15385 Carrie Drive
Grass Valley, CA 95949
Office: (530) 477-8400
Tech. Support: (530) 477-8402
FAX: (530) 477-8403
Sales: (800) 874-8663
Email: tech@norcommcorp.com
Web:www.norcommcorp.com

MODEL NC409 TOUCH-TONE* ANI/ALARM ENCODER INSTRUCTION MANUAL

INTRODUCTION

The Model NC409 is a unique field programmable micro-miniature Touch-Tone* ANI Encoder with 15 memory locations and last number redial. The NC409 features 0.5 to 20 digit per second, Encode Pause and Wait, PTT triggered ANI, Transmit T.O.T., Busy Lock-Out, TX Keying Output, Mic Mute Output, Alert Tone Output functions and a four line binary input for remote control of all 15 memories, plus last number redial, each capable of holding up to 30 characters. Eight of the fifteen memory locations can be programmed for alarm functions, providing selection of duration, ANI repetition rate and grace period.

The Model NC409 is completely self-contained measuring 0.85"W x 1.36"L x .165"H and is designed to automatically or manually generate all 16 standard DTMF characters. E^2Prom memory provides non-volatile storage of user programmable memories and input/output configuration and it is easily programmed by means of an external "X-Y" matrix 12 or 16 button keypad with common ground or optional Model NC500 Universal/P.C. Programmer.

GENERAL

The Model NC409 has been engineered for maximum reliability. However, should you require technical assistance or detailed information, please contact our Customer Service Department at (530) 477-8400.

SPECIFICATIONS

SIGNAL FORMAT . . . . . Encodes all 16 standard DTMF (Touch-Tone*) characters.

CODE CAPACITY . . . . . Fifteen (15) memories and one (1) ANI memory plus last number redial each capable of holding up to 30 characters using the 16 standard DTMF characters. (PTT Auto ANI limited to 14 characters)

PROGRAMMING METHOD . . . . . Field programmable by use of an "X-Y" matrix 12 or 16 button keypad with common ground. [No more programming by wire jumpers, code plugs or dip switches].

MEMORY . . . . . Programmable data is stored in non-volatile memory and will remain intact regardless of power interruptions. Requires no batteries.

OUTPUT LEVEL . . . . . Adjustable to 500mVRMS (No load).

OUTPUT IMPEDANCE . . . . . 22K ohm, D.C. blocked.

TWIST . . . . . Ratio of column to row tone is 3.0dB.

TONE ACCURACY . . . . . ±0.01% minimum, ±0.5% maximum.

PTT KEYING OUTPUT . . . . . Power MosFet output (150mA maximum @ 50Vds).

TIME BASE . . . . . Crystal controlled (3.5795MHz).

DATA RATE . . . . . 0.5 to 20 digits per second (DPS).

OPERATING VOLTAGE . . . . . 5.5VDC to 24VDC.

OPERATING CURRENT . . . . . <8mA.

SIZE . . . . . 0.85" W x 1.36" L x 0.165" H. 21.4mm W x 34.25mm L x 4.156mm H.

OPERATING TEMPERATURE . . . -20°C to +80°C.

MOUNTING . . . . . Can be mounted directly to pins on back of Digitran KL series 12 or 16 button keypad or wired remotely.

INTERFACING . . . . . Micro-miniature header and 12" color coded cable assembly.

-SPECIFICATIONS ARE NOMINAL AND AT 24°C AMBIENT TEMPERATURE-

THEORY OF OPERATION

The Model NC409 is easily programmed by means of an "X-Y" matrix 12 or 16 button keypad with common ground. Each of the numbered keys (0-9,*,#, and A-D) has the ability to store and execute up to a 30 digit sequence. "0" has the same capacity but instead functions as a Last Number Redial (LNR). A separate 14 digit ANI memory is dedicated to PTT operation; once programmed, it is executed by an active PTT Input.

A 4-line Binary-Coded Decimal (BCD) input allows activation of all 15 memories using "**Low True Logic**". This is useful for applications that do not utilize a keypad but instead use a binary switch to ground or a diode matrix for selecting memory locations. This same input may instead be configured as a 5-line input (4-line BCD plus strobe) using "**High True Logic**". This mode of operation allows the user to fully mimic keypad operation of the Model NC409 and makes available a multitude of interface/remote operation possibilities.

Two available modes of operation enable the user to configure the Model NC409 to best suit their needs. Manual Priority Mode provides easy manual operation while maintaining automatic execution as a recessed function. Automatic Priority Mode provides easy automatic operation while maintaining manual execution as a recessed function. Configurable input/output options round out the versatility of the Model NC409. **NOTE: Factory default settings are denoted by symbol [D].**

A) MANUAL PRIORITY MODE [D]:

Manual Priority Mode is selected by installing solder jumper JU4 (Always install or remove solder jumpers with power "**OFF**"). In this mode, all DTMF characters (1-9 and A-D) are generated by pressing their respective keys on the keypad for as long as the key is held; "0", "*", and "#" are the exceptions. If "0", "*", or "#" follow within 2 seconds of release of a previous character, it will immediately generate that DTMF character. To use "0", "*", or "#" as a first character, that digit must be pressed and **HELD** a period of time (1 second for "*" or "#", 2 seconds for "0") after which time that DTMF character is generated. This method of operation is necessary because "0", "*", and "#" serve special control functions within the Model NC409. By itself, "0" is the control character that provides access to the automatic features of the Model NC409. "0" pressed and immediately released, first gives an acknowledgement beep (not DTMF generated) and opens a 2 second window. A second character pressed within this 2 second window sends out the number sequence stored in that memory location (0 pressed again is Last Number Redial) **NOTE**: The operation as discussed here may differ if the user has activated any of the Alarm Mode functions (See "Alarm Mode Theory of Operation").

