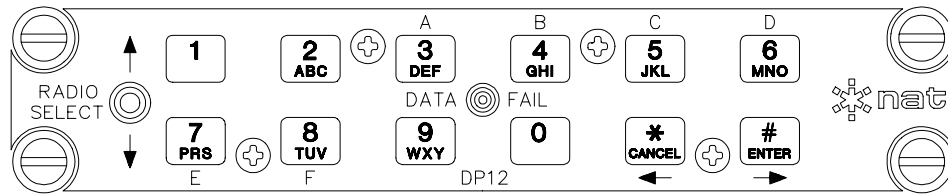
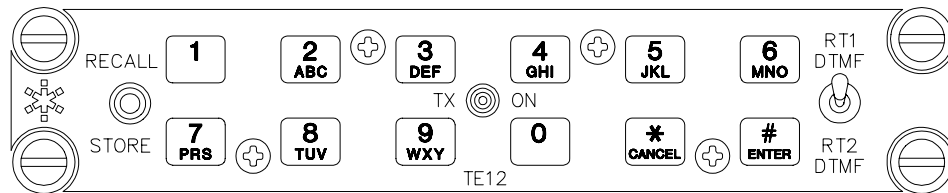
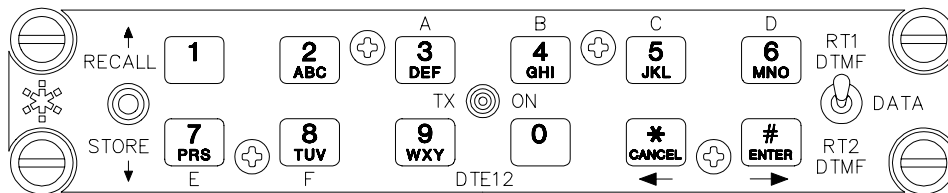




**SM11**

**DTE12/TE12/DP12  
DTMF Tone Encoder/Data Entry  
Keypad**



**INSTALLATION AND OPERATION MANUAL**

**REV 4.00 November 25, 2003**

**Northern Airborne Technology Ltd.  
1925 Kirschner Road  
Kelowna BC, Canada  
V1Y 4N7**

**Telephone (250) 763-2232  
Facsimile (250) 762-3374**

**Copyright 2003 by Northern Airborne Technology**



Periodically NAT will release manual amendments. In order to maintain the most accurate and up to date manual these amendments should be carried out immediately upon receipt and recorded on the following amendment record.

AMENDMENT RECORD				
Amendment Number	Amendment Date	Section(s) Changed	Date Entered	Entered By

Insert any Amendment Instruction sheets after this page.



## Table of Contents

Section	Title	Page
1.0	Description	
1.1	Introduction	1-1
1.2	Purpose of Equipment	1-1
1.2.1	DTMF Signaling	1-1
1.2.2	Keypad Data Entry	1-1
1.3	Features	1-2
1.4	Specifications	1-3
1.4.1	Electrical Specifications	1-3
1.4.2	Physical Specifications	1-4
1.4.3	Environmental Specifications	1-4
1.5	Unit Nomenclature	1-5
2.0	Installation	
2.1	General	2-1
2.2	Unpacking and Inspection	2-1
2.3	Installation Procedures	2-1
2.3.1	Warnings	2-1
2.3.2	Cautions	2-2
2.3.3	Notes	2-2
2.3.4	Cable and Wiring	2-2
2.3.5	External Switches and Breakers	2-3
2.3.6	Post- Installation Checks	2-3
2.4	Installation Configurations	2-4
2.4.1	Tac/Com Systems	2-4
2.4.2	Tac/Com Control Head Serial Ports	2-5
2.4.3	One Data Pad	2-5
2.4.4	One Data Pad and One Slave Control Head	2-6
2.4.5	Two Data Pads and One Slave Control Head	2-9
2.4.6	One Data Pad and Two Slave Control Heads	2-10
2.4.7	Multiple Data Pads and Slave Control Heads	2-14
2.5	Installation Drawings	2-15



3.0	Operation	
3.1	Introduction	3-1
3.2	Controls	3-1
3.2.1	The Mode Switch (TE12 and DTE12)	3-2
3.2.2	The Function Switch	3-2
3.2.3	Number Buttons (0-9)	3-2
3.2.4	CANCEL, Left Arrow, (*) Button	3-3
3.2.5	ENTER, Right Arrow, (#) Button	3-3
3.2.6	Transmit, Data Error Annunciator	3-3
3.3	DTMF Signaling Operation of TE12/DTE12	3-4
3.3.1	Selecting a Radio	3-4
3.3.2	Manual Transmitting a Tone Sequence	3-4
3.3.3	Retransmitting a Tone Sequence	3-5
3.3.4	Storing a Tone Sequence	3-6
3.3.5	Transmitting a Stored Tone Sequence	3-7
3.3.6	Deleting a Stored Tone Sequence	3-8
3.3.7	Displaying a Stored Tone Sequence	3-9
3.4	Data Entry Mode	3-10
3.4.1	Selecting a Channel on a Control Head	3-10
3.4.2	Editing Frequencies on a Control Head	3-11
3.4.3	DTE12/DP12 Serial Communications Time-out	3-13





## Section 1.0 Description

### 1.1 Introduction

---

The TE12 and DTE12 are accessory units for use with Tac/Com FM transceivers and other transceivers requiring generation of **DTMF** (Dual Tone/Multi-Frequency) signaling tones.

The DTE12 and DP12 are intended for use with Tac/Com II (TH and UEC series) Control Heads, and provide keypad entry for radio and channel selection, as well as frequency editing.

### 1.2 Purpose of Equipment

---

#### 1.2.1 DTMF Signaling

---

In many systems where air to ground FM communication is carried out, a requirement may exist for special signaling functions such as repeater activation, direct phone patch dialing or selective calling. When this function is to be accomplished using DTMF tones (the same tones heard on a "touch tone" phone), then the TE12 or DTE12 can be used. DTMF tones are momentary tones sent for a specific function, unlike CTCSS or sub-audible tones which are present continuously during transmission to control squelch gate activation.

Whenever a tone sequence is selected on the DTE12/TE12, the appropriate transmitter is keyed and the tones are sent to the radio. No other operator intervention is required, and no external transmitter keying is needed. The transceiver immediately returns to the receive mode as soon as the tone sequence has been sent.

This function is useful for direct phone dialing (via appropriate radio systems), EMS aircraft to Hospital calling (where DTMF tones are used to activate the specific hospital radio on a common channel), and various repeater control functions.

#### 1.2.2 Keypad Data Entry

---

The DTE12 and DP12 allow direct channel selection by pressing the channel number buttons and the ENTER button, without having to slew through all the channels between the present and new channel. Transmit or receive frequencies can be edited by simply entering the frequency on the keypad, without having to slew through each digit of the frequency.

## 1.3 Features

---

### **MICROPROCESSOR CONTROLLED:**

Unlike many DTMF signaling systems, the TE12 and DTE12 are microprocessor controlled. The tones are digitally stored and synthesized for exceptional long term crystal-controlled stability and accuracy.

### **FLOATING OUTPUTS FOR TWO RADIOS (DTE12/TE12):**

Two sets of radio connections, floating to minimize noise coupling problems, provide maximum interconnect versatility. The outputs are disconnected from the radios when not active.

### **ADJUSTABLE TONE LEVEL (DTE12/TE12):**

Individual internal adjustment for each of the two DTMF tone level outputs (0.0-1.0  $V_{rms}$  into 150  $\Omega$ ) for level matching with all types of transceivers.

### **TEN MEMORY LOCATIONS (DTE12/TE12):**

Ten non-volatile memory locations for storing and recalling sequences of up to 11 tones.

### **LAST TONE SEQUENCE RECALL (DTE12/TE12):**

The last tone sequence entered (up to 11 tones) may be recalled and retransmitted.

### **TRANSMIT ANNUNCIATOR (DTE12/TE12):**

Front panel LED lights green when the DTE12/TE12 is transmitting a tone sequence.

### **INCOMPLETE OPERATION ANNUNCIATOR (DTE12/TE12):**

Front panel LED flashes red while an operation is still in progress.

### **TONE SEQUENCE DISPLAY (DTE12):**

Manually entered, or recalled, tone sequences can be shown on a Tac/Com II (TH and UEC-SERIES) Control Head Display.

### **DATA ENTRY KEYPAD (DTE12/DP12):**

Provides quick and easy channel selection, and frequency editing, for Tac/Com II (TH and UEC-SERIES) Control Heads.

## 1.4 Specifications

### 1.4.1 Electrical Specifications

Input power:	+28 VDC (18-32V)
Supply Current:	60 mADC idle 110 mADC operating
Lighting Current:	160 mADC @ 28 VDC 900 mADC @ 5 VDC
Annunciators:	(One Bicoloured LED)
Transmit	Green
Incomplete Operation	Red (Flashing)
Serial Comm. Fault	Red (Flashing)
Controls:	
Front Panel	Tone/Data Switches (12 Push Buttons) Function Switch (Mom. Centre-off Toggle) Mode Switch (Two or Three Pos'n Toggle)
Internal	Master Tone Output Level (Potentiometer) Individual Tone Output Levels (2 Potentiometers)
Outputs:	
Transmit Key (2)	PTT Key (floating) up to 2 ADC.
Tone Output (2)	DTMF Audio (floating, can drive 150 ohm mic input up to 1.0 Vrms with or without DC bias).
Tones	AT&T Telephone standard tones, 697, 770, 852, 941, 1209, 1336, and 1477 (+/- 0.5% max.) Hz.
Recalled Tone Sequence Timing	
PTT start to tone start:	140 ms
Tone length:	70 ms
Delay between tones:	70 ms

Tone Assignments	"0"	941 Hz + 1336 Hz
	"1"	697 Hz + 1209 Hz
	"2"	697 Hz + 1336 Hz
	"3"	697 Hz + 1477 Hz
	"4"	770 Hz + 1209 Hz
	"5"	770 Hz + 1336 Hz
	"6"	770 Hz + 1477 Hz
	"7"	852 Hz + 1209 Hz
	"8"	852 Hz + 1336 Hz
	"9"	852 Hz + 1477 Hz
	"*"	941 Hz + 1209 Hz
	"#"	941 Hz + 1477 Hz

Serial Data RS232, 8 bits, 2400 baud, No Handshaking.

#### 1.4.2 Physical Specifications

---

Weight: 350 g / 0.8 lb.

Dimensions: 4.1" deep behind panel.  
5.75" wide at front panel, 5.0" behind.  
1.125" high.

Standard Dzus rack mounting.

Allow 2" of connector and cable clearance  
behind unit (6.1" min. clearance total)

#### 1.4.3 Environmental Specifications

---

Operating Temperature -40 C to +70 C

Storage Temperature -55 C to + 85 C (survival)

Altitude 25,000 feet

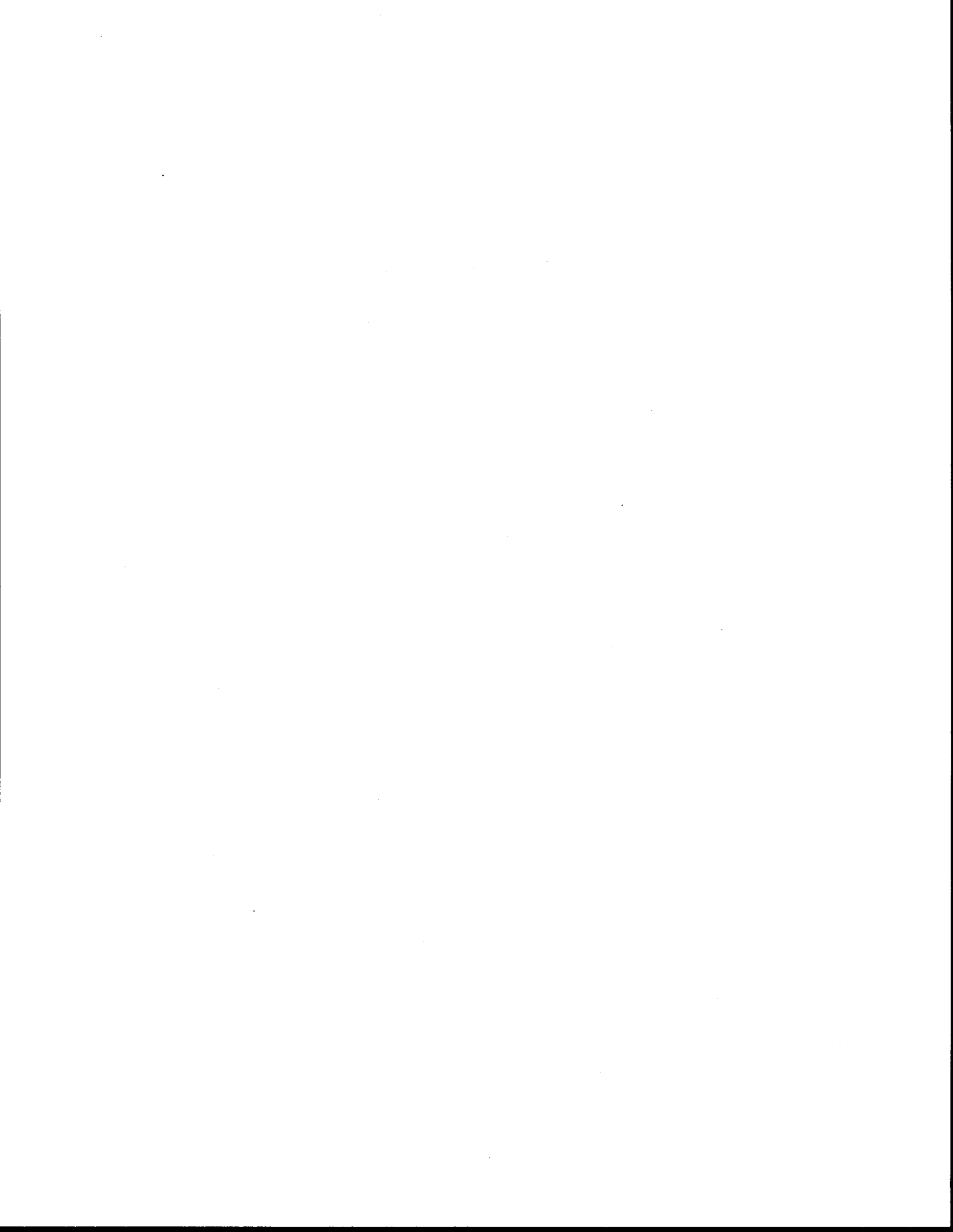
Humidity 95% non-condensing

Shock & Vibration 6G, suitable for panel mounting  
in fixed wing or rotary aircraft.

**1.5 Unit Nomenclature**

<u>Model</u>	<u>Description</u>	<u>Panel Lighting</u>
DTE12-001	DTMF Tone Encoder / Keyboard Data Entry	28 VDC
DTE12-501	DTMF Tone Encoder / Keyboard Data Entry	5 VDC
TE12-001	DTMF Tone Encoder	28 VDC
TE12-501	DTMF Tone Encoder	5 VDC
DP12-001	Keyboard Data Entry	28 VDC
DP12-501	Keyboard Data Entry	5 VDC

End of section 1.0



## Section 2.0 Installation

### 2.1 General

---

Installation information in this section consists of unpacking and inspection procedures, installation procedures, post-installation checks, and installation drawings.

### 2.2 Unpacking and Inspection

---

Unpack the equipment carefully, and locate the warranty card. Inspect the unit visually for damage due to shipping, and report all such claims immediately to the carrier involved.

**Note that each unit supplied should have the following;**

- DTE12, TE12, or DP12 Unit
- Warranty Card
- Installation and Operation Manual
- Release Certificate

Verify that all items are present before proceeding, and **report any shortage immediately to your supplier.**

Complete the warranty card information, and send it to NAT when the installation is complete. If you fail to complete the warranty card, the warranty will be activated on **date of shipment from NAT.**

### 2.3 Installation Procedures

---

#### 2.3.1 Warnings <-- **IMPORTANT!**

---

Do not bundle any lines from this unit with **transmitter coax lines**. Do not bundle any logic, audio, or DC power lines from this unit with 400 Hz synchro wiring or AC power lines. Do not position this unit or wiring from this unit next to any device **with a strong alternating magnetic field such as an inverter, or significant audio interference will result.**

### 2.3.2 Cautions

---

In all installations, use shielded cable **exactly as shown** and ground as indicated. Significant problems may result from not following these guidelines.

It is permissible to ground the shield from the DTE12/TE12 audio output at the transceiver, or to a suitable return such as the MIC LO connection to the radio, if this is actually grounded. Do not send the tone data from the DTE12/TE12 as a single conductor shielded wire, as the output of this unit is floating, and provides no shield ground. Be sure both output pins are connected.

