

How to use DTMF ANI with an IP-223 and a C-Soft Console

By Dave Grant

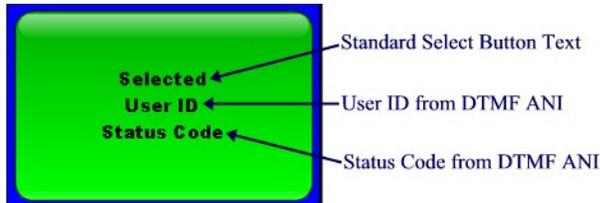
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Introduction

DTMF is used everywhere. In the Telex RoIP world it is one of many formats supported by the IP-223 to allow a user in the field to automatically pass information to a C-Soft or hard Console. This paper deals with the C-Soft Console exclusively. The IP-223 can be configured to decode and forward a *User ID*, a *Status Code*, and a *Console Calling ID* to a C-Soft Console. This information is used to populate the Select Button in the case of the *User ID* and *Status Code*, and the *Calling ID* is used by the mobile to alert a particular Console and cause it to un-mute the audio and flash the Select Button. The following illustration shows where the *User ID* and *Status Code* appear on the Select Button on a C-Soft Console.



At the very least, when an IP-223 is configured to listen for a DTMF ANI string and a valid string arrives. It constructs a packet that will populate the *User ID* position and the *Status Code* position, on the Select Button of the C-Soft Console with the digits received from the mobile. In addition, the received digits are compared to the *User ID List* and the *Status ID List* that is programmed on the C-Soft Console. If there is a match in the *User ID List*, the *User ID* position of the Select Button will be populated with the corresponding name from the *User ID List* and the *Status Code* position will be filled from the *Status ID List*.

In order to use this feature we must make matching configuration changes to the IP-223 and the C-Soft Console.

Let's get started – IP223

We will start at the radio end. You will need a radio that can generate a string of DTMF digits that are short and close spaced, the typical duration might be 50ms of tone and 25ms of silence or inter-digit time. The length of the string can be up to 32 digits long and can contain the characters 0-9, *, #, and A-D.

I will not go into detail regarding the normal settings that are required to make the IP-223 functional in whatever Mode you have it configured for. I will focus on the settings that are unique to DTMF Signaling on the IP-223 and C-Soft.

Tone Types

The IP-223 must be told to listen for DTMF digits. That is done on the *Per Line Settings Page* of the IP-223 setup. In the *Signaling Setup* section, the *Tone Type* must be set to DTMF.

Signaling Setup			
<input type="checkbox"/> Fleetsync Decode	<input type="checkbox"/> Fleetsync Encode	<input type="checkbox"/> MDC Decode	<input type="checkbox"/> MDC Encode
Set Tone Type here →	Tone Type: <input type="text" value="DTMF"/>	ANI Suffix: <input type="text"/>	
	Digit Duration: <input type="text" value="25"/> ms	Interdigit Duration: <input type="text" value="25"/> ms	
	Pause Duration: <input type="text" value="100"/> ms	Preamble Duration: <input type="text" value="25"/> ms	
	Group Digit: <input type="text" value="A"/>	Repeat Digit: <input type="text" value="E"/>	

The other settings, *Digit Duration*, *Interdigit Duration*, *Pause Duration*, and *Preamble Duration* will be set according to the requirements of the mobile or handheld that will be providing the DTMF ANI Signaling.

Once the *Tone Type* has been set to DTMF, settings submitted and saved, the IP-223 will be able to receive DTMF tones on the Rx Line and decode them. However the format of the DTMF digit string must be programmed before we can send any information to the Console. This is done also on the *Per Line Settings Page* of the IP-223, in the *Signaling Setup* section in the *ANI Call Format* text box.

ANI Call Types

In this section of the programming, there are 16 different ANI Formats that can be entered. They are labeled as *ANI Decoder # 1 - ANI Decoder # 16*. Each *ANI Decoder #* has an *ANI Call Type* that can be selected from a dropdown box, the *ANI Call Types* we will be using are ***Emergency***, ***Individual***, and ***Status***.

The ***Emergency Call Type*** is used to signal to the C-Soft Console that the caller is declaring a **Formal Emergency** and that the Console should respond accordingly with Alarms and Flashing Select Button for the line that the DTMF string was received on. The *Emergency Call* type will allow a *User ID* as well as a *Status Code* to be included in the DTMF string.

The ***Individual Call Type*** is used to send a *User ID* only to the C-Soft Console. You will not be able to include any other information with this Call Type.

The ***Status Call Type*** is used to send a *User ID* and/or a *Status Code* to the C-Soft Console.

Telex Radio Dispatch DTMF ANI Application Note

The following illustration shows the section in the IP-223 where those ANI formats are entered.