B) AUTOMATIC PRIORITY MODE:

Automatic Priority Mode is selected by removing solder jumper JU4 (Always install or remove solder jumpers with power "**OFF**"). In this mode, all keypad characters (0-9,*,#, and A-D) execute the number sequence stored in that memory location (0 is Last Number Redial). When depressed, each key will give an acknowledgment beep; when released, the number sequence executes. To access manual operation while in this mode, depress and **HOLD** the first digit for 2 seconds. When 2 seconds have elapsed, that DTMF character will be generated. The remaining characters may now be entered in a normal fashion providing that no more than 2 seconds elapse between characters. When 2 seconds pass without any further keypad entries, the Model NC409 reverts back to automatic operation. **NOTE:** The operation as discussed here may differ if the user has activated any of the Alarm Mode functions (See "Alarm Mode Theory of Operation").

C) ENCODE OUTPUT:

Provides encoded DTMF tones.

D) PTT KEYING OUTPUT:

Program selectable for either "**COMMON**" or "**FOLLOWING [D]**" operation. Provides an active "LOW" for keying of transmitter circuitry. With this output set for "FOLLOWING" and solder jumper JU1 removed, the user installs the PTT Input and PTT Keying Output leads separately into the transceiver and breaks the PTT path in the transceiver (NC409 in series with PTT function). This allows the Model NC409 to control the transceivers PTT function for the purposes of using the Busy Lock-Out or Transmit T.O.T. features. If these features are not desired nor is it feasible to break the PTT function in the transceiver, the user may select "COMMON" operation, install solder jumper JU1 and remove the PTT Keying Output lead from the plug. In this configuration, a one-wire PTT interface is used but still allows automatic PTT for encoding.

E) AUTOMATIC PTT KEYING:

Program selectable for either "**ENABLE**" or "**DISABLE**" (**[D] = "ENABLE"**). This setting applies to manual operation **only**. When disabled, this feature is useful for applications requiring "**STORE** and **SEND**" operation where a number may be manually entered (PTT Keying Inactive) and then sent automatically using Last Number Redial (PTT Keying Active).

F) TONE ALERT OUTPUT:

Provides tone output for acknowledgement, Busy Lock-Out , Transmit T.O.T. and Program modes.

G) MIC MUTE OUTPUT:

Provides an active "**LOW**" during encoding. Used for muting microphone audio during encoding.

H) PTT INPUT:

Program selectable for either active "**LOW [D]**" or "**HIGH**". **NOTE:** If PTT "COMMON" operation is selected, the PTT Input is automatically set to active "LOW". In "FOLLOWING" operation, the PTT Input activates the PTT Keying Output, Transmit T.O.T. and Busy Lock-Out functions. If PTT Auto ANI is enabled, the PTT Input will also activate this feature.

I) BUSY LOCK-OUT INPUT:

Program selectable for either active "**LOW**" or "**HIGH [D]**". Upon an active input, the PTT Input is disabled. (If Busy Lock-Out active state returns to inactive state while PTT is depressed, PTT Input must first be released before PTT function is enabled). A 125mS pulsating 1800Hz tone is generated at the Alert Tone Output if the PTT Input is activated during Busy Lock-Out. This function is to alert user that channel is in use. **NOTE:** The Model NC409 must be installed in series with transmitter PTT circuitry and PTT Keying Output set for "FOLLOWING" operation to utilize this feature.

J) BINARY CODED DECIMAL/ALARM TRIGGER INPUT:

This input can be set to function in one of two available modes. **"4-line mode"** is selected by removing solder jumper JU5 AND leaving BCD input mode select lead removed from ground. In this mode, a "**LOW**" on one or more of the four inputs (Q1, Q2, Q3, and Q4) will trigger the memory location associated with that particular binary input. This mode is also used for triggering the 8 available Alarm Status settings for memory locations 1 through 8. **"5-line mode"** is selected by installing solder jumper JU5 OR taking BCD Input mode select lead to ground. In this mode, the four inputs work in "**HIGH**" true logic and use the Strobe Input for reading in the data. This mode is useful with a four line plus Strobe Output from a keypad decoder chip or other similar output device. Access to memory programming in this mode is accomplished differently than normal operation. To access the memory programming mode, install solder jumper JU2. When memory programming is complete, remove the jumper. (SEE "TRUTH TABLES FOR BCD INPUT" PAGE #4)

K) KEYBOARD ENCODE:

Program selectable for either "**SMART**" or "**DUMB**" (**[D] = "DUMB"**). Encode speed, pause and wait functions may be inserted within a memory location and utilize "*" and "#" as special control characters. With a "SMART" keyboard these characters may be used, but this also means that special control characters must be used to automatically generate a "*" or a "#". For users who do not intend to utilize any special control characters and desire a more straight forward method to entering number sequences, the "DUMB" keyboard may be chosen and the Model NC409 will execute characters exactly as they were entered.