### 2.3.3 Notes

---

The DTMF output is a low level audio line, and connects to a sensitive point on the transceiver. This line must be shielded, and routed to avoid pick-up to stray fields in the aircraft. Failure to do this will result in noisy transmitter operation when the DTE12/TE12 is in use **AND** when normal transmissions are made. In essence, the line to the DTE12/TE12 represents an unterminated line attached to the transmitter mic input, and will easily pick up interference if poorly installed and routed.

### 2.3.4 Cable and Wiring

---

Use Tefzel M27500 or Raychem spec. 44 (M81044) shielded wire with Raychem D140 series or equivalent solder sleeves (for shield terminations) to make the most compact and easy to terminate interconnect. Follow the wiring diagram provided in Section 2.5 as required for your version.

Allow 3" from the end of the wire to the shield termination to allow the hood to be easily installed. Note that the hood is a "clamshell" hood, and is installed **after** the wiring is complete.

All wiring should be at least 24 AWG (22 AWG preferred) except power and ground lines which should be at least 22 AWG (20 AWG preferred). Ensure that the ground connection is clean and well secured.



### 2.3.5 External Switches and Breakers

There are no additional external components required to make a complete installation with the DTE12/TE12; all functions are self-contained. An individual breaker or fuse should be in the power line of this unit for protection, with a rating no less than 0.5A, and no greater than 1.0A. It is permissible to attach the power feed to the DTE12/TE12 to the breaker of an existing affected radio, if sufficient breaker capacity exists, and wire gauge is adequate for fire protection.

### 2.3.6 Post-Installation Checks

#### IMPORTANT!

With the DTE12/TE12/DP12 disconnected from its mating connector, check pin <13> for +28 VDC relative to ground, and check pin <25> for continuity to ground (below 0.5 ohms). Check for lighting power on pin <3> (**28 VDC**), or <6> (**14 VDC**), or <4> (**5 VDC**) and a lighting ground on pin <15>.

**Do not** attach the DTE12/TE12/DP12 until these conditions are met, or damage may result to the unit which is **not covered under warranty**.

#### 2.3.6.1 DTMF Signaling Testing

Turn on the aircraft radios, and set a radio connected to the DTE12/TE12 to a suitable test channel. Set the DTE12/TE12 to the appropriate audio output position (RT1 or RT2), and hold down any tone button, while monitoring the TX output on a suitable communications monitor such as the IFR 1200S.

Observe the deviation of the transmitted signal and ensure it **does not exceed 3 kHz**. If it is over this value, adjust it to no more than 3 kHz with the output level trimpots on the side and top of the DTE12/TE12 (See drawing DTE12\900-0). Set the individual tone level adjustments on the top of the unit to their midway points. Use the master tone level adjustment on the side of the unit for coarse adjustment of the deviation, then the individual tone level adjustments for fine-tuning the deviation levels for the individual transceivers.

The **optimum setting** for use with NAT Tac/Com transceivers is **2 kHz of deviation**, which is achieved with a DTE12/TE12 output of 130 mVrms (loaded into the transceiver) or 180 mVrms on an unloaded bench test. Measure this level with an RMS voltmeter only.

The exact level desired by any given ground-based system may vary, but is typically between 500 Hz and 3 kHz of deviation on an FM transceiver. If an AM transceiver is used, set the modulation during DTMF transmission to no more than 70%, and no less

than 30% with the DTE12/TE12 level adjustments. If two transceivers are used, be sure that operation is satisfactory on both units.

Test the store and recall functions for DTMF sequences, and ensure that all functions are fully operational. Refer to section 3.3 for specific operating instructions.

### **2.3.6.2 Keypad Data Entry Testing**

Try the DATA function on the DTE12/DP12, and ensure that you can select channels and perform frequency editing as described in section 3.4 of this manual.

If all functions are satisfactory, including panel lighting, tone output, data entry (if used) and store/recall, and if no interference problems are found in a system check of the aircraft radios, then the aircraft may be returned to service, and the appropriate log entries and approval documentation filed.

## **2.4 Installation Configurations**

### **2.4.1 Tac/Com Systems**

A Tac/Com system is defined as one master Tac/Com control head and all the radios and peripheral devices connected to it. All the peripherals communicate with the master control head through serial ports.

When DTE12/DP12 units are installed in Tac/Com systems, there are several different configurations possible. The configuration that is selected will depend on whether there is room in the master control head for a serial I/O expansion board, and with which control head(s) the data pad(s) will be used.

It is important to know with which control head a DTE12 will be used because the DTE12 tone sequences will be displayed only on that control head, not the others in the system. A DTE12/DP12, when used to edit frequency data, must be used with a master control head.

Note for the rest of this section, DTE12/DP12 units will simply be referred to as Data Pads.

### 2.4.2 Tac/Com Control Head Serial Ports

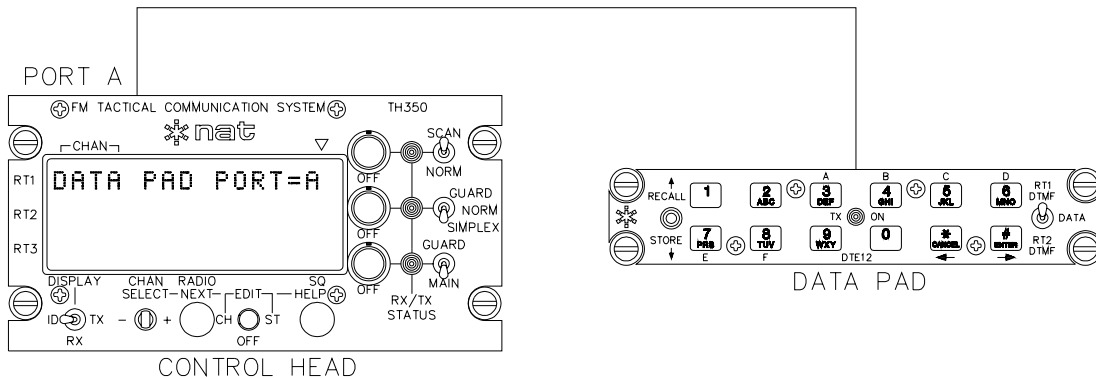
The main serial port (referred to as Port A) on both master and slave control heads is located on the system connector (J100). Additional serial ports may be added to both master and slave control heads. These are located on an optional serial I/O expansion board (interface 'Y'), and are referred to as Ports B and C. All control head serial ports are RS-232 compatible, and can be used to communicate with a data pad.

The master control head must have its data pad port configured properly before the system will function. Configuration is accomplished via the front panel controls and must be performed by a qualified technician. For details, see the Installation and Configuration Mode section of the Tac/Com Control Head manual.

When a slave control head is connected to a master, it is always done so by connecting port A of the slave to port A of the master. When additional slaves are added to a system, they are 'daisy chained' from the first slave. Port A of each additional slave must be connected to port C of the previous slave. Port B of each slave is reserved for connecting to other peripherals such as data pads.

### 2.4.3 One Data Pad

For the simplest system, where a single data pad is connected to a single control head, there is only one possible configuration. The data pad is connected to Port A of the control head, and no serial I/O expansion board is necessary. Configure the control head data pad port to 'A'.

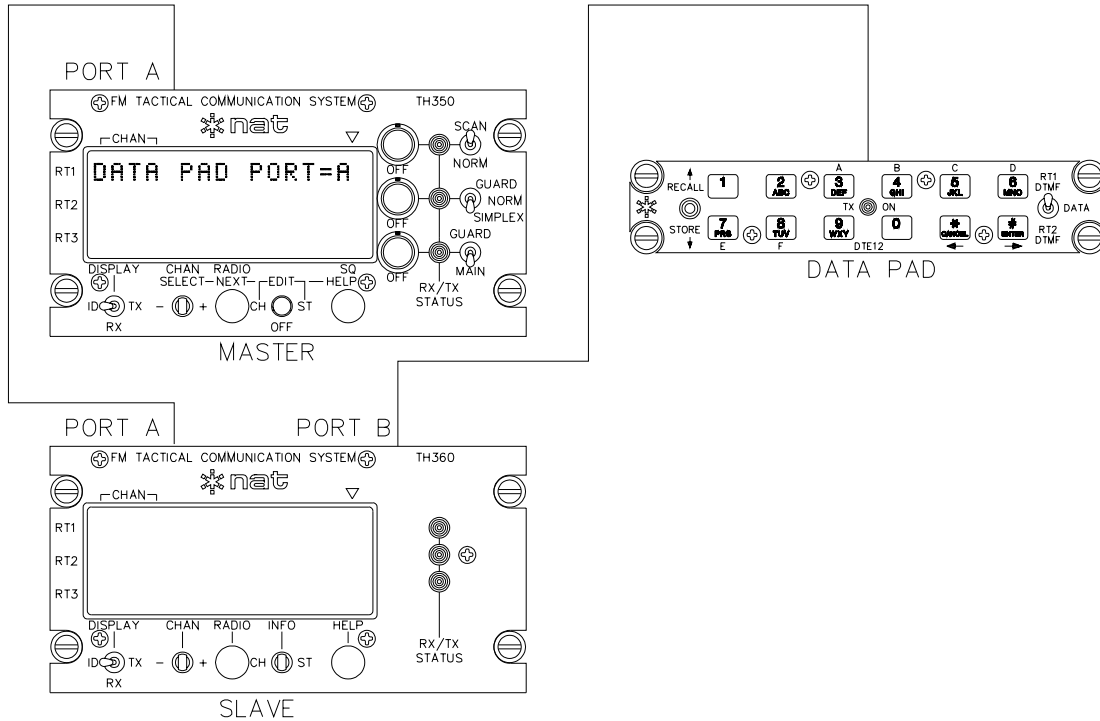


Dwg: DTE12\302-1101



**2.4.4.2 One Data Pad and One Slave - Configuration #2**

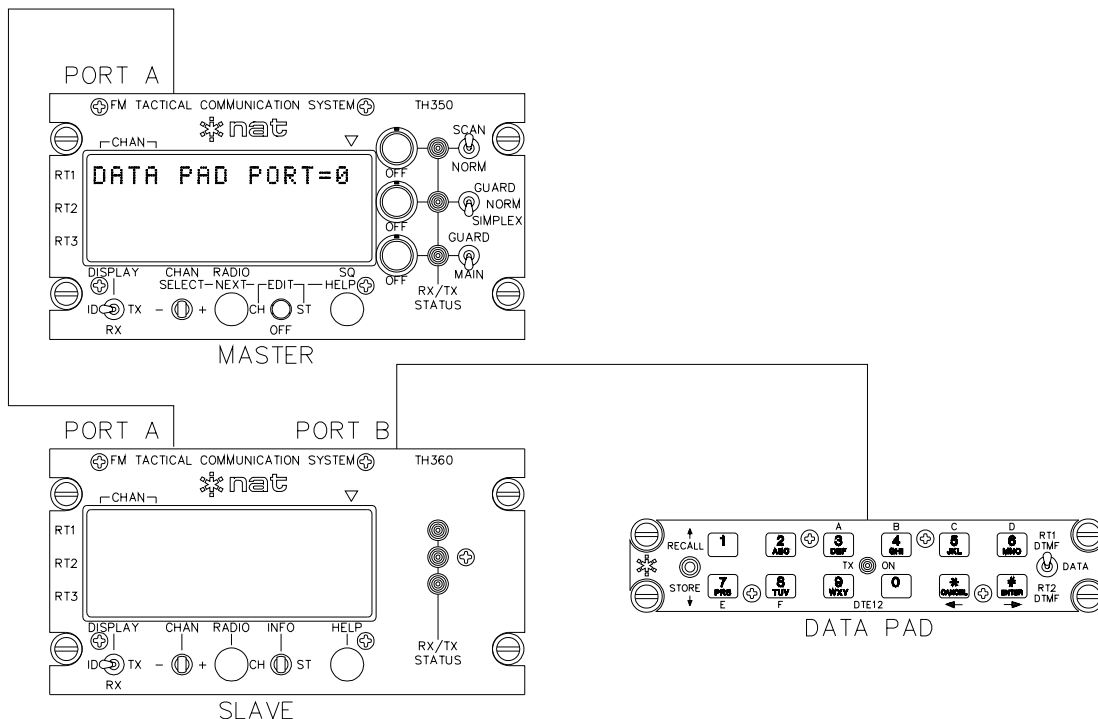
When the data pad is to be used with the master control head, but there isn't room in the master for a serial I/O expansion board, install the board in the slave and connect the data pad to port B of the slave. Connect port A of the slave to port A of the master. Configure the master control head data pad port to 'A'.



Dwg: DTE12\302-3101

**2.4.4.3 One Data Pad and One Slave - Configuration #3**

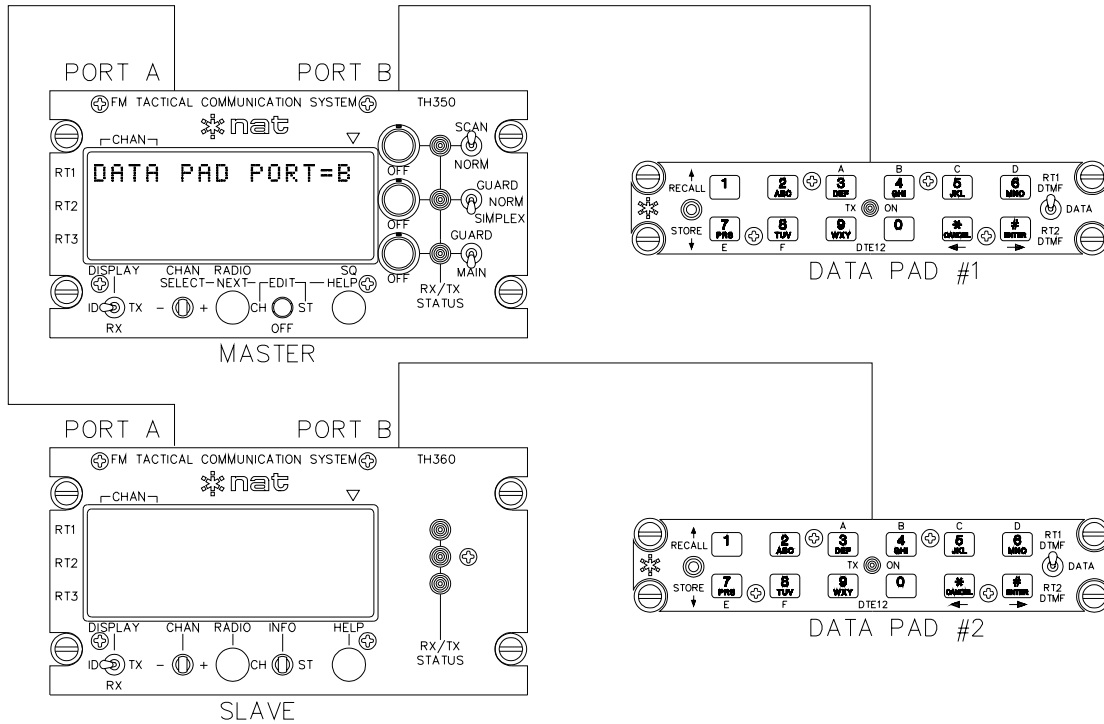
When the data pad is to be used with the slave control head, install a serial I/O expansion board in the slave and connect the data pad to port B of the slave. Connect port A of the slave to port A of the master. Configure the master control head data pad port to '0'.



Dwg: DTE12\302-4101

### 2.4.5 Two Data Pads and One Slave Control Head

For this system there is only one possible configuration. Install I/O expansion boards in both control heads, connect the master data pad to port B of the master control head, and connect the slave data pad to port B of the slave control head. Connect port A of the slave to port A of the master. Configure the master control head data pad port to 'B'.