ANI Decoder #:	ANI Call Type:	ANI Call Format:
1	Emergency	911
2	None	*III#
3	Emergency	IISSS
4	Group	*III#SSS#
5	Individual	*III#SSSS#911##
6	Status	*III#SSSS#RRRR#
7	None	
8	None	
9	None	
10	None	
11	None	
12	None	
13	None	
14	None	
15	None	
16	None	

As you can see in *ANI Decoder #1*, I have selected the **Emergency ANI Call Type** from the dropdown box. As I had mentioned earlier, the **Emergency** Call Type is special. When the C-Soft Console receives a message with this Call Type, a Formal Emergency is logged in the *Global Call History* and an entry is made in the *Emergency Call History* with any additional information that may have been supplied.

ANI Call Format

Finally there is the *ANI Call Format* text box. The *ANI Call Format* string is also known as a *mask*. With a *mask*, we can use other symbols besides just DTMF digits to give us more information. As a string of DTMF digits is received, they are compared to each *ANI Call Format mask*, starting with *ANI Decoder #1* and if there is no match, moving to *ANI Decoder #2*, and so-on to *ANI Decoder #16*.

In this case I have set the *ANI Decoder #1 - ANI Call Format* string to “911”, what this means is that if the 3 DTMF digits 9, 1, 1 are received at the Rx Input of the IP-223 with the proper level and timing, an **Emergency** Message is sent to the C-Soft Console and it goes into Emergency Alarm. In this configuration, only the Emergency is activated, there is no additional information available for the *Global Call History* on the Console, such as *User ID* or *Status Code*.

So you can see what happens when the IP-223 receives a specific DTMF digit string, like “911” and the *ANI Call Format mask* is just the digits “911” there is a match, a Message of the type in the *ANI Call Type* box is sent to the C-Soft Console, and the list of *ANI*

Call Formats being processed stops. The fact that the processing stops is important, make sure that you keep shorter *masks* in the lower numbered decoder slots. This will speed up the processing by the IP-223 and lighten the CPU load.

The *mask* elements that we will be working with are the “I” or *User ID* element, the “S” or *Status Code* element, and the “R” or *Console ID* element for inbound select calling a specific console. There are other *mask* elements that we will not be dealing with in this document, refer to the IP-223 Users Manual for more information.

Examples

I have created 6 example *ANI Decoder* entries here that I will describe how they work and what they will allow you to do.

ANI Decoder #:	ANI Call Type:	ANI Call Format:
1	Emergency	911
2	Individual	*III#
3	Status	IISSS
4	Status	*III#SSS#
5	Emergency	*III#SSSS#911##
6	Status	*III#SSSS#RRRR#
7	None	
8	None	
9	None	
10	None	

ANI Decoder #1 (mask “911”)

This is a very simple direct match *mask*. By only using DTMF digits, there is only 1 match, “911”. This is a simple way to launch an Emergency at a C-Soft Console.

<p>At this point on the Console you will see the phrase “Active Emergency” appear on the Select Button, just below the Select/Selected text. The Select Button will be flashing Red as well.</p>	
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ANI Decoder #2 (mask “*III#”)

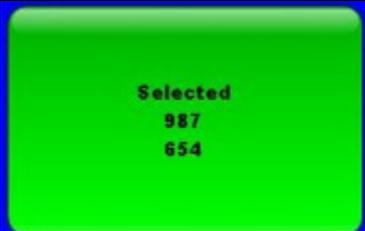
This *mask* is using a combination of DTMF digits and the “I” *mask* element. By setting the *mask* to “*III#” we are saying that we are looking for a string of DTMF digits that

match a “*” digit followed by any 3 DTMF digits, followed by a “#” digit, no shorter, no longer. If we get a match, the IP-223 will create a packet with the *User ID* set to the 3 digits received. For example, if we received “*567#”, an Individual Message would be created with the *User ID* section set to “567”. The IP-223 will also display a “567” on its front display.

<p>At this point on the Console you will see the “567” appear on the Select Button, just below the Select/Selected text.</p>	 A screenshot of a green rectangular button with a blue border. The button contains the text "Selected" in a bold, black font, and below it, the number "567" in a smaller black font.
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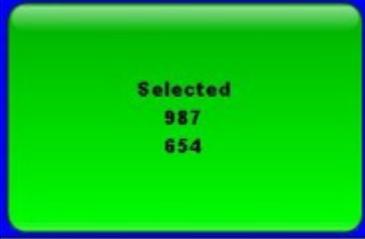
ANI Decoder #3 (mask “IISSS”)

This *mask* has no required DTMF digits and will match any DTMF string that is 6 digits long. It will split the 6 digits into a 3 digit *User ID* and a 3 digit *Status Code*. For example, if we received “987654”, a Status Message would be created with the *User ID* section set to “987” and the *Status Code* section set to “654”. The IP-223 will also display a “987” on its front display.