L) ENCODE SPEED:

Program selectable from 0.5 to 20 digits per second (**[D] = 10 DPS**). This selectable default speed setting affects all Automatic Number Sequences. There is also the ability to change encode speed within a memory location. With Keyboard Encode set for "SMART" operation, the "speed" control character "*1**N**" (where "N" is the speed setting) can be entered anywhere within a memory. This speed setting is only effective within the memory in which it is used.

Speed Settings

SETTING	0	1	2	3	4	5	6	7	8	9	0
DPS	0.5	1	2	3	4	5	6	8	10	15	20

* Digits per Second

M) ENCODE PAUSE:

Program selectable from 500mS to 6 seconds in 500mS increments (0-9, * = 10 and # = 12). A "**PAUSE**" may be inserted anywhere within an automatic number sequence. The sequence, when executed, will pause for the programmed amount of time and then resume, beginning with the next character in the sequence. The PTT Keying Output will remain active during the pause. With Keyboard Encode set for "SMART" operation, the "pause" control character "*2**N**" (where "N" is the pause duration setting) can be entered anywhere within a memory. An Automatic Number Sequence containing a pause will halt at the pause control character and then continue after the "pause" duration has elapsed.

N) ENCODE WAIT:

Program selected. A "**WAIT**" may be inserted anywhere within an automatic number sequence. The sequence will stop at this point and resume only upon a momentary active state on the PTT Input. If this PTT Input does not occur within 30 seconds from the beginning of the "Wait" command, the sequence will abort. The PTT Keying Output will go inactive for the duration of the "Wait" function. With Keyboard Encode set for "SMART" operation, the "Wait" control character "*3" can be entered anywhere within a memory.

O) 16 CHARACTER ENCODING WITH A 12 BUTTON KEYPAD:

Through the use of special control characters, all 16 DTMF characters may be entered into memory when using a 12 button keypad. With Keyboard Encode set for "SMART" operation, the control character "#**N**" (where "N" is the character desired) can be entered anywhere within a memory. (Note that "*" and "#" also require special control characters with Keyboard Encode in "SMART" mode.)

The Control Characters are:

#* = * #2 = B
= # #3 = C
#1 = A #4 = D

TRUTH TABLES FOR BCD INPUT

4-LINE MODE1				
MEMORY #	Q4	Q3	Q2	Q1
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
0	1	0	1	0
#	1	0	1	1
A	1	1	0	0
B	1	1	0	1
C	1	1	1	0
D	1	1	1	1

LOW = TRUE = 1

5-LINE MODE					
DTMF CHARACTER	ACTIVE STROBE	Q4	Q3	Q2	Q1
1	1	0	0	0	1
2	1	0	0	0	0
3	1	0	0	0	1
4	1	0	0	1	0
5	1	0	0	1	1
6	1	0	0	1	0
7	1	0	0	1	1
8	1	1	1	0	0
9	1	1	1	0	1
0	1	1	1	0	0
0	1	1	1	0	1
#	1	1	1	1	0
A	1	1	1	1	1
B	1	1	1	1	0
C	1	1	1	1	1
D	1	0	0	0	0

HIGH = TRUE = 1

P) PTT AUTO ANI:

Program selectable "**DISABLE**", "**START**" or "**END**" of transmission (**[D] = "ENABLE" and "START"**). If selected "START", this feature will automatically trigger the 1 to 14 character ANI memory location upon an active state on the PTT Input. If PTT Delay has been programmed, the ANI (ANI "START") will activate AFTER this delay has expired. If selected "END", this feature will automatically trigger the 1 to 14 character ANI memory location when the PTT Input goes inactive, at which time the PTT Keying Output remains active until completion of the ANI sequence.

Q) PTT DELAY:

Program selectable from Ø to 1.2 seconds in 100mS increments (**[D] = 300mS**). (Increments are Ø-9, * = 10 and # = 12) This delay allows a momentary tap of the PTT button (used with some decoders) without activating the ANI. This delay also allows for "KEY UP" time in transmitters and/or repeaters so that the ANI (ANI "START") doesn't get cut off.

R) PTT AUTO ANI T.O.T.:

Program selectable Ø to 120 seconds in 10 second increments (**[D] = 120 seconds**). This timer starts at the end of each active state on the PTT Input. This timer must complete its cycle without an active PTT Input before the PTT Auto ANI can again be triggered.

S) TRANSMIT TIME-OUT TIMER:

Program selectable from Ø to 120 seconds in 10 second increments (**Ø = disabled, [D] = 120 seconds**). Timer starts each time PTT Input is activated. Upon Time-Out, the transpond PTT Output returns to its inactive state and a 125mS pulsating 1800Hz tone is generated at the Tone Alert Output. This condition continues until the PTT button is released, at which time the pulsating tone stops and the T.O.T. is reset.

NOTE: The Model NC409 must be installed in series with Transmitter PTT Circuitry and PTT Keying Output set for "FOLLOWING" operation to utilize this feature.

T) ANI MEMORY PROGRAMMING MODE INHIBIT:

Program selectable **"NO"** or **"YES"** (**[D] = "NO"**). When set to "YES", this function inhibits any further access to the ANI Memory Programming Mode, while maintaining normal execution of stored number sequences. Attempts to access the programming mode under this condition will result in the pulsating 1800Hz tone normally heard when exiting the programming mode and no function takes place.