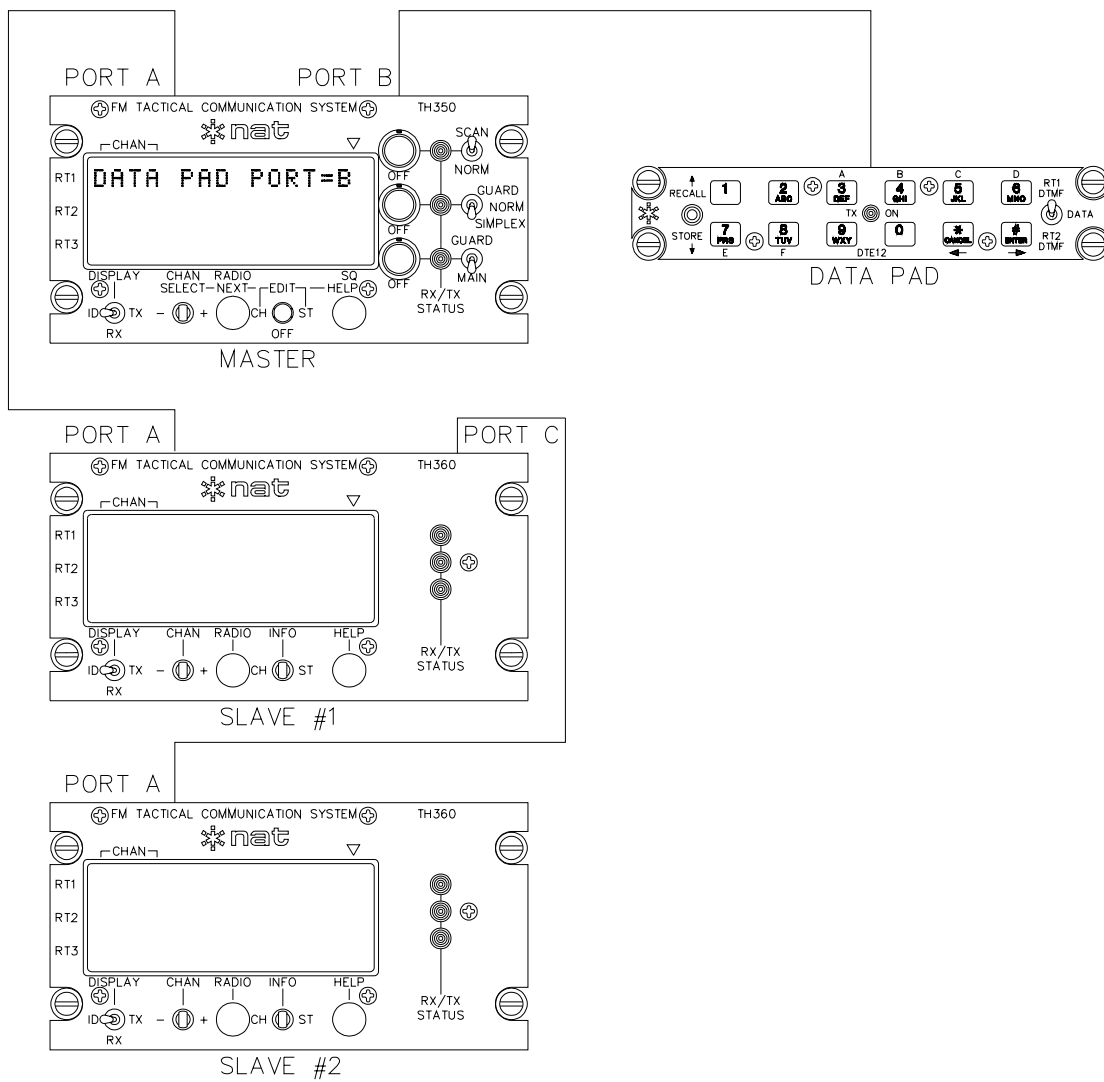
Dwg: DTE12\302-5101

### 2.4.6 One Data Pad and Two Slave Control Heads

For this system there are four possible configurations.

#### 2.4.6.1 One Data Pad and Two Slaves - Configuration #1

When the data pad is to be used with the master control head, and there is room in the master for a serial I/O expansion board, install the board in the master and connect the data pad to port B of the master. Also install an I/O expansion board in the first slave control head. Connect port A of the first slave to port A of the master. Connect port A of the second slave to port C of the first slave.

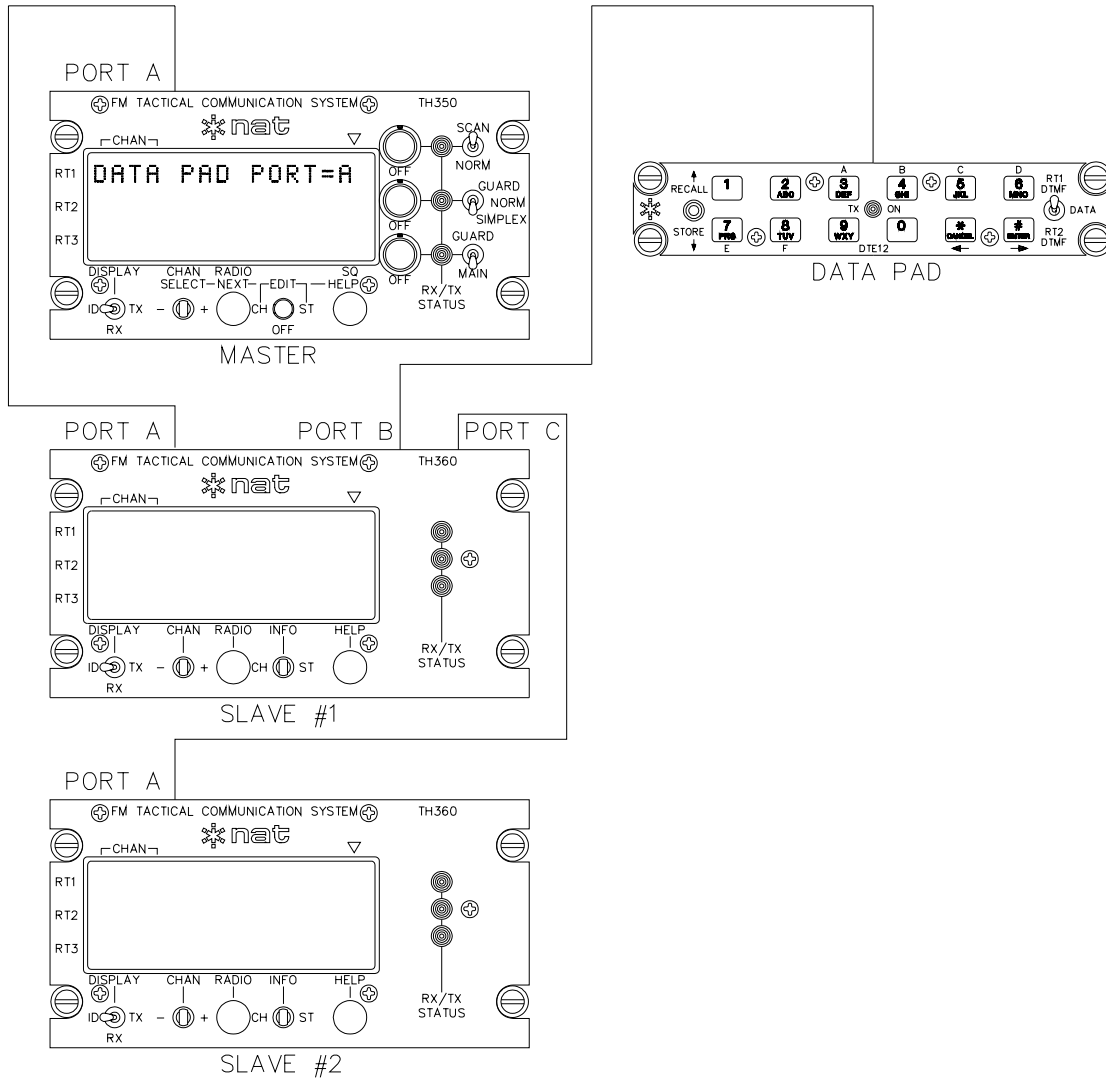


Dwg: DTE12\302-6101



**2.4.6.2 One Data Pad and Two Slaves - Configuration #2**

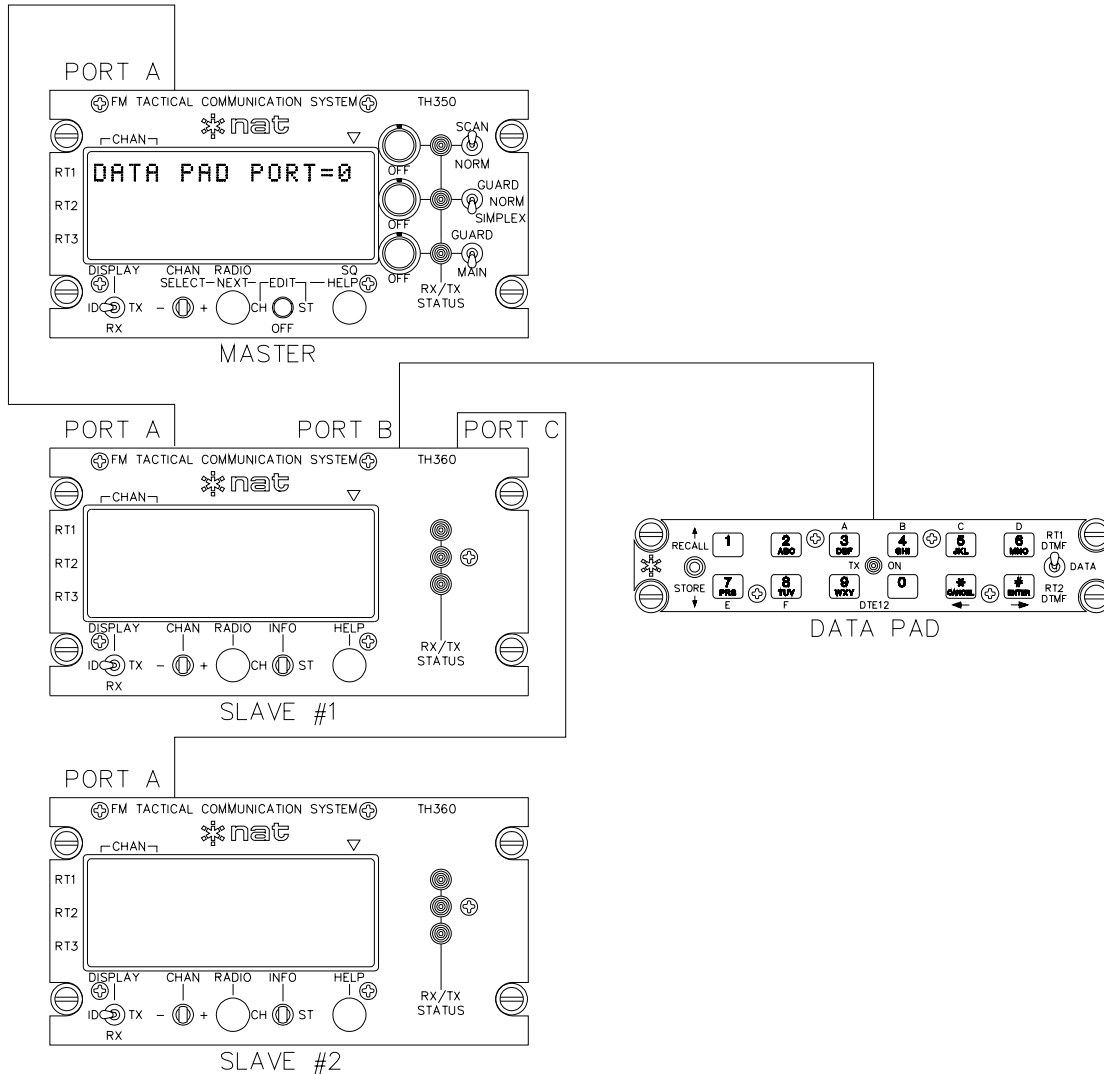
When the data pad is to be used with the master control head, but there isn't room in the master for a serial I/O expansion board, install the board in the first slave and connect the data pad to port B of that slave. Connect port A of the first slave to port A of the master. Connect port A of the second slave to port C of the first slave. Configure the master control head data pad port to 'A'.



Dwg: DTE12\302-7101

**2.4.6.3 One Data Pad and Two Slaves - Configuration #3**

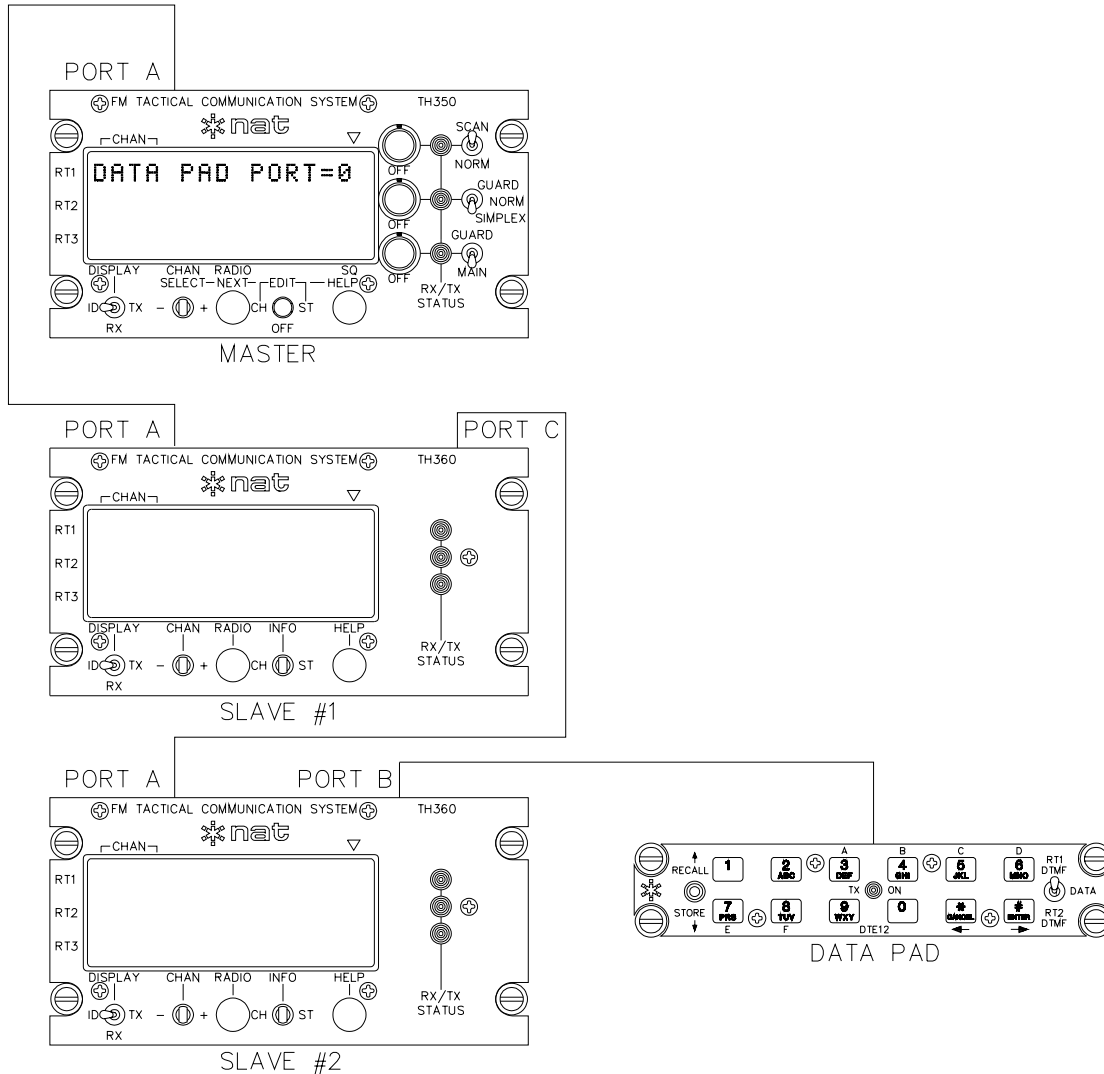
When the data pad is to be used with the first slave control head, install a serial I/O expansion board in that slave and connect the data pad to port B of that slave. Connect port A of the first slave to port A of the master. Connect port A of the second slave to port C of the first slave.