<p>At this point on the Console you will see the “987” appear on the Select Button, just below the Select/Selected text, and just below that the <i>Status Code</i> “654” appears.</p>	 A screenshot of a green rectangular button with a blue border. The button contains the text "Selected" in a bold, black font, followed by the number "987" on the next line, and the number "654" on the third line.
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ANI Decoder #4 (mask “*III#SSS#”)

This *mask* has DTMF “#” digits that are used to delineate the *User ID* “III” and the *Status Code* “SSS” and makes it harder to spoof, while parsing the “III” into a 3 digit *User ID* and “SSS” into a 3 digit *Status Code*. For example, if we received “*987#654#”, a Status Message would be created with the *User ID* section set to “987” and the *Status Code* section set to “654”. The IP-223 will also display a “987” on its front display.

<p>At this point on the Console you will see the “987” appear on the Select Button, just below the Select/Selected text, and just below that the <i>Status Code</i> “654” appears.</p>	
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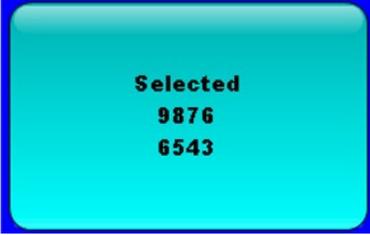
ANI Decoder #5 (mask “*IIII#SSSS#911##”)

This *mask* has DTMF “#” digits that are used to delineate the *User ID* “IIII” and the *Status Code* “SSSS” and makes it harder to spoof, while parsing the “IIII” into a 4 digit *User ID* and “SSSS” into a 4 digit *Status Code*. In addition, because this decoder is set to ANI Call Type *Emergency*, a match on this decoder will signal the Console that an *Emergency* has been declared. For example, if we received “*9876#6543#911##”, a *Emergency* Message would be created with the *User ID* section set to “9876” and the *Status Code* section set to “6543”. The IP-223 will also display a “9876” on its front display.

<p>At this point on the Console you will see the “9876” appear on the Select Button, just below the Select/Selected text. The Select Button will be flashing Red as well.</p>	
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ANI Decoder #6 (mask “*IIII#SSSS#RRRR#”)

This *mask* has DTMF “#” digits that are used to delineate the *User ID* “IIII” and the *Status Code* “SSSS” and makes it harder to spoof, while parsing the “IIII” into a 4 digit *User ID* and “SSSS” into a 4 digit *Status Code*. In addition, this mask has the “R” *mask* element in it as well. This adds a third section to the Status Message packet that is sent to the Console. This section is called the *Caller ID*, and it will cause a Console that is programmed for the correct *Caller ID* to flash the Select Button on the Console. If the Console has a different *Caller ID* it won’t show any activity and stay silent. For example, if we received “*9876#6543#2944#”, a *Status* Message would be created with the *User ID* section set to “9876”, the *Status Code* section set to “6543”, and the Console *Caller ID* to “2944”. The IP-223 will also display a “9876” on its front display.

<p>At this point on the Console you will see the “9876” appear on the Select Button, just below the Select/Selected text, and just below that the <i>Status Code</i> “6543” appears. The Select Button will be flashing Blue as well.</p>	
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At this point you should be able to configure an IP-223 to respond to several different DTMF strings that will display *User ID*, *Status ID*, and sound a system Emergency on a remote console.

Let's get started – C-Soft Console

Available Signaling Features – Inbound

Up to this point we have made no changes to our console. To use the numeric *User ID*, numeric *Status ID* and the *Emergency Alert* the only configurations done, are on the IP-223.

Emergency Alert

The *Emergency Alert* is a special action on the C-Soft Console. And in being a special action, it requires special response. On the C-Soft Console several things happen when an *Emergency Alert* is received. First, the Select Button for that channel will start to flash red and an emergency alert tone is sounded at the console. In addition an entry is added to the Call Log and the Emergency Log stating the source, time and any cause that may be reported via *Status ID*. The alarm and the flashing cannot be stopped until an Emergency ACK Button and/or an Emergency Resolve Button is pressed. This is the mechanism that FleetSync and MDC use to implement the Man-Down function in their respective protocols. Beyond the addition of the ACK or Resolve Buttons, there is no additional configuration required on the console to use this feature. When an *Emergency Alert* is received only the *User ID* is available to display on Select Button, the *Status ID* is only available in the console log.