U) "*" AND "#" PROGRAMMING INHIBIT:

Program selectable **"NO"** or **"YES"** (**[D] = "NO"**). When set to "YES", this function inhibits any further re-programming of the "*" and "#" user memories. This feature provides two secured memories plus normal user access to the remaining 13 memories. Normal execution of stored number sequences is maintained. Attempts to reprogram the "*" and "#" memories will result in the same steady 1800Hz error tone that occurs when an attempt is made to store a number in the "0" (LNR) memory.

V) MANUAL OPERATION INHIBIT:

Program selectable **"NO"** or **"YES"** (**[D] = "NO"**). When set to "YES", this function inhibits all manual operation and forces the NC409 into the automatic mode regardless of the mode select jumper JU4. This limits the end user to auto dialing only and helps deter system abuse.

ALARM MODE
THEORY OF OPERATION

The Alarm Mode provides the user a means of custom configuring the Model NC409 to provide the generation of a periodic, repeating ANI for use in security or alarm related functions. The Alarm Mode function can be exclusively assigned to each of the first 8 memory locations (1 through 8) and is triggered via the Binary Coded Decimal (BCD)/Alarm Trigger Input. Alarm "EXCLUSIVE" disables the activation of a memory location via the external keypad if that memory is designated as Alarm Mode "SET".

NOTE: This function slightly alters the operation of the Model NC409 in the Manual Priority and Automatic Priority Modes.

A) ALARM ENABLES:

Program selectable "**SET**" or "**NO**" for each of the first 8 memory locations (1 through 8, **[D] = No locations set**). When "SET" is chosen for one of the available memory locations, the following Alarm functions/options are available. If set to "NO", that memory location functions normally as described in "Manual Priority Mode" and "Automatic Priority Mode" sections.

B) ALARM DELAY (Grace Period):

Program selectable from Ø to 120 seconds in 10 second increments (**Ø = no delay, [D] = Ø**). If a delay is programmed, it provides a grace period in which the alarm activation can be reset before the repeating ANI sequence begins. An optional audible beep (**[D] = Disabled**) sounds every 2 seconds at the Tone Alert Output during the Alarm Delay to notify the user that the alarm function has been activated and is about to send the repeating ANI.

C) ALARM EXCLUSIVE:

Program selectable "**NO**" or "**YES**" (**[D] = "NO"**). This function applies to any ANI memories with Alarm Enable "SET". With Alarm Exclusive set for "YES", an ANI designated as an alarm can only be activated via the 4-line input. An attempt to execute that same memory via the keypad will result in a steady 1800Hz error tone.

D) PTT HANG:

Program selectable "**DISABLE**" or "**ENABLE**" (**[D] = DISABLE**). When selected for "ENABLE", the PTT Keying Output will remain active for the entire duration of a triggered alarm function. This feature is useful when it is desired to monitor conversation and/or noise occurring at the alarm site. The Mic Mute Output only goes active during ANI execution and therefore will not interfere with transmitted audio. When PTT "HANG" is selected as "DISABLE", the PTT Keying and Mic Mute Outputs will only go active upon ANI execution.

E) DURATION:

Program selectable 1 through 10 minutes or "**INFINITE**" (**[D] = 1 minute**). This determines the amount of time a triggered alarm function will operate before terminating itself. A momentary ground on the Alarm Reset Input will terminate an active alarm function at any time. When set for "INFINITE" duration, the alarm function will continue endlessly until terminated by a momentary ground on the Alarm Reset Input.

F) REPETITIONS PER MINUTE:

Program selectable 1-10, or 12 repetitions per minute (**[D] = 3**). When an alarm is triggered, an initial ANI is immediately activated regardless of the RPM setting. The following ANI activations will then occur at intervals dependent on the RPM setting. For example, an RPM of 6 will activate the ANI once every 10 seconds; an RPM of 12 will activate the ANI once every 5 seconds; etc.

INTERFACING INSTRUCTIONS

The Model NC409 comes complete with factory default program settings and a 14 pin micro-miniature cable assembly.

Although the Model NC409 is engineered for maximum immunity to R.F., it's suggested that all leads be kept to minimum lengths and away from transmitter final circuitry.

When using the Digitran Model KL0054 12 button keypad, the NCC Spacer may be used to mount the NC409 encoder with keypad to the front of most hand-held or mobile transceivers.

BROWN . . . . . See "Binary Coded Decimal/Alarm Trigger Input" under "Theory of Operation" for application of
[Q4 of BCD Input] this input.

RED [+ SUPPLY] . . . . . Connect to 5.5VDC to 24VDC.

ORANGE . . . . . See "Binary Coded Decimal/Alarm Trigger Input" under "Theory of Operation" for application of
[Q2 of BCD Input] this input.

WHITE . . . . . Connect to Transmitter PTT Circuitry. This output is an open collector transistor and will sink
[TX/T.O.T./Busy Lock- to ground 100mA @ 40VDC. **NOTE**: In order for this output to control PTT function for
Out Keying Output] purpose of using T.O.T. and Busy Lock-Out, encoder must be installed in series with transceiver's PTT line and PTT/TX Keying Select set for **"FOLLOWING"** operation.

VIOLET . . . . . Connect to receiver's audio output circuitry NOT controlled by the squelch circuitry. This
[Tone Alert Output] will prevent muting of the alert tones when the receiver is squelched. This output is D.C. blocked and a series resistance may be installed in the lead for adjusting audio level and to prevent circuitry loading.