Dwg: DTE12\302-8101

**2.4.6.4 One Data Pad and Two Slaves - Configuration #4**

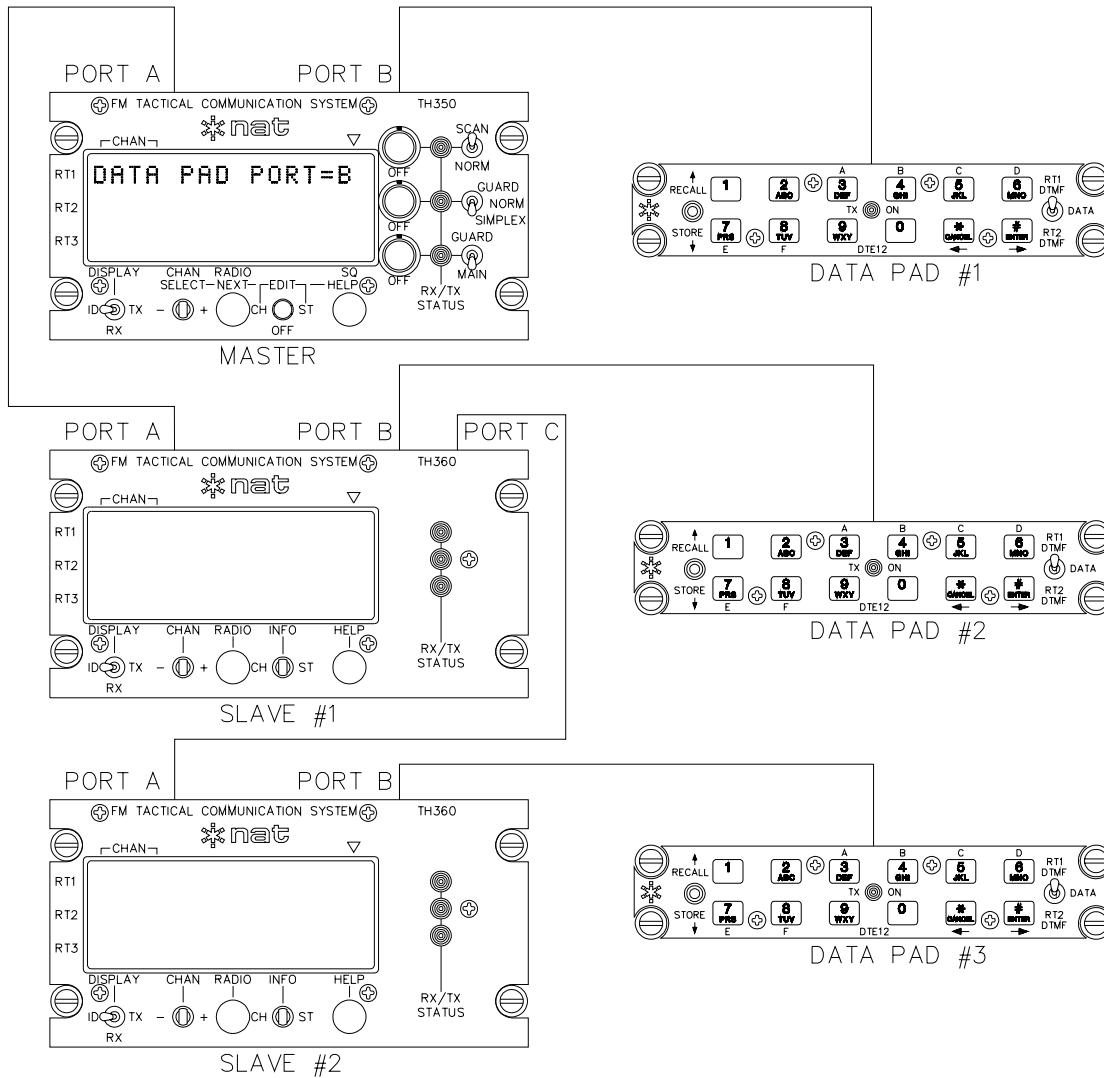
When the data pad is to be used with the second slave control head, install serial I/O expansion boards in both slaves. Connect the data pad to port B of the second slave. Connect port A of the first slave to port A of the master. Connect port A of the second slave to port C of the first slave.



Dwg: DTE12\302-9101

### 2.4.7 Multiple Data Pads and Slave Control Heads

Install a serial I/O expansion board in each slave control head that is not the last one in the 'daisy chain'. Also install a serial I/O expansion board in the master control head and in the last slave control head if you wish to connect data pads to them. Connect each data pad to port B of the control head with which it is being used. Connect port A of the first slave to port A of the master. Connect port A of each additional slave to port C of the previous slave. Configure the master control head data pad port to 'B'. The diagram below shows a system with two slaves and three data pads.



Dwg: DTE12\30210101

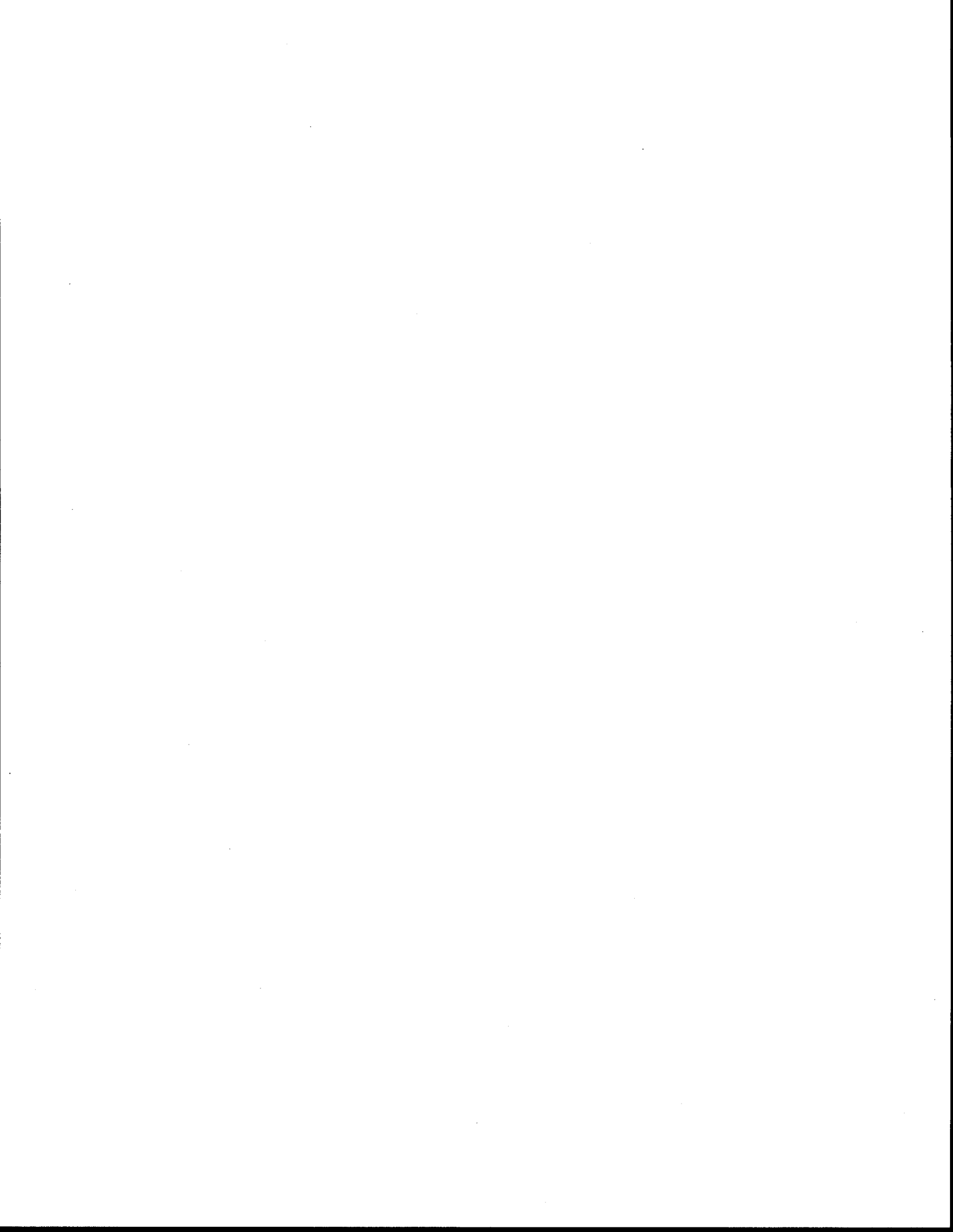
## 2.5 Installation Drawings

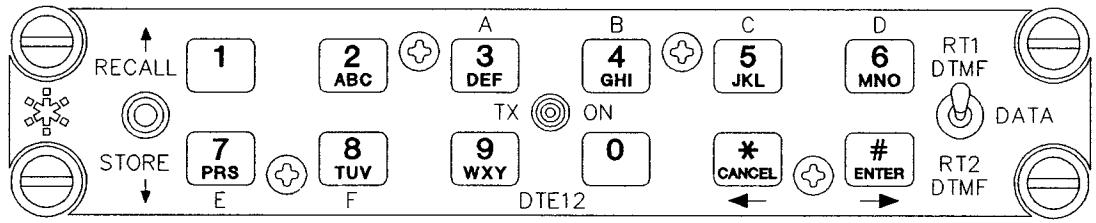
DRAWING	REV.	DESCRIPTION	TYPE
DTE12\905-0	2.00	DTE12 Faceplate	Mechanical
TE12\905-0	2.00	TE12 Faceplate	Mechanical
DP12\905-0	2.00	DP12 Faceplate	Mechanical
DTE12\900-0	1.10	DTE12 Orthographic Drawing	Mechanical
DTE12\403	C	DTE12 Interconnect	Interconnect
TE12\403	A	TE12 Interconnect	Interconnect
DP12\403	-	DP12 Interconnect	Interconnect
DTE12\405	A	DTE12 Connector Map	Connector Map
TE12\405	-	TE12 Connector Map	Connector Map
DP12\405	-	DP12 Connector Map	Connector Map

### Earlier Revision Diagrams

DTE12\905A	A	DTE12 Faceplate - Serial Number 1001 to 1143	Mechanical
TE12\905A	A	TE12 Faceplate - Serial Number 1001 to 1143	Mechanical
DP12\905	-	DP12 Faceplate - Serial Number 1001 to 1143	Mechanical
DTE12\900	-	DTE12 Orthographic Drawing Ser. Nos. 1001 to 1143	Mechanical

Section 2.0 ends following these drawings.



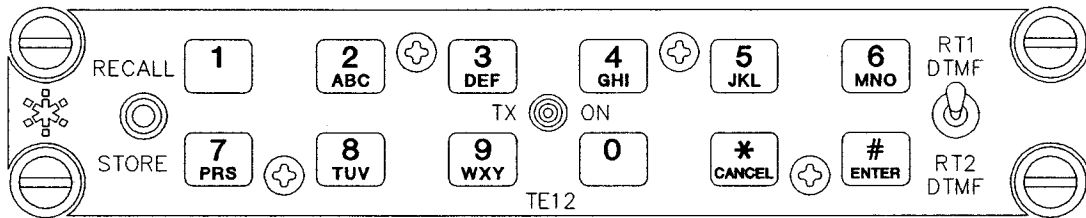


**Confidential and Proprietary to NAT**

REVISION		DATE		<b>*nat</b> NORTHERN AIRBORNE TECHNOLOGY LTD.			
-		MAR 20/91		DESIGNED BY		DESCRIPTION	
A		NOV 27/91		MQS		DTMF ENCODER / DATA ENTRY PAD	
2.00		MAR 21/94		DRAWN BY		PART NUMBER	DRAWING TYPE
				MQS		DTE12	FACEPLATE
				APPROVED BY		DRAWING NUMBER	FILE NUMBER
				<b>NAT R&amp;D</b>		DTE12\905-0	DTE12\905-0200
							SHEET 1/1

1952

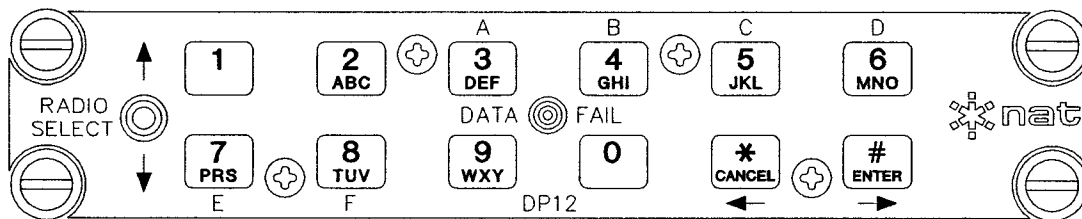




**Confidential and Proprietary to NAT**

REVISION	DATE	<b>*nat</b> NORTHERN AIRBORNE TECHNOLOGY LTD.			
-	MAR 20/91	DESIGNED BY	DESCRIPTION		
A	NOV 27/91	MQS	DTMF TONE ENCODER		
2.00	MAR 21/94	DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
		MQS	TE12	FACEPLATE	1/1
		APPROVED BY	DRAWING NUMBER	FILE NUMBER	
		<b>NAT R&amp;D</b>	TE12\905-0	TE12\905-0200	



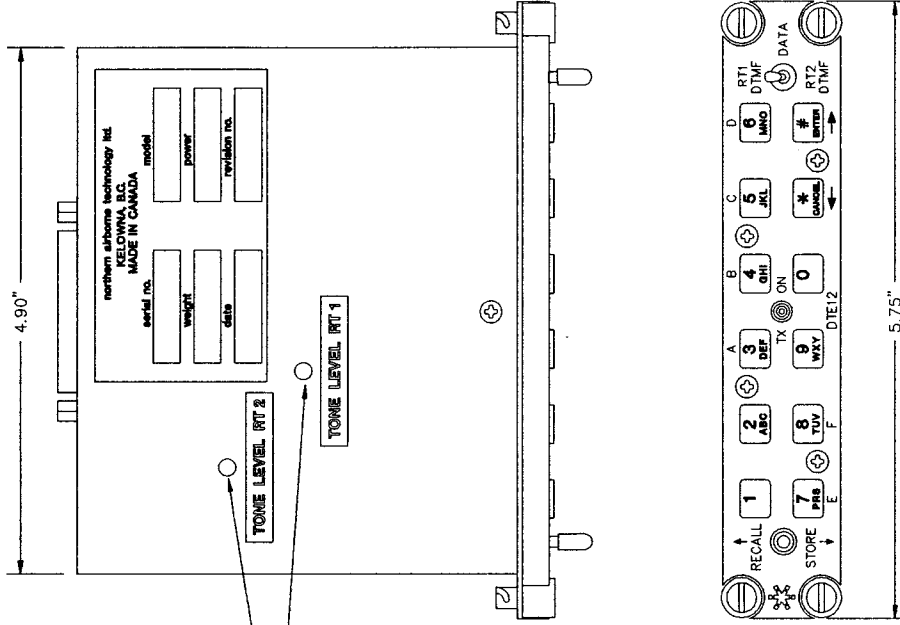


**Confidential and Proprietary to NAT**

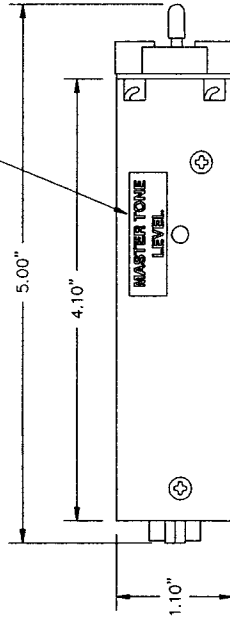
		<b>*nat</b> NORTHERN AIRBORNE TECHNOLOGY LTD.			
REVISION	DATE	DESIGNED BY	DESCRIPTION		
-	NOV 27/91	MQS	DATA ENTRY PAD		
2.00	MAR 21/94				
		DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
		MQS	DP12	FACEPLATE	1/1
		APPROVED BY	DRAWING NUMBER	FILE NUMBER	
		<b>NAT R&amp;D</b>	DP12\905-0	DP12\905-0200	

1948

MECHANICAL DRAWING OF THE  
 DTE12 DTMF TONE ENCODER / DATA ENTRY KEYPAD.  
 DIMENSIONS ALSO APPLY TO THE  
 TE12 DTMF TONE ENCODER,  
 AND THE DP12 DATA ENTRY KEYPAD.  
 SCALE: 2:1



DTMF TONE OUTPUT LEVEL ADJUSTMENT  
 ( DTE12 AND TE12 ONLY )



**Confidential and Proprietary to NAT**

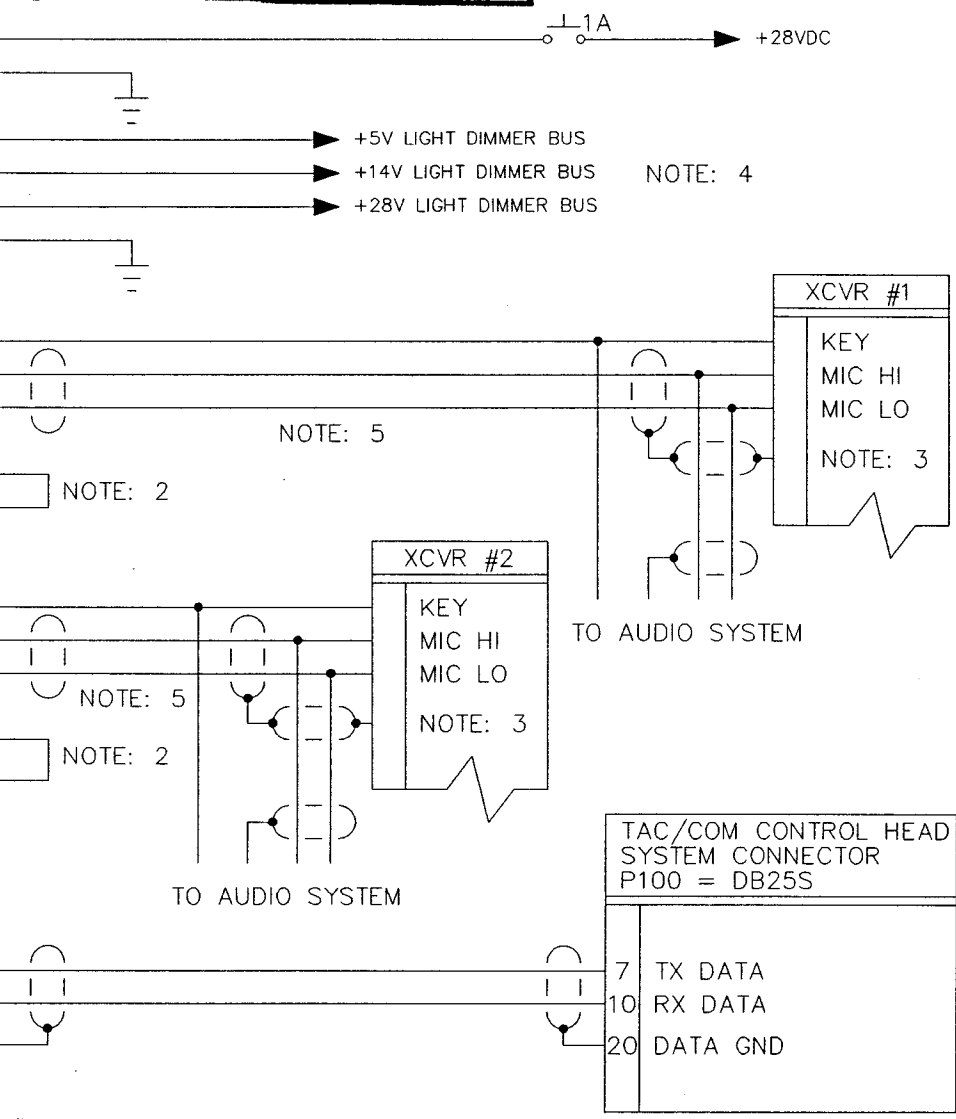
REVISION	DATE	DESIGNED BY	DESCRIPTION
1.00	AUG 20/93	S. MOORE	DTE12 DTMF TONE ENCODER/DATA ENTRY PAD
1.10	MAR 25/94		
		DRAWN BY	PART NUMBER
			DTE12
		S.M./T.M.	DRAWING TYPE
			ORTHOGRAPHIC
		APPROVED BY	DRAWING NUMBER
		<b>NAT R&amp;D</b>	FILE NUMBER
			DTE12\900-0

1950

INTERCONNECT DRAWING FOR CONNECTING A NAT DTE-12 DTMF ENCODER/DATA ENTRY PAD TO TWO TRANSCEIVERS AND A TAC/COM CONTROL HEAD.