User ID

When a *User ID* is generated by the IP-223, it is put into a packet and sent to the C-Soft Console. The C-Soft Console takes that *User ID* and compares it to the *User ID List* in the console to see if there is a match. If the console finds a matching entry it will take the

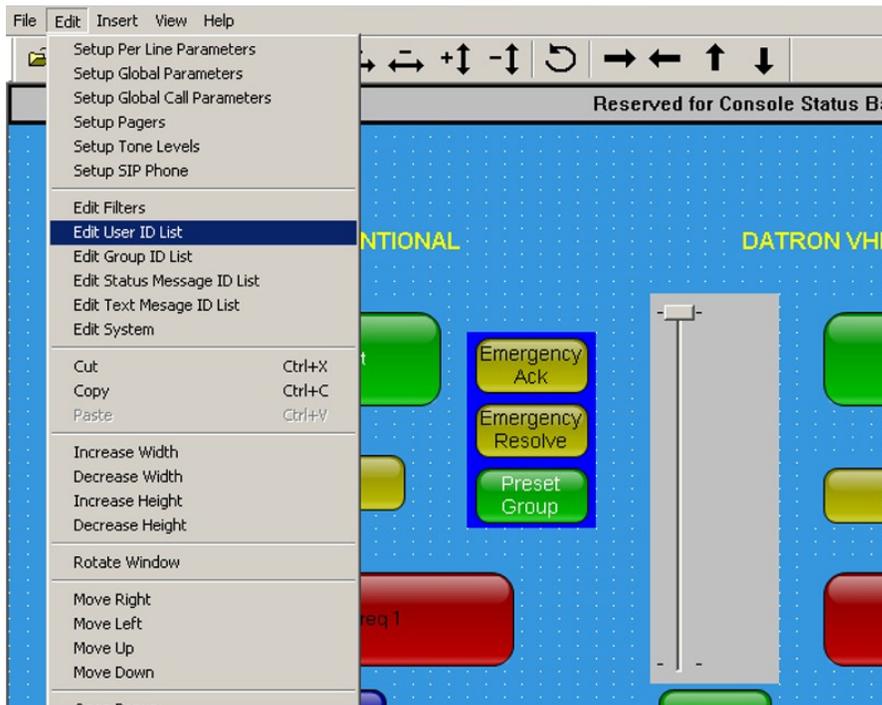
corresponding text and display it on the Select Button. If there is not a match, the console displays the numeric *User ID* as received on the Select Button. The *User ID* can be used in conjunction with the *Emergency Alert* and the *Status ID* to present information on the Select Button. See the section on the *User ID List* for more information.

User ID List

The *User ID List* is used as a lookup table for inbound *User ID* packets. Normal call processing is as follows; the IP-223 decodes a valid *User ID* and sends a packet to the C-Soft Console. Upon arrival, the inbound *User ID* is compared to the *User ID List*, if a match is found the corresponding Name is used in place of the ID. If there is no match the numeric *User ID* is displayed as a number in the call log and on the Select Button.

User ID List Configuration

To configure the *User ID List*, open the C-Soft Designer and load your C-Soft Console file. From the Menu Bar select *Edit | Edit User ID List* as shown in the example below.



After selecting *Edit | Edit User ID List* you will see the following dialog box. There are a total of 5000 entries allowed in the *User ID List* starting at number 1 as shown.

Telex Radio Dispatch DTMF ANI Application Note

The screenshot shows a window titled "User ID List" with a table containing 12 rows. Each row has columns for "Name", "User ID", "Type", and "TX Inhibit". All fields are currently empty. At the bottom of the window are buttons for "Load File", "Save File", and "Close".

	Name:	User ID:	Type:	TX Inhibit:	
1			Generic	<input type="checkbox"/>	Filters
2			Generic	<input type="checkbox"/>	Filters
3			Generic	<input type="checkbox"/>	Filters
4			Generic	<input type="checkbox"/>	Filters
5			Generic	<input type="checkbox"/>	Filters
6			Generic	<input type="checkbox"/>	Filters
7			Generic	<input type="checkbox"/>	Filters
8			Generic	<input type="checkbox"/>	Filters
9			Generic	<input type="checkbox"/>	Filters
10			Generic	<input type="checkbox"/>	Filters
11			Generic	<input type="checkbox"/>	Filters
12			Generic	<input type="checkbox"/>	Filters

When configuring the *User ID List* you must enter a *Name* value that will be used to display on a button or in the *Call History/Per-Line Call History* windows upon receipt of the corresponding *User ID*. As an example of a Phone *User ID*, when I put **Dave** in the *Name* box and **4255551212** in the *User ID* box, and then open a *Call List Window* in the C-Soft Console I can do a dial by name instead of having to lookup the number.

The screenshot shows the same "User ID List" window, but the first row is now populated. The "Name" field contains "Dave" and the "User ID" field contains "14255551212". All other fields remain empty. The "Load File", "Save File", and "Close" buttons are still present at the bottom.

	Name:	User ID:	Type:	TX Inhibit:	
1	Dave	14255551212	Generic	<input type="checkbox"/>	Filters
2			Generic	<input type="checkbox"/>	Filters
3			Generic	<input type="checkbox"/>	Filters
4			Generic	<input type="checkbox"/>	Filters
5			Generic	<input type="checkbox"/>	Filters
6			Generic	<input type="checkbox"/>	Filters
7			Generic	<input type="checkbox"/>	Filters
8			Generic	<input type="checkbox"/>	Filters
9			Generic	<input type="checkbox"/>	Filters
10			Generic	<input type="checkbox"/>	Filters
11			Generic	<input type="checkbox"/>	Filters
12			Generic	<input type="checkbox"/>	Filters

This configuration entry in the *User ID List* will result in the following result appearing in the *Call List Window*.