GRAY . . . . . Default programmed for PTT Active **"Low"**. Connect to transceiver circuitry that provides a
[T.O.T./PTT Input] **"Low"** when keyed. To connect to circuitry that provides a **"High"** when keyed, program this function for PTT Active **"High"**. **NOTE:** The encoder must be placed in series with Transceiver's PTT Line and PTT/TX Keying Select set for **"FOLLOWING"** operation to enable use of T.O.T. and Busy Lock-Out. When PTT/TX Keying is set for **"COMMON"** operation, the PTT Input is forced to active "Low" operation (The White lead may be removed and solder bridge jumper JU1 installed to facilitate **"COMMON"** operation as a one wire interface).

BLUE . . . . . This input may be used for externally selecting the operating mode of the BCD Input. When
[BCD Input Mode Select] ungrounded, the input is set to **"4-line mode"**. When taken to ground, the input is set to **"5-line mode"**. (See "Theory of Operation" for explanation of these modes) Solder bridge jumper JU5 on the PCB may be used instead, in which case this lead may be removed.

BLACK [- SUPPLY] . . . . . Connect to system ground.

YELLOW . . . . . See "Binary Coded Decimal/Alarm Trigger Input" under "Theory of Operation" for application of
[Q3 of BCD Input] this input.

WHITE/BLUE . . . . . This input works in conjunction with the BCD Input when in 5-line mode. See "Binary Coded
[Strobe Input] Decimal/Alarm Trigger Input" under "Theory of Operation" for application of this input.

BLACK/WHITE . . . . . See "Binary Coded Decimal/Alarm Trigger Input" under "Theory of Operation" for application of
[Q1 of BCD Input] this input.

GREEN . . . . . Connect to microphone input amplifier stage. To set proper deviation level, encode a DTMF
[Encode Audio Output] character and adjust output level pot. R2 for ±3KHz deviation, as viewed on monitor scope. (See Component Locator for location of R2)

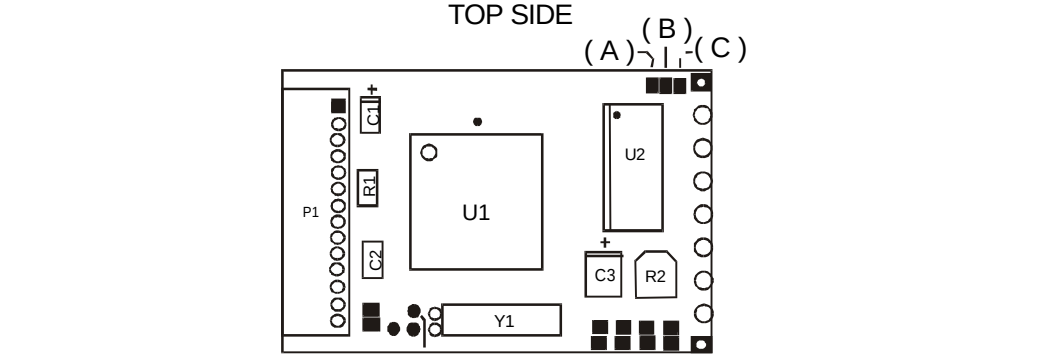
PAD "D" ON P.C.BOARD . . . . . Default programmed for active "**HIGH**". Connect to receiver's squelch circuitry that provides
[Busy Lock-Out Input] a minimum of +2VDC when channel is busy. For reverse operation, program this function for active "**LOW**". Connect to squelch circuitry that provides a minimum of +2VDC and goes to Ø (ground) when channel is busy. **NOTE:** This feature may be utilized by soldering a wire onto the pad for hook-up to transceiver. PTT/TX Keying must be set for **"FOLLOWING"** operation to utilize this feature.

PAD "E" ON P.C.BOARD . . . . . Connect this input to a switch, button or logic circuitry that will provide a **"LOW"** to reset
[Alarm Reset Input] Alarm activation. **NOTE:** This input may be HELD low to inhibit Alarm activation. This is useful for temporary disabling of alarm functions for purpose of entering through a door or opening a cabinet without setting off an alarm.

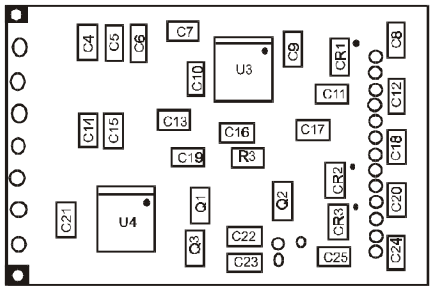
PAD "F" ON P.C.BOARD . . . . . Connect this output to microphone's audio path for disabling of Mic Audio during encoding of
[Mic Mute Output] DTMF characters.

COMPONENT LOCATOR

TOP SIDE



BOTTOM SIDE



PROGRAMMING INSTRUCTIONS

The Model NC409 is field programmable via an installed 12 or 16 button keypad (The BCD Input in 5-line mode may also be used). This keypad must be of the X-Y matrix type with a common ground such as the Digitran KL series or Pipo Communications keypads. To configure the NC409 for a 12 button keypad, install solder jumper JU6-B&C. To configure for a 16 button keypad, install solder jumper JU6-A&B. If a keypad is not used, the NC500 Universal/P.C. Programmer is available for programming the NC409.