**Confidential and Proprietary to NAT**

DTE-12 DTMF/DATA PAD P101 = DB25S	
+28VDC PWR IN PWR GND	13 25
+5VDC LIGHTS	4
+14VDC LIGHTS	6
+28VDC LIGHTS	3
LIGHTS COM	15
KEY OUT #1	7
TONE OUT HI #1	8
TONE OUT LO #1	20
KEY IN #1	19
SPARE GND	18
KEY OUT #2	10
TONE OUT HI #2	11
TONE OUT LO #2	23
KEY IN #2	22
SPARE GND	21
RX DATA	1
TX DATA	2
SERIAL GND	14
TEST AUDIO HI	5
TEST AUDIO LO	17
SPARE	9
SPARE	12
SPARE	16
SPARE	24



FOR TESTING ONLY

9 N.C.  
12 N.C.  
16 N.C.  
24 N.C.

- NOTES:
- 1) ALL WIRING = 22 AWG, EXCEPT PWR AND GND = 20 AWG.
  - 2) JUMPERING PIN 18 TO 19 (AND 22 TO 21) WILL OUTPUT A GROUND REFERENCED KEYLINE. ELSE KEY IN & OUT MUST BE USED WITH AN EXTERNALLY REFERENCED KEYLINE.
  - 3) SHIELD SHOULD RETURN TO GROUND AT XCVR. CAN BE MIC LO IN MANY CASES.
  - 4) CONNECT TO ONLY ONE OF PINS 3, 4 AND 6 (DEPENDING ON TYPE OF LIGHTS IN DTE12).
  - 5) FOR RADIOS THAT DO NOT HAVE A DEDICATED MIC LO LINE, TIE 'TONE OUT LO' LINE TO 'KEY OUT' LINE AT DTE12, AND RUN SINGLE LINE TO 'KEY' (PTT) LINE AT RADIO.

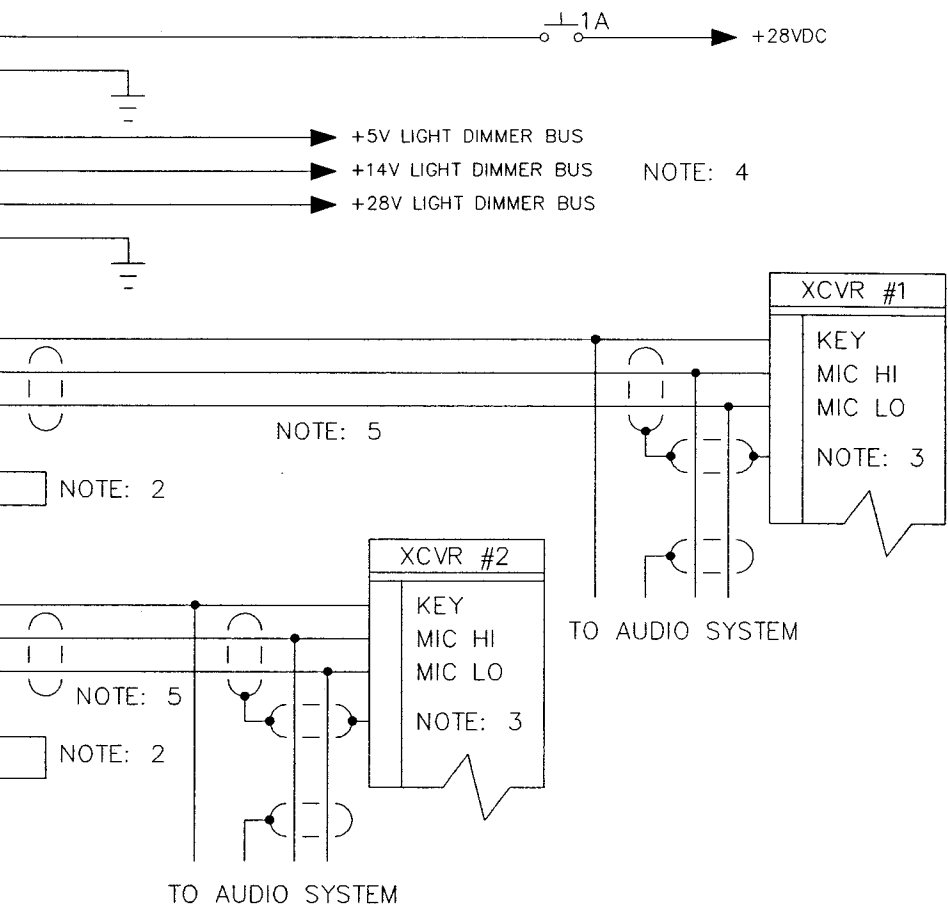
REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
A	21 JUNE 91	PART NUMBER	DRAWING NUMBER	FILE NUMBER
B	3 SEPT 91	DTE-12	DTE12\403	DTE12\403C
C	23 APR 93	DESCRIPTION	SHEET	DATE
		INTERCONNECT	1 OF 1	MAR 21/91
		DESIGNED BY	DRAWN BY	APPROVED BY
		KV/MQS	KV/MQS	<i>[Signature]</i>

1950



INTERCONNECT DRAWING FOR CONNECTING A NAT TE-12 DTMF ENCODER TO TWO TRANSCEIVERS.

TE-12 DTMF ENCODER P101 = DB25S	
+28VDC PWR IN	13
PWR GND	25
+5VDC LIGHTS	4
+14VDC LIGHTS	6
+28VDC LIGHTS	3
LIGHTS COM	15
KEY OUT #1	7
TONE OUT HI #1	8
TONE OUT LO #1	20
KEY IN #1	19
SPARE GND	18
KEY OUT #2	10
TONE OUT HI #2	11
TONE OUT LO #2	23
KEY IN #2	22
SPARE GND	21
RESERVED	1
RESERVED	2
RESERVED	14
TEST AUDIO HI	5
TEST AUDIO LO	17
SPARE	9
SPARE	12
SPARE	16
SPARE	24



**Confidential and Proprietary to NAT**

FOR TESTING ONLY

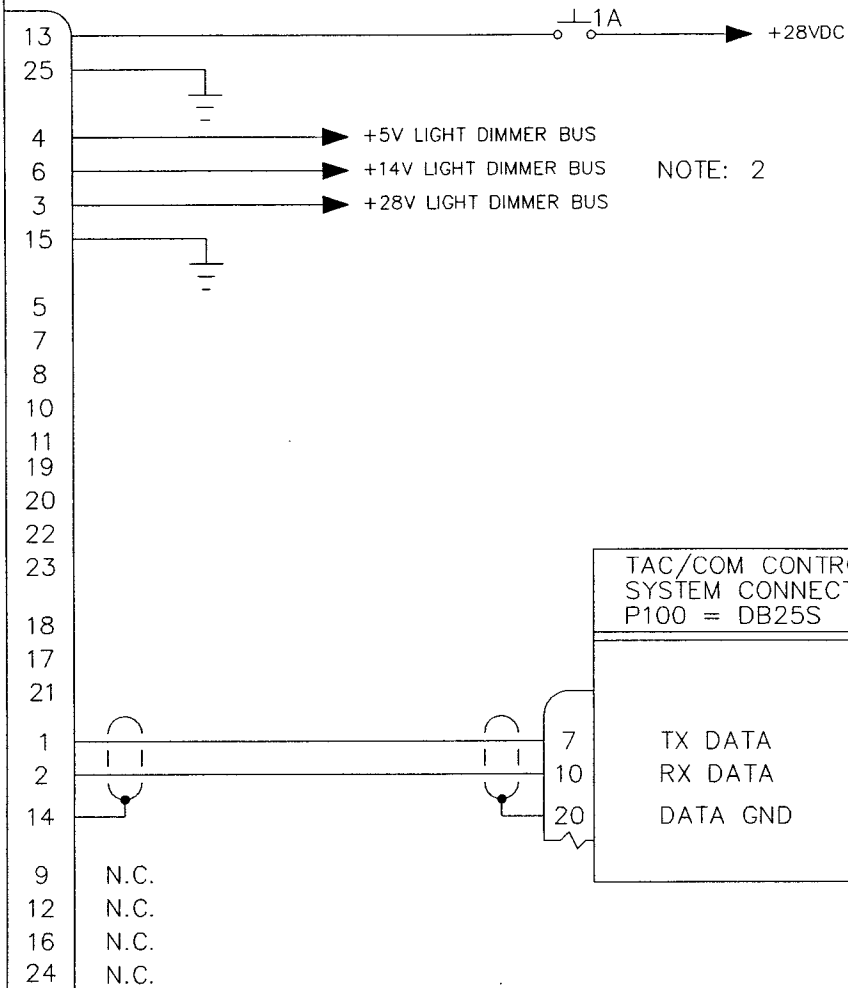
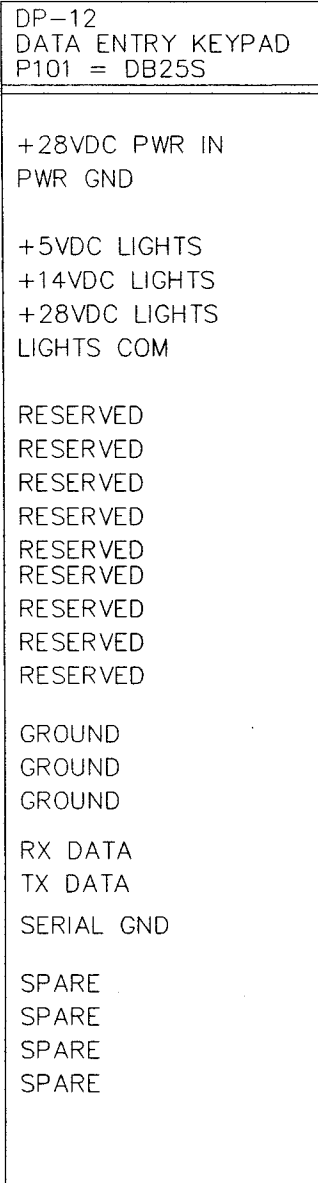
- NOTES:
- 1) ALL WIRING = 22 AWG, EXCEPT PWR AND GND = 20 AWG.
  - 2) JUMPERING PIN 18 TO 19 (AND 22 TO 21) WILL OUTPUT A GROUND REFERENCED KEYLINE. ELSE KEY IN & OUT MUST BE USED WITH AN EXTERNALLY REFERENCED KEYLINE.
  - 3) SHIELD SHOULD RETURN TO GROUND AT XCVR. CAN BE MIC LO IN MANY CASES.
  - 4) CONNECT TO ONLY ONE OF PINS 3, 4 AND 6 (DEPENDING ON TYPE OF LIGHTS IN TE12).
  - 5) FOR RADIOS THAT DO NOT HAVE A DEDICATED MIC LO LINE, TIE 'TONE OUT LO' LINE TO 'KEY OUT' LINE AT TE12, AND RUN SINGLE LINE TO 'KEY' (PTT) LINE AT RADIO.

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
A	APR 26/93	PART NUMBER	DRAWING NUMBER	FILE NUMBER
		TE-12	TE12\403	TE12\403A
		DESCRIPTION	SHEET	DATE
		INTERCONNECT	1 OF 1	MAR 21/91
		DESIGNED BY	DRAWN BY	APPROVED BY
		KV/MQS	KV/MQS	<i>[Signature]</i>

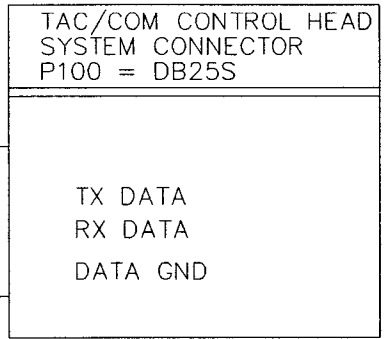
CONFIDENTIAL

INTERCONNECT DRAWING FOR CONNECTING A NAT DP-12 DATA ENTRY PAD  
TO A TAC/COM II (TH-SERIES) CONTROL HEAD.

DP-12



NOTE: 2



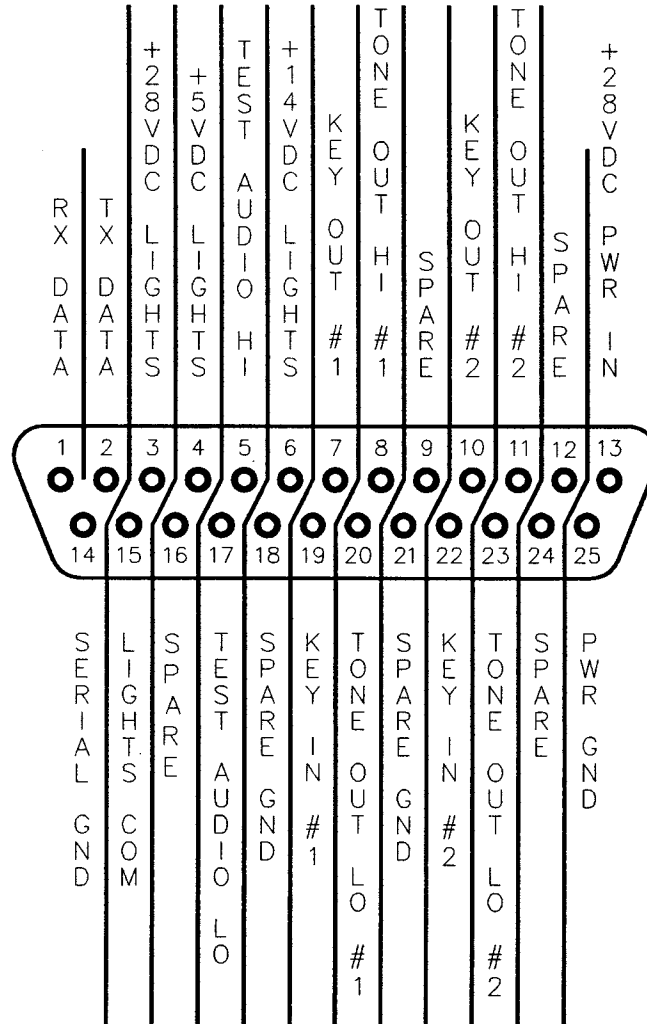
- NOTES:
- 1) ALL WIRING = 22 AWG (24 AWG MIN), EXCEPT PWR AND GND = 20 AWG.
  - 2) CONNECT TO ONLY ONE OF PINS 3, 4 AND 6 (DEPENDENT ON TYPE OF LIGHTS IN DP12).