Call List: TW-7000

ID Type: Alias

UserID: Dave

Alias	UserID
Dave	14255551212

Filters: No Filter

Status: No Status [Set Status]

Status OK Call Outside Call3 Call4 Call5
 Call6 Call7 Call8 Call9 Call10

Done

The *Type* dropdown list will associate this *User ID* with a particular type of user when a *Call List Window* or *Manual Call List Window* is active. This can be *Generic* which means show with any line type. It can be *Fleetsync*, which means that this *User ID* will be visible when a *Fleetsync* resource is being used. It can be *Phone*, which will make it visible when a *Phone* resource is being used. It can be *iDen*, and this *User ID* will be visible when an *iDen* resource is being used. Or it can be *MDC-1200*, and be associated with an *MDC-1200* resource.

The *TX Inhibit* will allow a *User ID* to be looked up on an inbound call but will block that *User ID* from being seen in a *Call List* or *Manual Call List Window*.

The *Filters* button will allow the *User ID* to be associated with other groups of user types in much the same way as the *Type* value is used. If your *User ID* is associated with a filter and that filter is selected, the *Name/User ID* will be visible.

Status ID

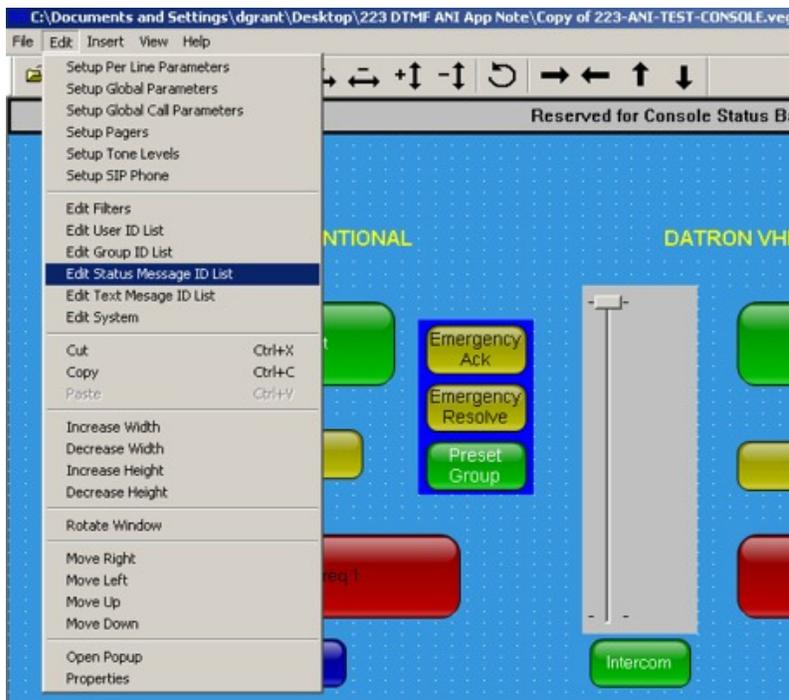
When a *Status ID* is generated by the IP-223, it is put into a packet and sent to the C-Soft Console. The C-Soft Console takes that *Status ID* and compares it to the *Status ID Table* in the console to see if there is a match. If the console finds a matching entry it will take the corresponding text and display it on the Select Button. If there is not a match, the console displays the numeric *Status ID* as received on the Select Button. The *Status ID* can be used in conjunction with the *User ID* to present information on the Select Button. See the section on the *Status ID List* for more information.

Status ID List

The *Status ID List* is used as a lookup table for inbound *Status ID* packets. Normal call processing is as follows; the IP-223 decodes a valid *Status ID* and sends a packet to the C-Soft Console. Upon arrival, the inbound *Status ID* is compared to the *Status ID List*, if a match is found the corresponding *Status Message* is used in place of the ID. If there is no match, the numeric *Status ID* is displayed as a number in the call log and on the Select Button.

Status ID List Configuration

To configure the *Status Message ID List*, open the C-Soft Designer and load your C-Soft Console file. From the Menu Bar select *Edit | Edit Status Message ID List* as shown in the example below.



Telex Radio Dispatch DTMF ANI Application Note

After selecting *Edit | Edit Status Message ID List* you will see the following dialog box. There are a total of 5000 entries allowed in the *Status Message ID List* starting at number 1 as shown.

