, the C Plus could be programmed so that when an emergency is received, the display reports PUMP ON and a man down reports PUMP OFF. The message table is also used to assign OUT1/OUT2 activation to particular messages and assign message priorities and sounder characteristics.

Mute Feature

The C Plus has circuitry that can be employed to mute a local speaker or even mute repeat audio at a repeater.

Operating with a Cimarron CDT

The Cimarron model CDT Hand Held Terminal is used to designate target ID's for outgoing commands to radios capable of two way signaling. The CDT has a 30-button membrane keypad and a 4 x 20 character LCD packaged in a shock resistant plastic case. It plugs into the RS-232 port in the rear of the C Plus.

Radio Kill using CDEU-1 and C Plus

A radio is lost or stolen. Maybe it ends up in the hands of an inmate at a prison or a fugitive at an active crime scene. This application allows the dispatcher to send a digital message to the radio, killing both transmit and receive function. The radio can still be controlled by the dispatcher (to key up and transmit ambient noise) and can be restored over the air as well.

Recognizing Multiple Radio Team Members

Truck 26 has four team members, all with their own radios. With this application, all radios will be displayed as TRUCK-26, and each member will be uniquely described on the C Plus III secondary display.

Remote Clear

The C Plus II and III main display is cleared by means of the clear button on the front panel. On the back of the C Plus there are connections available for a remote clear circuit. A foot switch can be easily attached to these connections allowing a dispatcher to clear the display without reaching for the C Plus.

Repeater Access Control using COS Qualified Mute

The C Plus can be used to filter out potential repeater users that do not have a beginning send ANI data burst. COS Qualified mute is a feature that activates the mute relay until after an ANI data burst is received. Once a data burst is received, the relay relaxes until channel busy changes state. This line can be used to limit access.

Repeater Controller

Two radios can be connected to the C Plus to create a rudimentary repeater. Any radios can be used with any mix of frequencies/bands. If the ANI ID is present and the ID is in the alias table, then the C Plus will key the associated transmitter. The Transmitter will remain keyed until Channel Busy from the receiver changes state. If someone without an authorized ANI ID attempts to access the repeater, the C Plus will not respond and the transmitter will not be keyed.

Self Tests

In addition to automatic self checks performed at power up, the C Plus also has diagnostic tools that can be used by the technician during installation and whenever functionality is in question.

Sounder Control

The C Plus is equipped with an internal audible signal device that can announce receipt of specific message types or receipt of traffic from specific users. Sounder characteristics are programmable and assignable to individual ID's and message types. The sounder can also be disabled.

Status Reporting using CDEU-1 and C Plus

You can create a simple status reporting system by combining the CDEU-1 encoder/decoder with the C Plus. A sense switch can be used to detect when a device is on or off (or the gate is open or shut). This information is transmitted via radio to a control station, where a C Plus II or III displays the condition of the device. The C Plus can be programmed to display the sensed equipment name (like PUMP 6) and its status (ACTIVE). A C Plus III would even increase the capability so the secondary display could present more information (like FIELD BRAVO RIG 10).

Taxi Bid Display

Taxi Bid is a display mode typically used by taxi dispatchers. It is most effective when used with the C Plus III multiple window display.

Tone Remote Keying

The C Plus is an encoder and a decoder. It is capable of encoding acknowledgments to critical messages and can send numerous different dispatch originated messages. But in a tone remote system, there is no local key line for the C Plus to toggle to activate the remote transmitter. In this situation, the C Plus Tone Remote Keying feature would do the trick. With this feature, when the C Plus needs to activate the remote transmitter, it will output the tone keying sequence and a user selectable function tone.

Unauthorized User Screening

This is a twist on the Authorize mode. When non-authorized users attempt to communicate, the C Plus does not display their ID and mutes the attached receiver during the transmission. It could be especially helpful in contracted dispatch situations to eliminate those who have not kept up with their dispatch fees.

Upgrading the C Plus Flash

The C Plus was designed with user upgradable flash software. This means

that as new features become available, customers can upgrade their software to take advantage of the new capabilities.

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