**Confidential and Proprietary to NAT**

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
		PART NUMBER	DRAWING NUMBER	FILE NUMBER
		DP-12	DP12\403	DP12\403
		DESCRIPTION	SHEET	DATE
		INTERCONNECT	1 OF 1	19 AUG 1993
		DESIGNED BY	DRAWN BY	APPROVED BY
		KV/MQS	SCOTT MOORE	NAT PROD

1950

CONNECTOR MAP OF THE DTE-12 DTMF ENCODER / DATA ENTRY PAD



**Confidential and Proprietary to NAT**

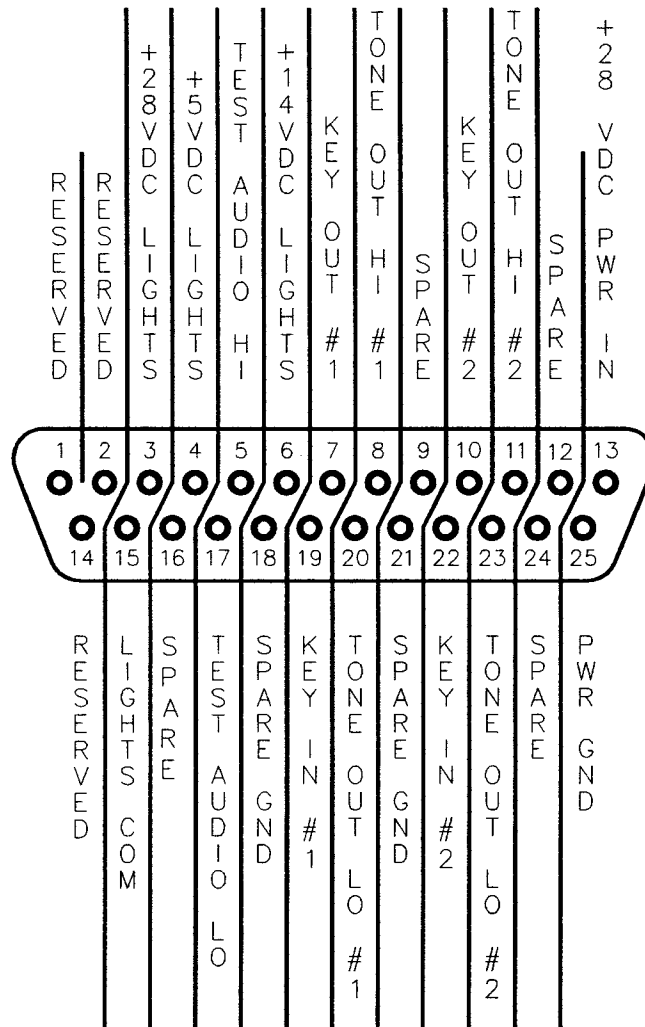
- NOTES:
- TONE OUT lines normally connect to R/T MIC input. Both lines (HI and LO) must be connected.
  - TEST AUDIO lines not normally connected. (Used for testing purposes only)
  - Connect only one of pins 3,4,6.
  - VIEW is the rear of the harness connector.

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
A	JULY 23/93	PART NUMBER	DRAWING NUMBER	FILE NUMBER
		DTE-12	DTE12\405	\DTE12\405A
		DESCRIPTION	SHEET	DATE
		CONNECTOR MAP	1/1	MAR 4/91
		DESIGNED BY	DRAWN BY	APPROVED BY
		MITCH Q. STINSON	T BLACKSTOCK	<b>NAT PROD</b> <b>119</b>

1950

1950

CONNECTOR MAP OF THE TE-12 DTMF ENCODER



- NOTES: - TONE OUT lines normally connect to R/T MIC input. Both lines (HI and LO) must be connected.  
 - TEST AUDIO lines not normally connected. (Used for testing purposes only)  
 - Connect only one of pins 3,4,6.  
 - VIEW is the rear of the harness connector.

**Confidential and Proprietary to NAT**

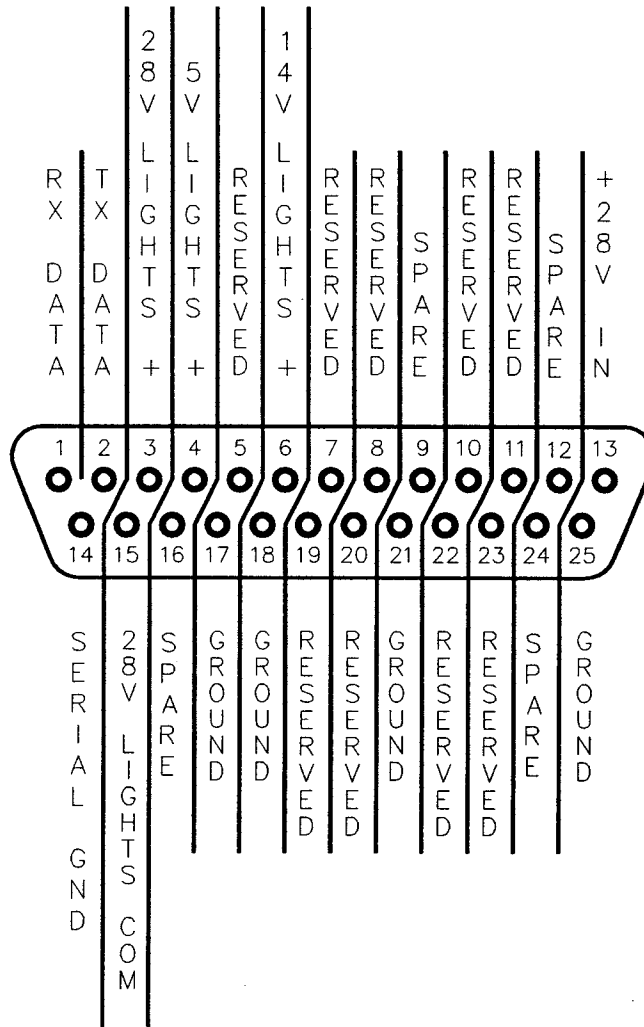
REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
		PART NUMBER	DRAWING NUMBER	FILE NUMBER
		TE-12	TE12\405	\TE12\405
		DESCRIPTION	SHEET	DATE
		CONNECTOR MAP	1/1	JULY 23/93
		DESIGNED BY	DRAWN BY	APPROVED BY
		MITCH Q. STINSON	T BLACKSTOCK	<b>NAT PROD</b> <b>119</b>

1950

1950



DP-12  
INTERCONNECT



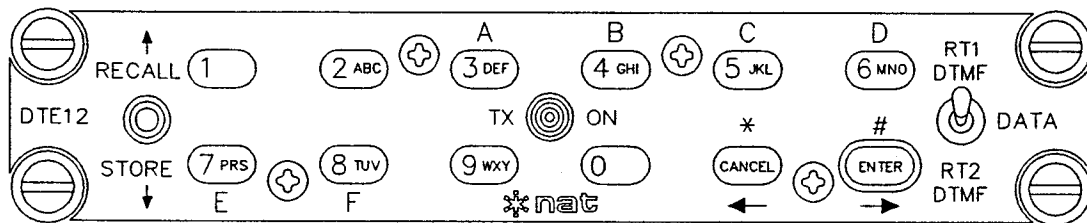
NOTE: - Connect only one of pins 3,4,6.

**Confidential and Proprietary to NAT**

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
		DESCRIPTION	PART NUMBER	DRAWING NUMBER
		CONNECTOR MAP	DP-12	DP12\405
		DATE	DRAWN BY	APPROVED BY
		OCT 23/91	MITCH Q. STINSON	<b>NAT PROD</b> <b>119</b>

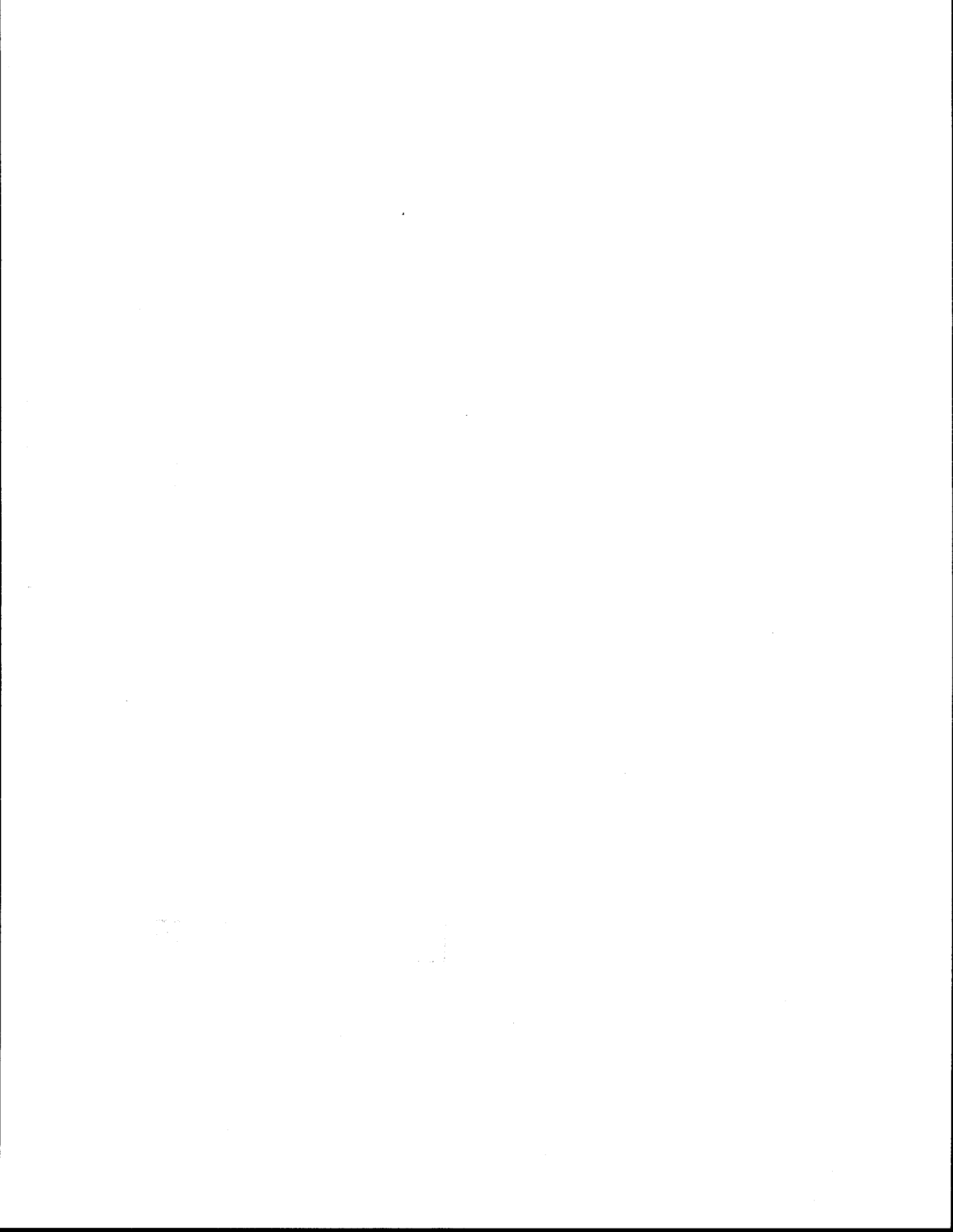
THE UNIVERSITY OF CHICAGO  
LIBRARY

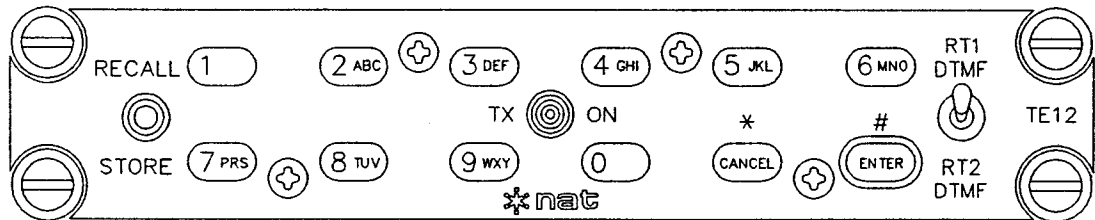
1957



**Confidential and Proprietary to NAT**

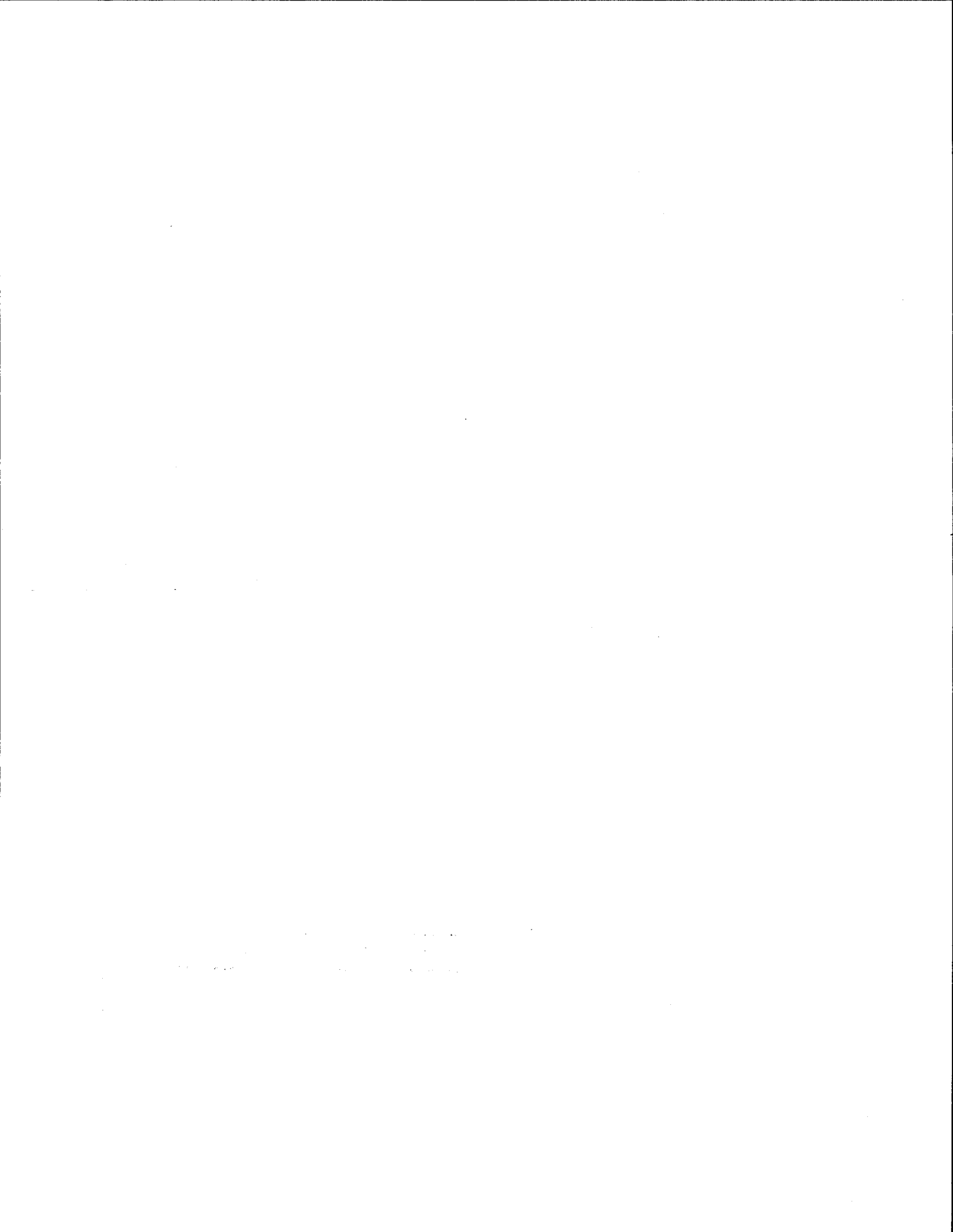
REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
A	NOV 27/91	DESCRIPTION	PART NUMBER	DRAWING NUMBER
		FACEPLATE	DTE12	DTE12\905A
		DATE	DRAWN BY	APPROVED BY
		MAR 20/91	MITCH Q. STINSON	NAT FOOD

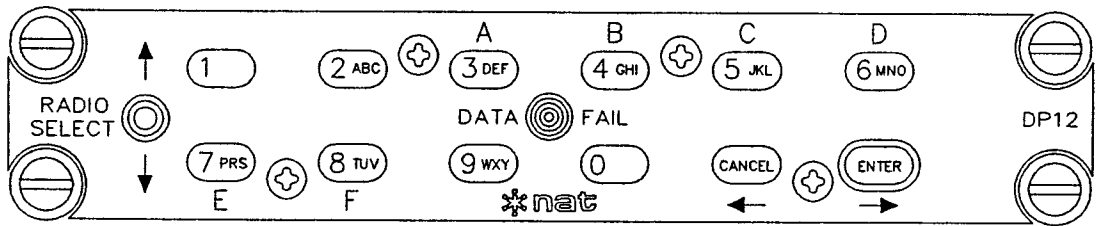




**Confidential and Proprietary to NAT**

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
A	NOV 27/91	DESCRIPTION	PART NUMBER	DRAWING NUMBER
		FACEPLATE	TE12	TE12\905A
		DATE	DRAWN BY	APPROVED BY
		MAR 20/91	MITCH Q. STINSON	NAT PROD 119