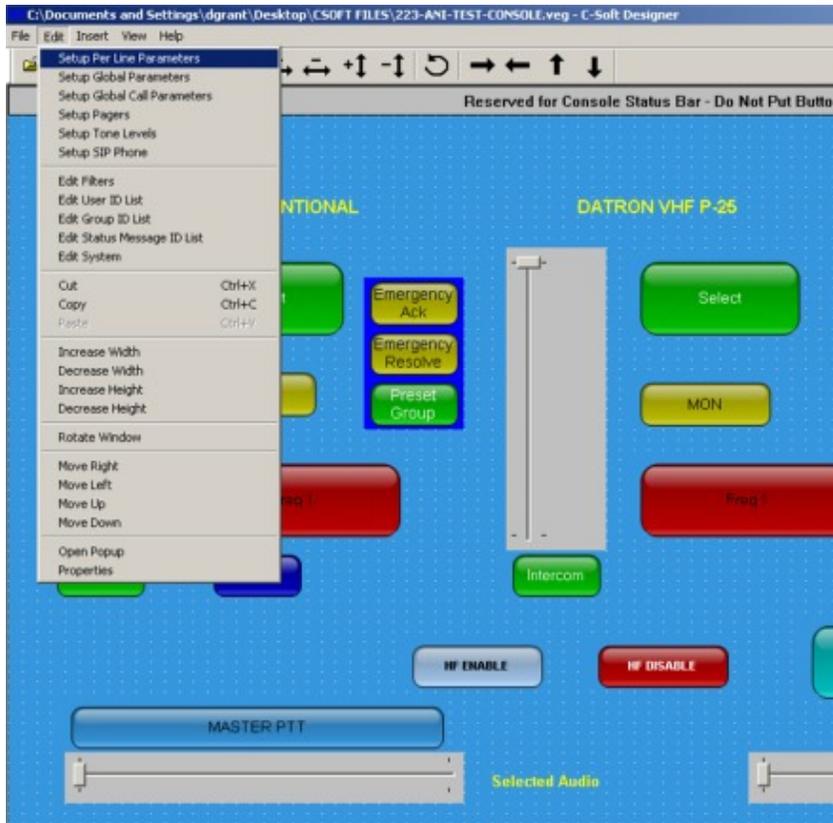
	Status Message:	Status ID:	Password Protected:	Set Color:
1			<input type="checkbox"/>	<input type="checkbox"/>
2			<input type="checkbox"/>	<input type="checkbox"/>
3			<input type="checkbox"/>	<input type="checkbox"/>
4			<input type="checkbox"/>	<input type="checkbox"/>
5			<input type="checkbox"/>	<input type="checkbox"/>
6			<input type="checkbox"/>	<input type="checkbox"/>
7			<input type="checkbox"/>	<input type="checkbox"/>
8			<input type="checkbox"/>	<input type="checkbox"/>
9			<input type="checkbox"/>	<input type="checkbox"/>
10			<input type="checkbox"/>	<input type="checkbox"/>
11			<input type="checkbox"/>	<input type="checkbox"/>
12			<input type="checkbox"/>	<input type="checkbox"/>

Buttons: Load File, Save File, Uncheck All, Set Color, Reset Colors, Close

Caller ID (Console Direct Call)

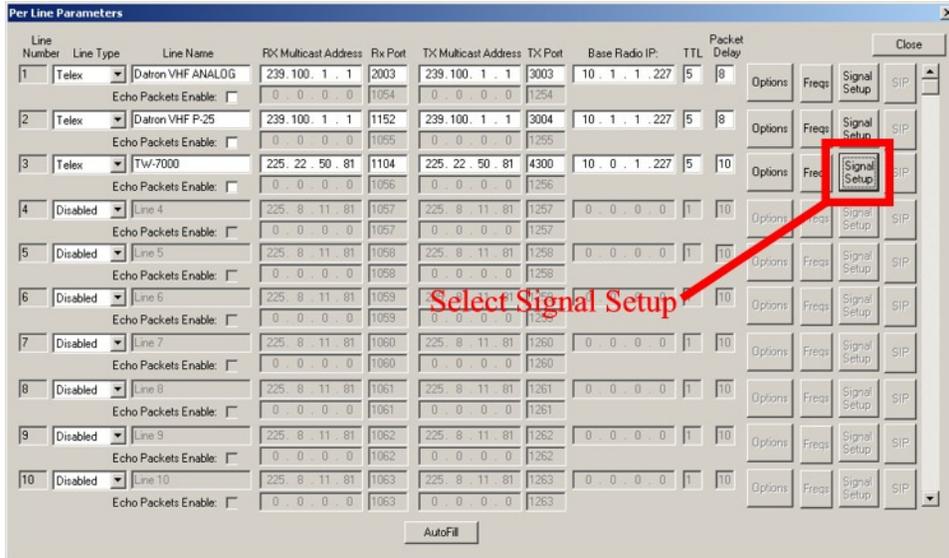
When a *Caller ID* is generated by the IP-223, it is put into a packet and sent to the C-Soft Console. If the *Caller ID* matches the *Per Line Console ID*, the Select Button will flash, the channel will un-mute, and an entry is made in the Console Call Log. Up to this point no additional configuration was required on the C-Soft Console. When using the *Caller ID* functionality there are several configuration settings that are required on the console. Fortunately all of the C-Soft Console configurations are located in one place and there are only 2 setting changes to make.