In order to program the Model NC409, the unit must have power applied and it is recommended that the Alert Tone Output be utilized for programming confirmation while in the programming mode. If the Model NC500 Universal Programmer is being utilized, simply plug the NC409 into the plug assembly. **NOTE:** When using the NC500, the audible beeps are replaced by visual light flashes.

Two different types of programming schemes are used in the Model NC409. One mode is easily accessed via the keypad to enable the end user to store his own number sequences in memory (ANI Programming Mode), and the other requires the removal of a solder bridge jumper on the P.C. Board which makes this mode inaccessible to the end user (Configuration Programming Mode).

CONFIGURATION PROGRAMMING MODE

The Configuration Programming Mode allows programming of all Input/Output configurations, Alarm function configurations and the 14 digit PTT Auto ANI.

The Configuration Programming Mode is entered by removing solder bridge jumper JU3 (Power "**OFF**"). Any feature may now be programmed in any order. Each key entry is confirmed by an audible beep. Each correctly entered program line is accepted with a series of audible beeps. Any error or invalid program line entry results in a steady, 1 second tone (the feature being programmed remains unchanged). The program line consists of the following entries: A "*****", followed by the address number of the desired feature, followed by a "**#**", followed by the index number (if used) and the parameters.

EXAMPLES:

To program a PTT Auto ANI of 1234:

1. Disconnect power.
2. Remove solder bridge jumper JU3.
3. Connect NC409 to keypad or plug into Model NC500 Universal Programmer.
4. Connect Alert Tone Output for audio acknowledgement (Not applicable to NC500 Universal/P.C. Programmer).
5. Apply power.
6. Enter "* 0 # 1 2 3 4" and wait for confirmation.
7. Remove power and replace solder bridge jumper JU3 or continue programming.

To program the PTT Auto ANI "**ON**" and at the "**START**" of an active PTT Input:

1. Disconnect power.
2. Remove solder bridge jumper JU3.
3. Connect NC409 to keypad or plug into Model NC500 Universal/P.C. Programmer.
4. Connect Alert Tone Output for audio acknowledgement (Not applicable to NC500 Universal/P.C. Programmer).
5. Apply power.
6. Enter "* 3 # 6 1" and wait for confirmation. (Sets "**ON**")
7. Enter "* 3 # 5 1" and wait for confirmation. (Sets "**START**")
8. Remove power and replace solder bridge jumper JU3 or continue programming.

NOTE: If you get a steady error tone, simply enter the program line again.

MEMORY PROGRAMMING MODE

The ANI Memory Programming Mode allows programming of the 15 available user ANI memories (1-9, *, # and A-D). This mode is easily accessed by the end user which provides the ability to customize and continually update the memories. Once programmed, further access to this mode may be inhibited if desired. (See "ANI Memory Programming Mode Inhibit" under "Theory of Operation" for more information.)

The ANI Memory Programming Mode is entered by simultaneously pressing and HOLDING the "*****" and "**#**" characters for 2 seconds, at which time a steady 1800Hz tone will begin sounding signifying the opening of the ANI Memory Programming Mode ("*" and "#" may be released at any time once the 1800Hz tone begins sounding). Programming may now begin. (**NOTE:** After 1 minute of inactivity in this mode, the Model NC409 will automatically terminate the mode and sound a steady 1800Hz tone for 1 second.) Once the Memory Programming Mode is opened, any of the 15 user ANI memories may be programmed; the program line consists of the following entries: The character associated with the desired memory, followed by the actual numbers (including special control characters, if any) to be stored in that memory. Enter up to 30 characters and then wait for 2 seconds at which time a pulsating 1800Hz tone will sound indicating acceptance of the sequence. If an attempt is made to enter more than 30 characters, each character over 30 will result in a steady 1800Hz tone and is ignored. If the 2 second window is allowed to time-out between character entries, the NC409 will accept the sequence up to that point and sound the pulsating 1800Hz acknowledgement (The 2 second window is only in effect once a sequence has begun). The mode is exited by simultaneously pressing and holding "*****" and "**#**" until the pulsating 1800Hz tone is heard.

EXAMPLES:

To program "5551234" into memory 1:

1. Simultaneously press and hold "*****" and "**#**" until the 1800Hz tone sounds.
2. Press "1 5551234" without exceeding 2 seconds between characters.
3. After 2 seconds, the pulsating 1800Hz tone will sound signifying acceptance of the sequence.
4. Another memory may now be programmed or the mode may be exited by simultaneously pressing and holding "*****" and "**#**" until the pulsating 1800Hz tone is heard.

To program "12A3B" into memory "*" using a 12 button keypad (must be set for "SMART OPERATION")

1. Simultaneously press and hold "*" and "#" until the 1800Hz tone sounds.
2. Press "* 1 2 #1 3 #2" without exceeding 2 seconds between characters.
3. After 2 seconds, the pulsating 1800Hz tone will sound signifying acceptance of the sequence.
4. Another memory may now be programmed or the mode may be exited by simultaneously pressing and holding "*" and "#" until the pulsating 1800Hz tone is heard.