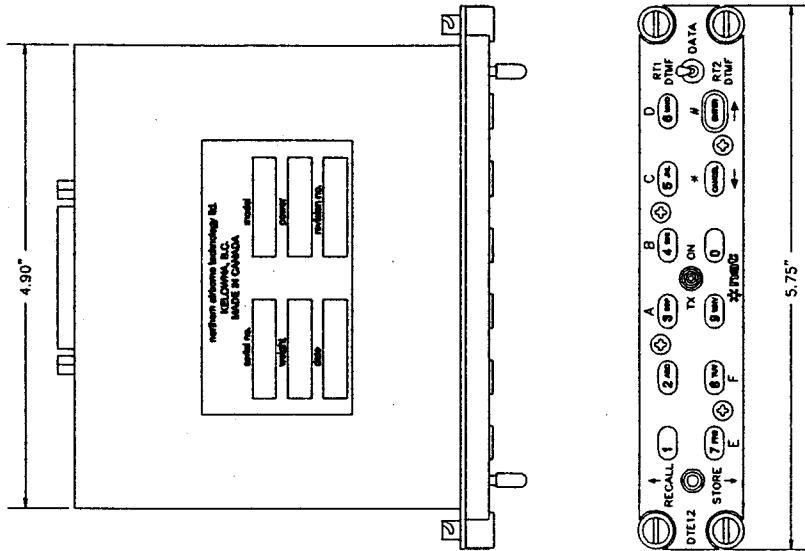
**Confidential and Proprietary to NAT**

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.		
		DESCRIPTION	PART NUMBER	DRAWING NUMBER
		FACEPLATE	DP12	DP12\905
		DATE	DRAWN BY	APPROVED BY
		NOV 27/91	MITCH Q. STINSON	NAT PROD 119

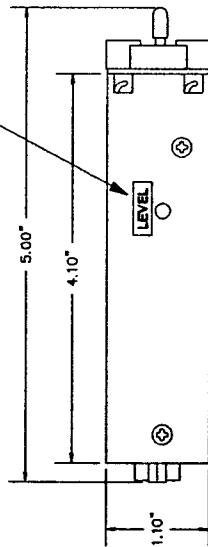
1954



MECHANICAL DRAWING OF THE  
 DTE12 DTMF TONE ENCODER / DATA ENTRY KEYPAD.  
 DIMENSIONS ALSO APPLY TO THE  
 TE12 DTMF TONE ENCODER,  
 AND THE DP12 DATA ENTRY KEYPAD.  
 SCALE: 2:1



DTMF TONE OUTPUT LEVEL ADJUSTMENT  
 ( DTE12 AND TE12 ONLY )



**Confidential and Proprietary to NAT**

REVISION	DATE	NORTHERN AIRBORNE TECHNOLOGY LTD. 1925 KIRSCHNER RD. KELOWNA, B.C.
		PART NUMBER DRAWING NUMBER FILE NUMBER
		DTE12-SERIES DTE12\900 DTE12\900
		DESCRIPTION SHEET DATE
		ORTHOGRAHIC 1 OF 1 20 AUG 1993
		DESIGNED BY DRAWN BY APPROVED BY
		MOS. KV SCOTT MOORE NAT PROD

17  
18

## Section 3.0 Operation

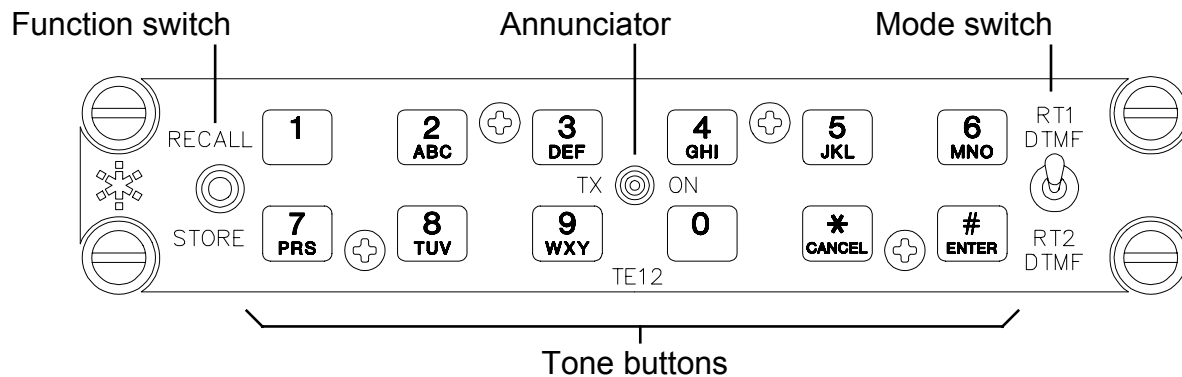
### 3.1 Introduction

There are two modes of operation for this product family, **DTMF SIGNALING**, and **KEYPAD DATA ENTRY**. The TE12 and DTE12 have DTMF tone generation capability, the DTE12 and DP12 have Keypad Data Entry functions, and the DTE12 is able to display DTMF tone sequence numbers on a Tac/Com II Control Head display.

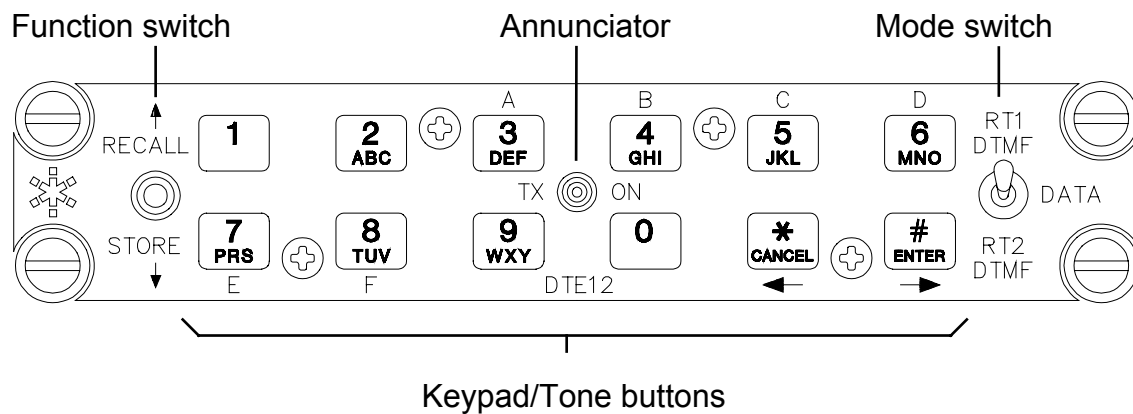
The information contained in this section applies to both earlier and current generation units

### 3.2 Controls

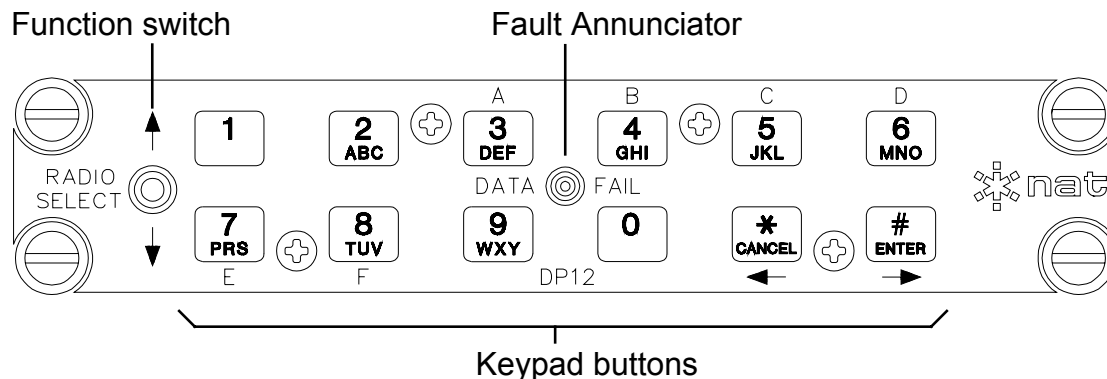
#### TE12 Controls



#### DTE12 Controls



## DP12 Controls



### 3.2.1 The Mode Switch (TE12 and DTE12)

On the TE12 the **Mode** switch is a two-position toggle switch that selects DTMF Operation on either RT1 or RT2.

On the DTE12 the **Mode** switch is a three-position toggle switch that selects between Data Entry Mode and DTMF mode on RT1 or RT2.

The DP12 does not have a **Mode** switch and is always in Data Entry Mode.

### 3.2.2 The Function Switch

The **Function** switch is a three-position, momentary, centre-off, toggle switch.

While in DTMF Mode (TE12 and DTE12 only) the **Function** switch allows tone sequences to be stored and recalled from the ten memory locations.

While in Data Entry Mode (DTE12 and DP12 only) and during Normal Control Head operation the **Function** switch provides a way to select the next or previous radio. During Control Head Channel Edit, the **Function** switch provides a way to select the next or previous channel to edit.

### 3.2.3 Number buttons (0-9)

While in DTMF Mode (TE12 and DTE12 only) the **Number** buttons allow the selected transceiver to be keyed and the associated tone to be generated.

During DTMF Recall and Store functions, the **Number** buttons are used to select one of the ten memory locations.

While in Data Entry Mode (DTE12 and DP12 only) the **Number** buttons are used to select channels and receive and transmit frequencies.

The **Number** buttons 3, 4, 5, 6, 7, 8 can be used to select channels by bank. The bank letter (A, B, C, D, E, F) is engraved above the **Number** button.

### 3.2.4 CANCEL , Left Arrow , (\*) Button

---

While in DTMF Mode (TE12 and DTE12 only) this is the (\*) button, and is used to key the selected transceiver and generate the associated tone.

During the DTMF Recall function this is the **CANCEL** button, and is used to exit the Recall function. During the DTMF Store function this is the **CANCEL** button, and is used to clear the data stored in the selected memory location.

While in Data Entry Mode (DTE12 and DP12 only) during channel edit, this is the **Left Arrow ( ← )** button and is used to select the previous field or digit for editing. During Normal control head operation it is the **CANCEL** button and is used to cancel the channel change command.

### 3.2.5 ENTER , Right Arrow, (#) Button

---

While in DTMF Mode (TE12 and DTE12 only) this is the (#) button and is used to key the selected transceiver and generate the associated tone.

During the DTMF Recall function this is the **ENTER** button, and is used to initiate transmission of a tone sequence. During the DTMF Store function this is the **ENTER** button, and is used to initiate the storage of a tone sequence in a memory location.

While in Data Entry Mode (DTE12 and DP12 only) and during control head channel edit, this is the **Right Arrow ( → )** button and is used to select the next field or digit for editing. During Normal control head operation it is the **ENTER** button and is used to complete the channel change command.

### 3.2.6 Transmit, Data Error Annunciator

---

This is a bicoloured light emitting diode.

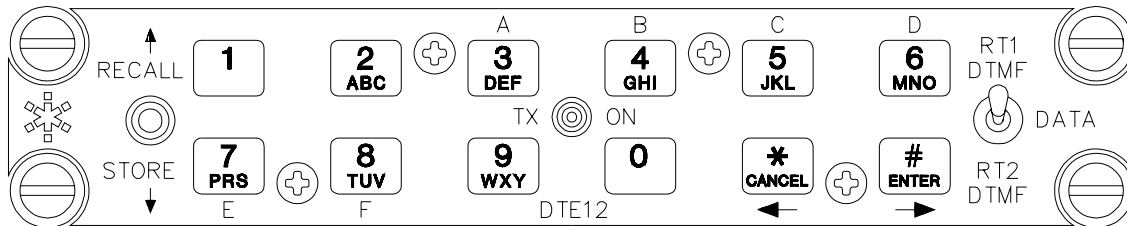
While in DTMF mode (TE12 and DTE12 only) the annunciator lights **GREEN** when the selected transceiver is transmitting. During the DTMF Recall and Store functions the annunciator will **FLASH RED** to indicate that an operation is incomplete. The operator must select a memory location, and press the **CANCEL** or **ENTER** button.

In Data Entry Mode (DTE12 and DP12 only) the annunciator will **FLASH RED** if there is an error in the transfer of serial data between the DTE12/DP12 and the Control Head.

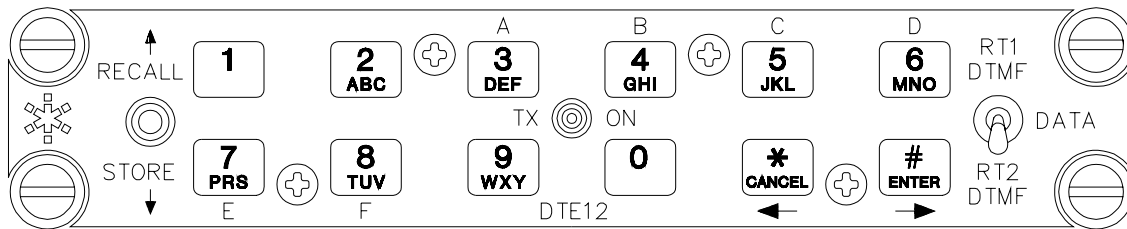
### 3.3 DTMF Signaling Operation of the TE12 and DTE12

#### 3.3.1 Selecting a Radio

- 1) Ensure the radio is on and correctly channeled before transmitting.
- 2) Use the **Mode** switch to select the transceiver that will transmit the DTMF tone sequence. The TE12 and DTE12 support two transceivers.



Tone Transmission on RT1



Tone Transmission on RT2

#### 3.3.2 Manually Transmitting a Tone Sequence

To manually transmit a tone or tone sequence:

- 1) Select the radio you want to transmit on with the **Mode** switch (**RT1/RT2**).
- 2) Press the **Keypad** buttons (**0-9,\*,#**) that correspond to the tone sequence you want to transmit.

The DTE12/TE12 will key the selected transceiver and generate a tone for each button that you press. One button press will result in one tone, no matter how long the button is depressed.

On DTE12 units that are connected to a Tac/Com II Control Head, the number of the first eleven buttons pressed will be shown on the display of the control head.

The DTE12/TE12 unit will wait approximately two seconds for the next **Keypad** button to be pressed. After two seconds, the DTE12/TE12 unit will release the transmit key, and the control head display will revert to normal.

The first eleven tones of this tone sequence are now stored in the Last Number memory location and may be transmitted again using the Retransmit Function, or may be stored in a permanent memory location.

### 3.3.3 Retransmitting a Tone Sequence

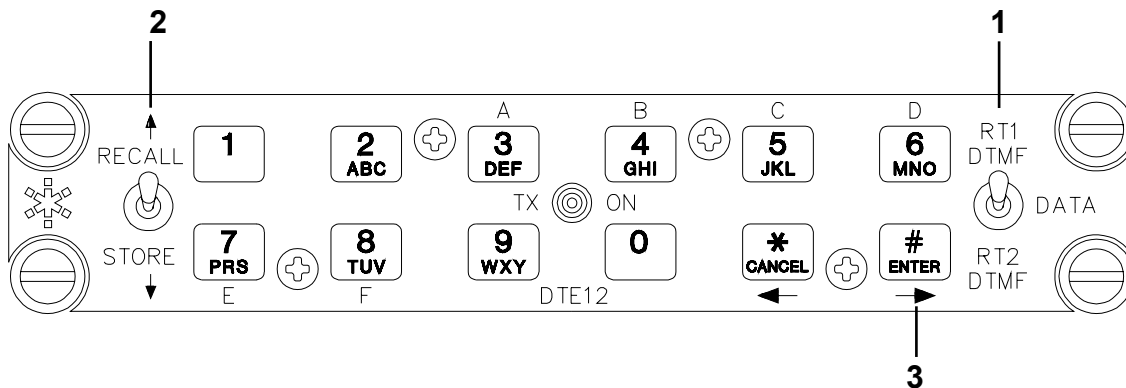
To retransmit the last manually entered tone sequence:

- 1) Select the radio you want to transmit on, with the **Mode** switch (**RT1/RT2**).
- 2) Toggle the **Function** switch to **RECALL**.  
The annunciator will **FLASH RED**.
- 3) Press the **ENTER** button.

The annunciator will light **GREEN**.

The selected transceiver will be keyed and the last manually entered tone sequence will be transmitted.

On DTE12 units the tone sequence will be shown on the control head display.