To setup a C-Soft Console to receive a console direct call via the *Caller ID*, we will need to use the C-Soft Designer to open our C-Soft Console and select *Edit | Setup Per Line Parameters*.

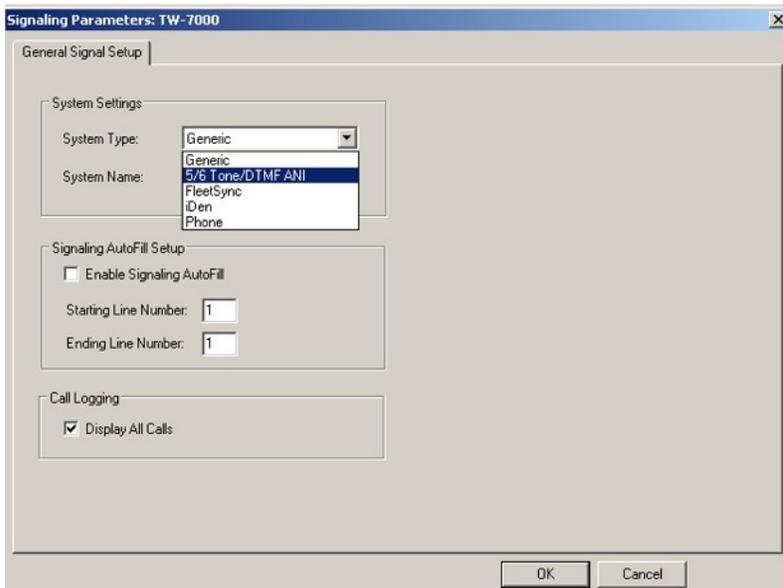


Telex Radio Dispatch DTMF ANI Application Note

Once we have opened the *Setup Per Line Parameters* page, we will need to select the *Signal Setup* button on the far right side of the page, remember this selection is line dependent. This will open up a new page called *Signaling Parameters*.



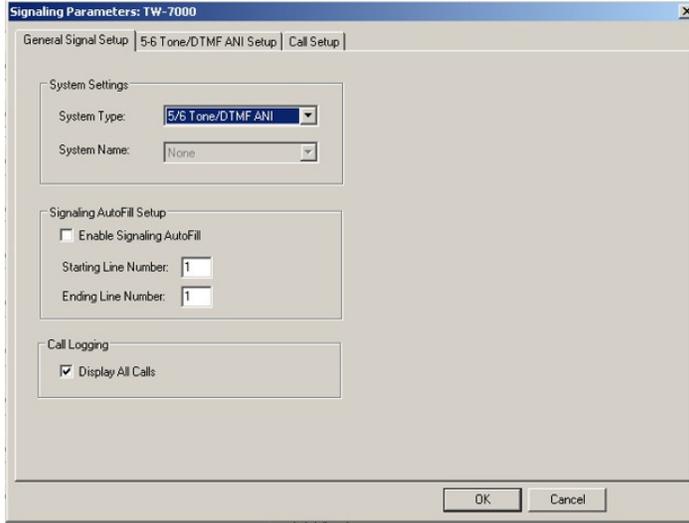
In my example I chose to configure Line 3, and after clicking the button, we see a page like the next example.



Typically the *System Type* is set to Generic. Select the *5/6 Tone/DTMF ANI* from the dropdown list. After that selection is made, 2 more tabs show up on the page.

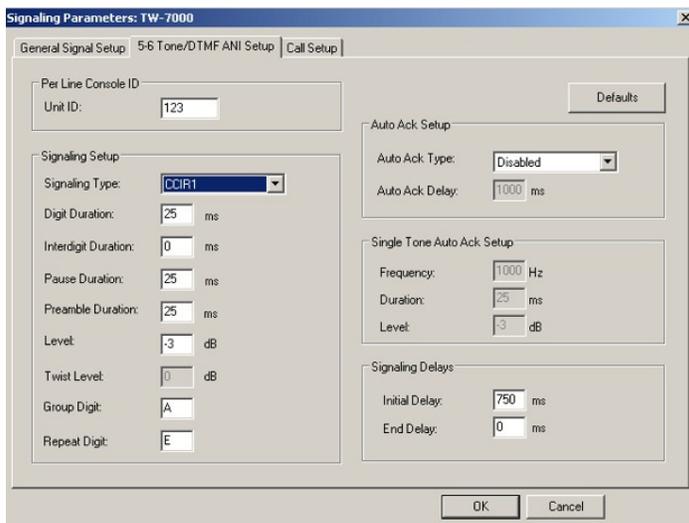
Telex Radio Dispatch DTMF ANI Application Note

Select the second tab, *5-6 Tone/DTMF ANI Setup*, you will see a page similar to the next example.