To program (assuming a default speed setting of 10 DPS) "13859(@ 10 DPS) [3 second pause] 5551234(@ 20 DPS)" into memory 5 (must be set for "SMART OPERATION"):

1. Simultaneously press and hold "*" and "#" until the 1800Hz tone sounds.
2. Press "5 13859 *26 *1* 5551234" without exceeding 2 seconds between characters.
3. After 2 seconds, the pulsating 1800Hz tone will sound signifying acceptance of the sequence.
4. Another memory may now be programmed or the mode may be exited by simultaneously pressing and holding "*" and "#" until the pulsating 1800Hz tone is heard.

FACTORY OPTIONS

The Model NC500 Universal/P.C. Field Programmer is a small, smartly styled battery powered plastic enclosure with keyboard for service shop or field programming of the Model NC409 DTMF Encoder.

The Model NC500 menu driven software provides all programming data to be input or read from the NC409 and edited on the screen along with a print-out of all data. Software is supplied on both a 5.25" and 3.5" floppy disk and operates under MS-DOS (version 3.01 or later) on any IBM-PC/XT, AT or Compatible computer. For further details concerning this option, call 1-800-874-8663.

Encoders may be ordered pre-programmed to customers specifications for a charge of $5.00 per unit.

Contact NorComm for more information concerning these features.

PROGRAMMING CHART

PTT ANI

FUNCTION	FEATURE NUMBER	ADDRESSING PARAMETERS	SEQUENCE LENGTH
Set PTT ANI	Ø	Any of the 16 DTMF Characters	1-14

ENCODE OUTPUT CONFIGURATIONS

FUNCTION	FEATURE NUMBER	INDEX NUMBER	ACTIVE PARAMETERS
PTT Input Polarity	3	1	Ø = LOW 1 = HIGH
Busy Lock-Out Input Polarity	3	2	Ø = LOW 1 = HIGH
Keyboard Operation	3	3	Ø = DUMB 1 = SMART
PTT Auto ANI	3	4	Ø = DISABLE 1 = ENABLE
PTT Auto ANI	3	5	Ø = START 1 = END
Auto PTT Keying	3	6	Ø = DISABLE 1 = ENABLE
PTT/TX Keying	3	7	Ø = FOLLOWING 1 = COMMON

TIMING CONFIGURATIONS

FUNCTION	FEATURE NUMBER	INDEX NUMBER	TIMING PARAMETERS
Default Encode Speed	2	1	0.5 to 20 DPS
PTT Delay	2	2	Ø to 1.2 Seconds
TX Time-Out Timer (T.O.T.)	2	3	Ø to 120 Seconds
PTT Auto ANI T.O.T.	2	4	Ø to 120 Seconds

NOTE: Select 1 to 9, * for 10 secs. or # for 12 secs. Ø disables function. See "Theory of Operation" for Encode speed settings.

ALARM CONFIGURATIONS

FUNCTION	FEATURE NUMBER	INDEX NUMBER	PARAMETERS
Alarm Enables	1	-	Memories 1 thru 8, Ø = None
Alarm Duration	4	1	1 to 10 minutes # = infinite
Alarm Reps. per minute	4	2	1 to 12 RPM
Alarm Grace Period	4	3	Ø to 12 Seconds
PTT Hang	5	1	Ø = Disable 1 = Enable
Alarm Exclusive	5	2	Ø = No 1 = Yes
Grace Period "Beep Alert"	5	3	Ø = Enable 1 = Disable
Memory Prog. Mode Inhibit	5	4	Ø = No 1 = Yes
* and # Programming Inhibit	5	5	Ø = No 1 = Yes
Manual Operation Inhibit	3	8	Ø = No 1 = Yes

NOTE: Select 1 to 9, * for 10 secs. or RPM; # for 12 secs. or RPM; Ø disables function.