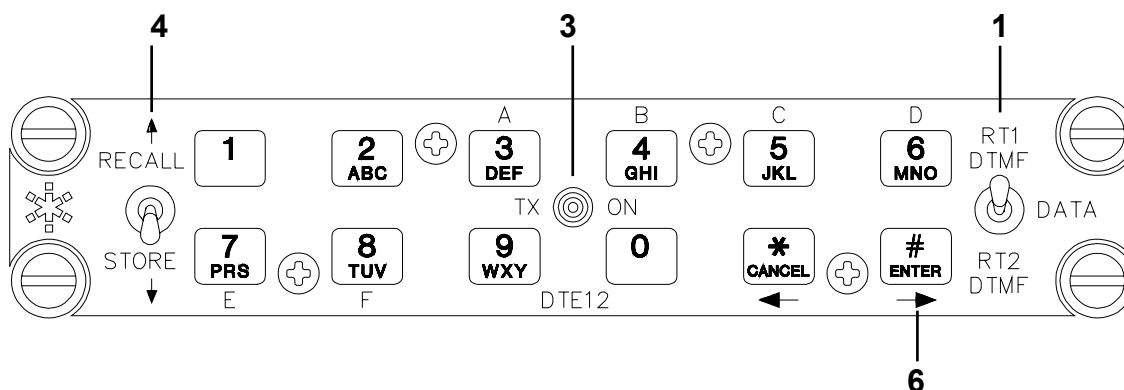


### 3.3.4 Storing a Tone Sequence

The memory inside the DTE12/TE12 can hold up to 10 separate 11-digit tone sequences. These are stored in locations accessed through the **Number** buttons (**0-9**). The DTE12/TE12 uses non-volatile memory to store the tone data, and there is no battery or ship power connection required to retain the information.

To store a tone sequence:

- 1) Select the radio you want to transmit on with the **Mode** switch (**RT1/RT2**).
- 2) Enter in the tone sequence using the **Keypad** buttons (**0-9, \*, #**).  
This will key the radio and transmit the tone sequence.  
The annunciator will light green.
- 3) **Wait until the radio has stopped transmitting and the annunciator has turned off.**  
The Control Head will lock-up if you press the **STORE** switch while the radio is transmitting.
- 4) Momentarily toggle the **Function** switch to **STORE**.  
The annunciator will **FLASH RED**.
- 5) Press the **Number** button of the desired storage location, **0-9**.  
The annunciator will still **FLASH RED**.  
If the wrong **Number** button was pressed, then press the correct **Number** button.
- 6) Press the **ENTER** button.  
The DTE12/TE12 will then store the tone sequence in the location you have selected (**0-9**), and the annunciator will turn off.



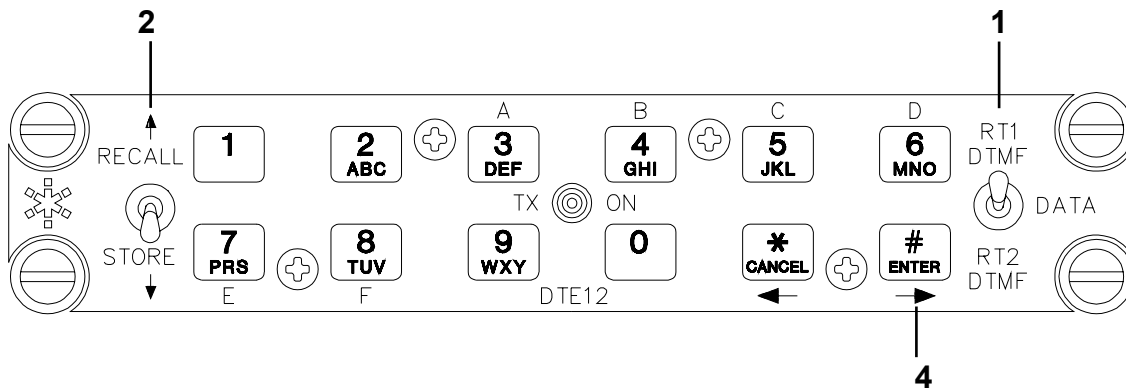
**Note:** If the last tone sequence entered is greater than 11 tones, only the first 11 tones will be stored.



### 3.3.5 Transmitting a Stored Tone Sequence

To transmit a stored tone sequence:

- 1) Select the radio you want to transmit on with the **Mode** switch (RT1/RT2).
- 2) Momentarily toggle the **Function** switch to **RECALL**.  
The annunciator will **FLASH RED**.
- 3) Press the **Number** button (**0-9**) of the location of the stored tone sequence.  
If a DTE12 is being used, the stored tone sequence will be shown on the display of the control head.  
The annunciator will still **FLASH RED**.  
If the wrong **Number** button was pressed, then press the correct **Number** button.
- 4) Press the **ENTER** button.  
The annunciator will light **GREEN**, the selected radio will be keyed and the tone sequence will be transmitted.  
To exit this mode without transmitting the tone sequence, press the **CANCEL** button instead of the **ENTER** button.

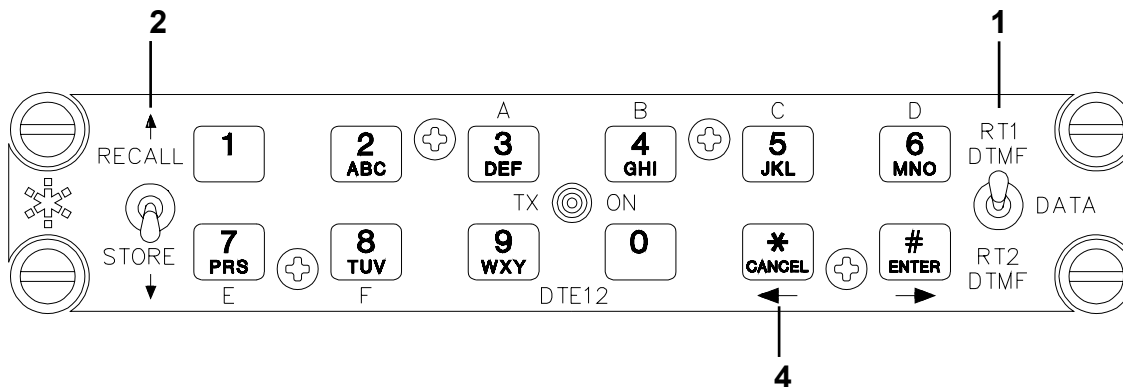


### 3.3.6 Deleting a Stored Tone Sequence

A stored tone sequence may be removed from the DTE12/TE12, without having to store another tone sequence in that location.

To delete a stored tone sequence:

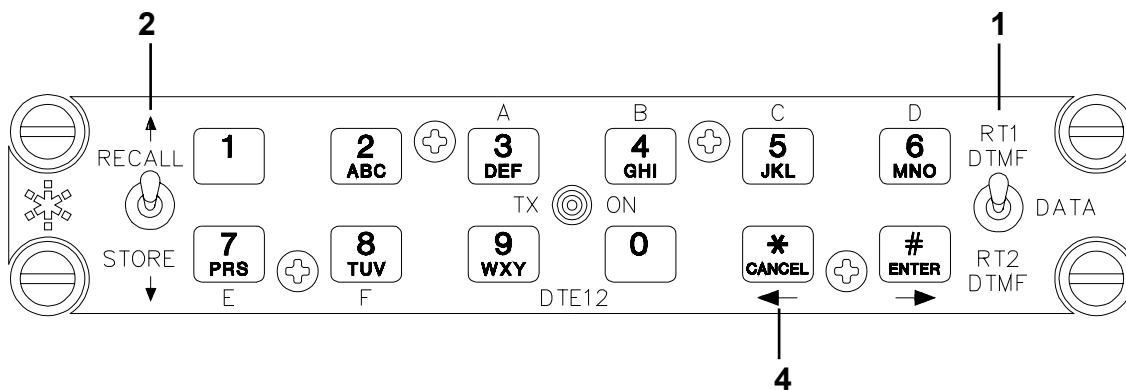
- 1) Select the DTMF mode with the **Mode** switch (**RT1/RT2**).
- 2) Momentarily toggle the **Function** switch to **STORE**.  
The annunciator will **FLASH RED**.
- 3) Press the **Number (0-9)** button of the memory location from which tone sequence is to be deleted.  
The annunciator will **FLASH RED**.
- 4) Press the **CANCEL** button.  
This will erase the tone sequence and leave the memory location blank.



### 3.3.7 Displaying Stored Tone Sequences (DTE12 only)

To display the tone sequence of a memory location:

- 1) Select the DTMF mode with the **Mode** switch (**RT1/RT2**).
- 2) Momentarily toggle the **Function** switch to **RECALL**.  
The annunciator will **FLASH RED**.
- 3) Press the **Number (0-9)** button of the location of the stored tone sequence.  
The annunciator will **FLASH RED**.  
The tone sequence will be show on the control head display.  
Continue to press the **Number (0-9)** buttons to view the tone sequences of the other memory locations.
- 4) Press the **CANCEL** button.  
To transmit the tone sequence on the selected transceiver press the **ENTER** button instead of the **CANCEL** button.



### 3.4 Data Entry Mode (DTE12 and DP12 Units)

---

The DTE12/DP12 units connect with Tac/Com II Control Heads to serve as data entry keypad units. Using the DTE12/DP12 keypad, control head channeling and frequency editing can be more easily accomplished.

#### 3.4.1 Selecting a Channel on a Control Head

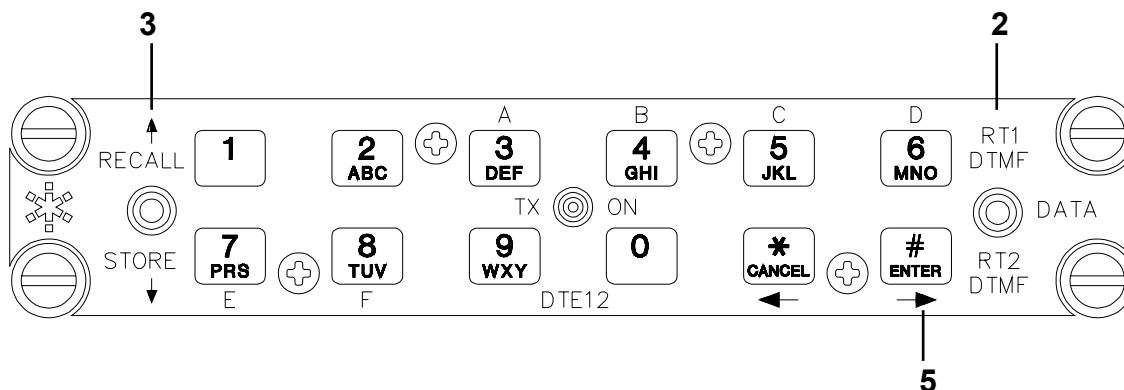
---

With the DTE12/DP12, it is possible to channel the Tac/Com control head.

To select a new channel on the Tac/Com II Control Head:

- 1) Ensure the Tac/Com II Control Head Edit switch is in the Off position.
- 2) Put the **Mode** switch in the **Data** position (DTE12 Only).
- 3) Use the **Function** (  $\uparrow$   $\downarrow$  ) switch to move the cursor to the control head display line of the transceiver that is to be channeled.  
(The Control Head 'Radio/Next' button may also be used.)
- 4) Press the **Number** buttons of the channel you want to select.  
Use the same method of channel numbering as is displayed on the control head.  
**Sequential** channel numbers range from the lowest to the highest channel number in the control head display.  
**Banked** channel numbers use **A, B, C, D, E, F** (the buttons **3, 4, 5, 6, 7, 8**) followed by the lowest to the highest channel number in the bank.
- 5) Press the **ENTER** button.  
To exit the select channel command press the **CANCEL** button instead of the **ENTER** button.

Example: To select channel 128, press: '1', '2', '8', 'ENTER'.  
To select channel 001, press: '1', or '0', '1', or '0','0','1', 'ENTER'.  
To select channel B12, press: 'B'('4'), '1', '2', 'ENTER'.



### DATA ENTRY MODE-CHANNEL SELECTION

Note: Only the last three channel numbers pressed before the **ENTER** button is pressed will be used for channel selection. If an invalid channel number is entered, no channel change will occur and the control head will display the message "CHANNEL ERROR".

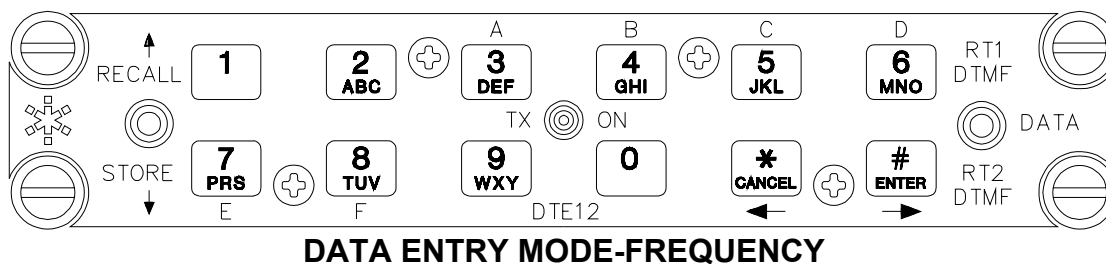
#### 3.4.2 Editing Frequencies on a Control Head

The DTE12/DP12 may be used to enter receive and transmit frequencies while the Tac/Com Control Head is in Channel Edit Mode.

To edit a frequency:

- 1) Select the channel to be edited on the Control Head.  
Use the DTE12/DP12 channel selection (See 3.2.2),  
or the Control Head CHAN/SELECT and RADIO/NEXT switches.
- 2) Put the Control Head EDIT switch in the CH (Channel) position.  
The first editable digit in the control head display will be flashing.
- 3) Put the Control Head DISPLAY switch in the TX position.
- 4) Enter the new transmit frequency on the DTE12/DP12 keypad.  
Use the **Number** buttons to enter the frequency digits.  
Use the ( ← ) button to edit the previous digit.  
Use the ( → ) button to edit the next digit.  
The decimal point and the receive/transmit/simplex flag will be skipped during editing.
- 5) Use the Control Head CHAN/SELECT switch to select the transmit tone.
- 6) Put the Control Head DISPLAY switch to the RX position.

- 7) Enter the new receive frequency and tone on the DTE12/DP12 keypad as per steps 4 and 5.
- 8) Toggle the **Function** (  $\uparrow\downarrow$  ) switch to select the next channel for editing.
- 9) When finished editing put the Control Head EDIT switch in the OFF position.



Example: To enter the transmit frequency 151.475 MHz,

Put the Control Head Edit switch to the CH position.

Put the Control Head Display switch in the TX position.

Press the following DTE12/DP12 **Number** buttons: **1, 5, 1, 4, 7, 5**

Put the Control Head Edit switch to the OFF position.

#### 3.4.2.1 Notes:

If an out of band frequency is entered, the Control Head will display asterisks instead of the receive or transmit frequency when the Edit switch is returned to the OFF position.

Example: >001 \*\*\*.\*\*\*t -

Go back into Channel edit mode and enter a valid frequency.

Editing a frequency to all zeros can be used to completely erase a channel (create a 'blank' channel).

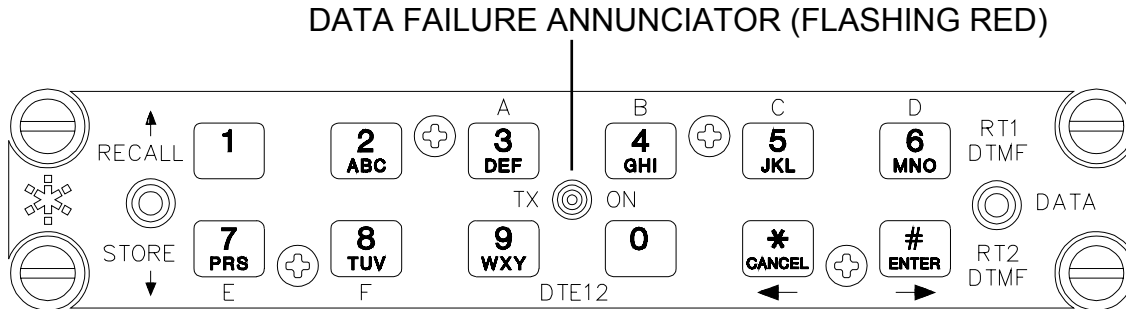
When the (  $\leftarrow$  ) or (  $\rightarrow$  ) buttons are used to move the editable (flashing) character past the end of the display line, it will 'wrap-around' to the other end of the display line.

#### 3.4.2.2 Limitations of Frequency Edit:

The DTE12/DP12 unit will not allow editing of the Alpha-numeric label that is displayed in the Control Head's ID - Display. The DTE12/DP12 unit will not allow editing of the receive or transmit tones. The Alpha-numeric label and receive and transmit tones must be edited from the Control Head by using the SELECT '+ / -' toggle switch. However, you may use the (  $\leftarrow$  ) and (  $\rightarrow$  ) buttons on the DTE12/DP12 to move to the previous, or next, portion of the receive or transmit tone.

### 3.4.3 DTE12/DP12 Serial Communications Time-out

To use the DTE12/DP12 for data entry with a Tac/Com II Control Head, the DTE12/DP12 must achieve serial data communication with the control head. If this duplex communication is not achieved, the DTE12/DP12 will retry for a brief period, and then time out. If it fails to achieve serial communication, the annunciator will briefly flash RED. This is a warning to the operator that some aspect of the DTE12/DP12 to control head interface is not working. The control head may be turned off, there may be a wire broken, or some other interface fault may exist.



End of Section 3.0