There are many parameters on this page, the only one we are interested in is the *Per Line Console ID – Unit ID*. Set this parameter to the desired *Caller ID* for this C-Soft Console, up to eight (8) digits. This completes the C-Soft Console Configuration for using *Caller ID* to alert a unique Console.

Now that the *Per Line console ID - Unit ID* has been set. In our example it is 123. We can compile and save the C-Soft Console, make sure that the IP-223 is configured to use DTMF ANI and has an ANI Signaling entry based on ANI DECODER #6, see above. When this C-Soft Console is started, the line that has been given a *Per Line console ID - Unit ID* will be muted for all traffic until a valid DTMF string is received that contains the desired Unit ID, at which point the line will un-mute and the Select Button will flash.

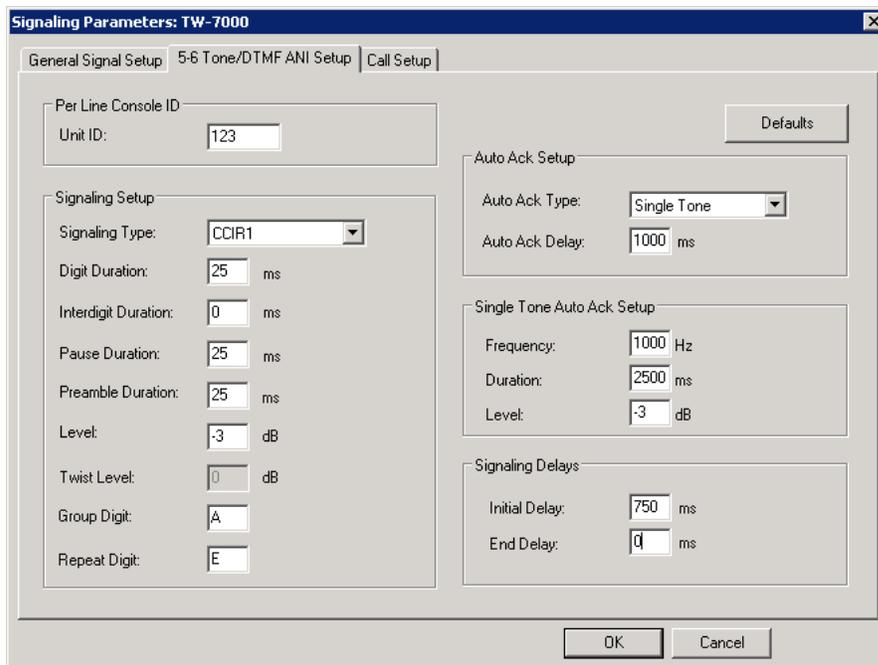


Remember that the *Caller ID* functionality depends on the IP-223 being configured to generate the packet in the first place.

Caller ID Auto Acknowledge

In addition to the Console Direct Call that we just discussed. There is an additional bit of functionality that can be enabled for this feature. Given that this feature is to allow a user in the field to signal a particular console, this added functionality will signal the user in the field that the C-Soft Console has received their call and to please stand-by. On the right side of the *5-6 Tone/DTMF ANI Setup* tab there is a section called *AutoAck Setup*. By default the *AutoAck Type* is set to disabled. However, when it is enabled the C-Soft Console has the ability to automatically send a confirmation tone. That tone can be a single tone or a DTMF string. The rest of the dialog is used to configure parameters such as the delay time before response, tone response frequency and duration, or a DTMF response string.

As an example, the following configuration will wait 1 second plus 750 ms and then send a 2.5 second burst of 1000 Hz tone when it receives an inbound call to its *Unit ID*.



Each line on the C-Soft Console can be configured to respond differently.

Call Setup Tab

The Third Tab called, *Call Setup*, is used to control the ten Call Buttons that appear on the bottom of a *Call List Window* or *Manual Call List Window*. Select the third tab to reveal the following page.

The use of this tab is to control what happens when one of the Call1-Call10 is clicked. The *Format* field follows somewhat the same form as the IP-223 DTMF ANI Call Format. The field is a *Mask* and can contain DTMF Digits as well as *mask elements*. The most common element is the “K”, which is a placeholder for the current *User ID*. The “P” is a pause element, normally used when on a PBX when a “9” is required for an outside call. The entry in Call 2 shows an example of dialing by *User ID*. The entry in Call 1 shows how to send a simple DTMF string on the selected line. See the example below of a *Call List Window* that appears when Line 3 is selected.

Alias	UserID
Dave	14255551212