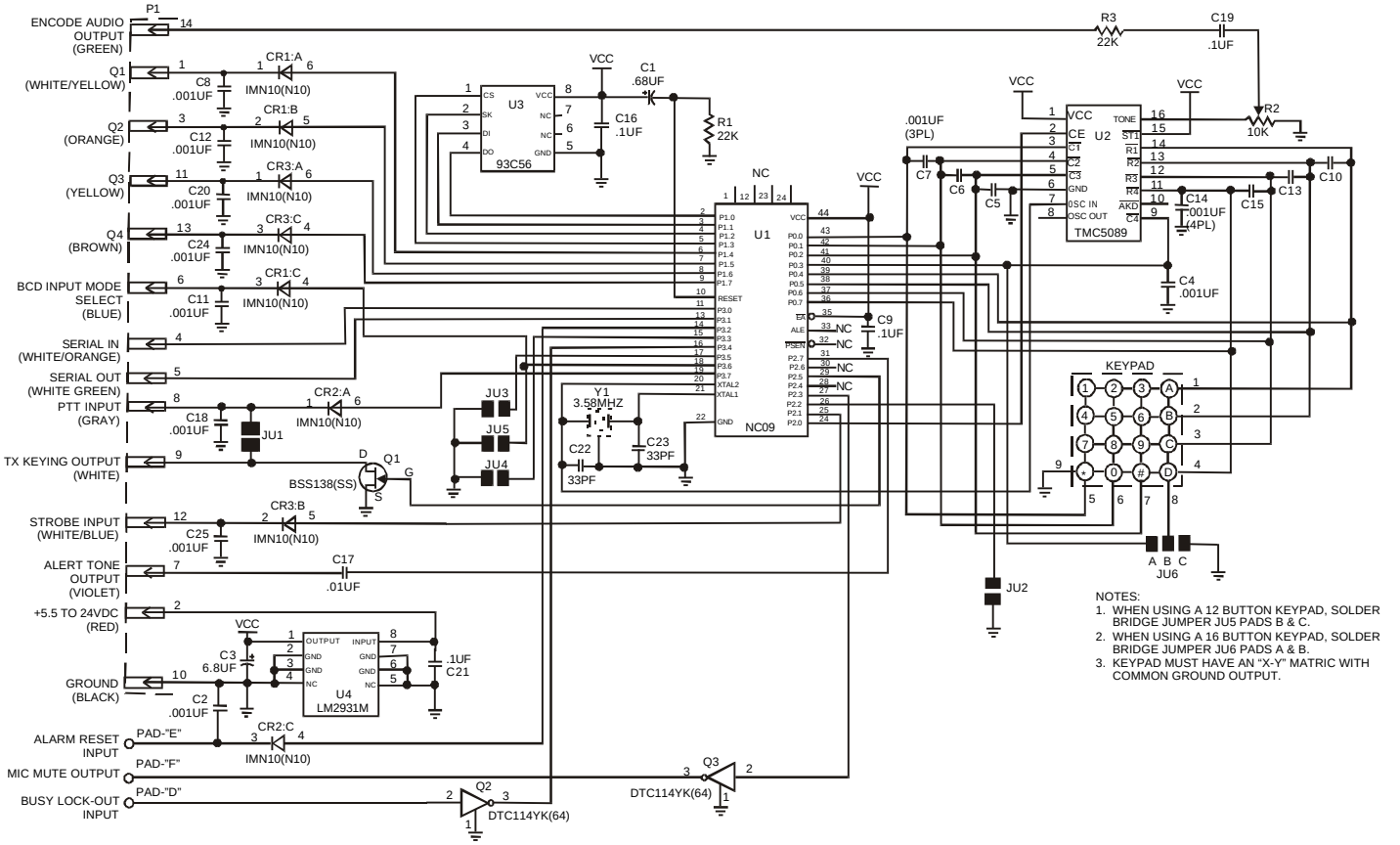
WARRANTY POLICY

NorComm products are unconditionally guaranteed for two (2) years on materials and labor from date of purchase.

All Warranty repairs must be performed at NorComm's Customer Service Department in Grass Valley, CA. Units under warranty can be returned for repair or replacement without prior authorization, however, a letter explaining the defect should be enclosed with the unit. Out of warranty units returned constitute Purchaser's authorization for NorComm to repair or replace equipment and to invoice Purchaser for any and all reasonable costs of repair labor, parts and freight.

NorComm shall not be obligated to repair or replace equipment rendered defective, in whole or in part, by causes external to the equipment, such as, but not limited to, catastrophe, power failure, or transients, environmental extremes, improper use, and maintenance or interfacing applications. NorComm further assumes no liability for any incidental or consequential damages which may result from the applications of its products by the Purchaser or any other party.

SCHEMATIC LAYOUT



PROGRAMMING WORKSHEET

The NC409 Programming Worksheet was developed to assist you in programming the encoder and to give you a permanent record for future reference. Fill in highlighted squares with desired limits for the "timed outputs" and "decode input/output configuration" with the desired DTMF digit. Start programming the NC409 by following the programming instructions on page 10 of the Instruction Manual and referring to this Programming Worksheet. Input each number exactly as it is shown on your Programming Worksheet, including all blocks, highlighted and unhighlighted.

CUSTOMER_____ **VEHICLE I.D.**_____ **DATE**_____

RADIO MAKE_____ **RADIO MODEL**_____ **SERIAL NO.**_____

PTT ANI

SET PTT ANI	*	0	#											

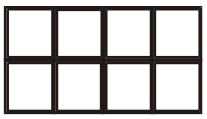
ENCODE OUTPUT CONFIGURATIONS

SET PTT ANI	*	3	#	1	
BUSY LOCK-OUT INPUT POLARITY	*	3	#	2	
KEYBOARD OPERATION	*	3	#	3	
PTT AUTO ANI	*	3	#	4	
PTT AUTO ANI	*	3	#	5	
AUTO PTT KEYING	*	3	#	6	
PTT/TX KEYING	*	3	#	7	

TIMING CONFIGURATIONS

DEFAULT ENCODE SPEED	*	2	#	1	
PTT DELAY	*	2	#	2	
TX TIME-OUT TIMER (T.O.T.)	*	2	#	3	
PTT AUTO ANI T.O.T.	*	2	#	4	

ALARM CONFIGURATIONS

ALARM ENABLES---------- * 1 # 

ALARM DURATION---------- * 4 # 1 ☐ = _____

ALARM REPS. PER MINUTE---------- * 4 # 2 ☐ = _____

ALARM GRACE PERIOD---------- * 4 # 3 ☐ = _____

PTT HANG---------- * 5 # 1 ☐ = _____

ALARM EXCLUSIVE---------- * 5 # 2 ☐ = _____

GRACE PERIOD "BEEP ALERT"------- * 5 # 3 ☐ = _____

MEMORY PROG. MODE INHIBIT------- * 5 # 4 ☐ = _____

*** AND # PROG. INHIBIT**---------- * 5 # 5 ☐ = _____

MANUAL OPERATION INHIBIT---------- * 3 # 8 ☐ = _____

NOTES