TNT

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- TYPE 'N TALK, TNT :Operator's Manual
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TABLE OF CONTENTS

SECTION.....PAGE

Introduction 1
Physical Description 2
Interconnections 4
---- Power 4
---- Audio 4
----- RS232
Installation 7

Operation 8
----- Inputting Data 8
----- Unit Assignment/Selection 9
----- Mode Selection 11
----- Commands 14
----- Vocabulary Programming 15
----- Correcting Mispronounced Vocabulary 17
---------- Misspelling Words 17
---------- Separating Words 21
------ Phonetic Programming 22
---------- Operation 22
---------- Phonetic Alphabet 22
----------Procedure & Example 23
Configurations 25
----- Single Unit - Dedicated Channel 26
----- Single Unit - Shared Channel (daisy chain) 26
----- Multiple Unit - Shared Channel (daisy chain) 26
Specifications 27
APPENDICES 28
LIST OF FIGURES iv
LIST OF TABLES iv

LIST OF FIGURES

FIGURE.....PAGE
Figure 1. TYPE 'N TALK Unit - Front View 2
Figure 2. TNT Front Panel 3
Figure 3. TNT Back Panel 3
Figure 4. RS-232 Cable Configuration 5
Figure 5. Block Diagram of a TNT 12
Figure 6. TNT Configurations 25

LIST OF TABLES

TABLE.....PAGE
Table 1. Baud Selection Switches 7
Table 2. Unit Assignment/Selection Codes 10
Table 3. Mode Control Codes 11
Table 4. Consonants With More Than One Pronunciation 18
Table 5. Letter Sequences Producing Long Vowel Sounds 19
Table 6. Diphthong Letter Sequences 19
Table 7. Letter Sequences Producing Short Vowel Sounds 19

- **INTRODUCTION**
  - TYPE 'N TALK (TNT) is a text-to-speech synthesizer. A revolutionary new voice output device, TNT is as easy to program as typing data or programs into a computer. TNT is a small, light weight unit that may be interfaced to computer, modem, or any RS-232 compatible serial device. It contains a VOTRAX SC01 phoneme synthesizer chip and a text-to-speech translation system. Functioning as a voice output device, TNT may be utilized in a variety of different applications from Computer Aided Instruction (CAl) to warning or prompting signals in any existing (or new) software program. One or more TNT units (up to 8) can be linked together (daisy chained) in order to provide multiple voice outputs from a single computer interface. TNT is a totally self-contained text-to-speech synthesizer; therefore, it will not slow down the throughput of the user's computer doing time consuming text translations. With this responsibility oft-loaded to a TNT, the user's computer is free to perform other tasks while speech is in process. The vocabulary spoken by TNT is of the user's unrestricted design. This is because a text-to-speech synthesizer creates speech from a set of rules describing English, rather than from a set of prestored utterances. In other words, text-to-speech has an unlimited vocabulary repertoire. This vocabulary can be inserted directly into the user's software programs similar to the way statements for activating a printer or CRT are written. This eliminates the need for any extra memory, RAM or ROM, usually required for prestored vocabulary techniques. Also, it is possible to use a standard high level computer anguage to directly drive a TNT unit. The versatility of use of the TNT is unlimited. The text that follows is intended to describe TNT's functions and operations. Implementation of a particular TNT configuration is to be determined by the user.
- **Physical Description**
  - The TYPE 'N TALK device is packaged in a smal, light weight case no larger than a portable cassette recorder. Dimensionally, TNT requires no more than 7.7" x 5.2" x 3.1" (19.3 mm x 12.3 mm x 6.5 mm) of space. It weights approximately 2 lbs. (896 g.)

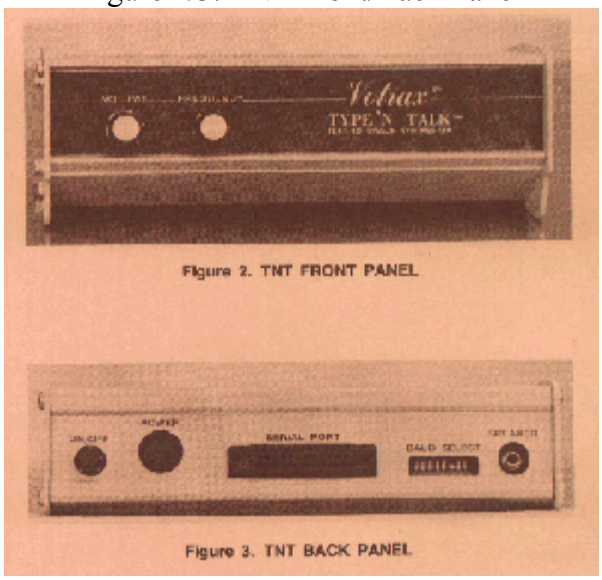
Figure 1. Type 'N Talk Unit - Front View

Figure 1. TYPE 'N TALK UNIT — FRONT VIEW

- Two voice control knobs, VOLUME and FREQUENCY, are located on the left front panel of TNT (See Figure 2). Referring to Figure 3, all other operational switches, jacks, and connector

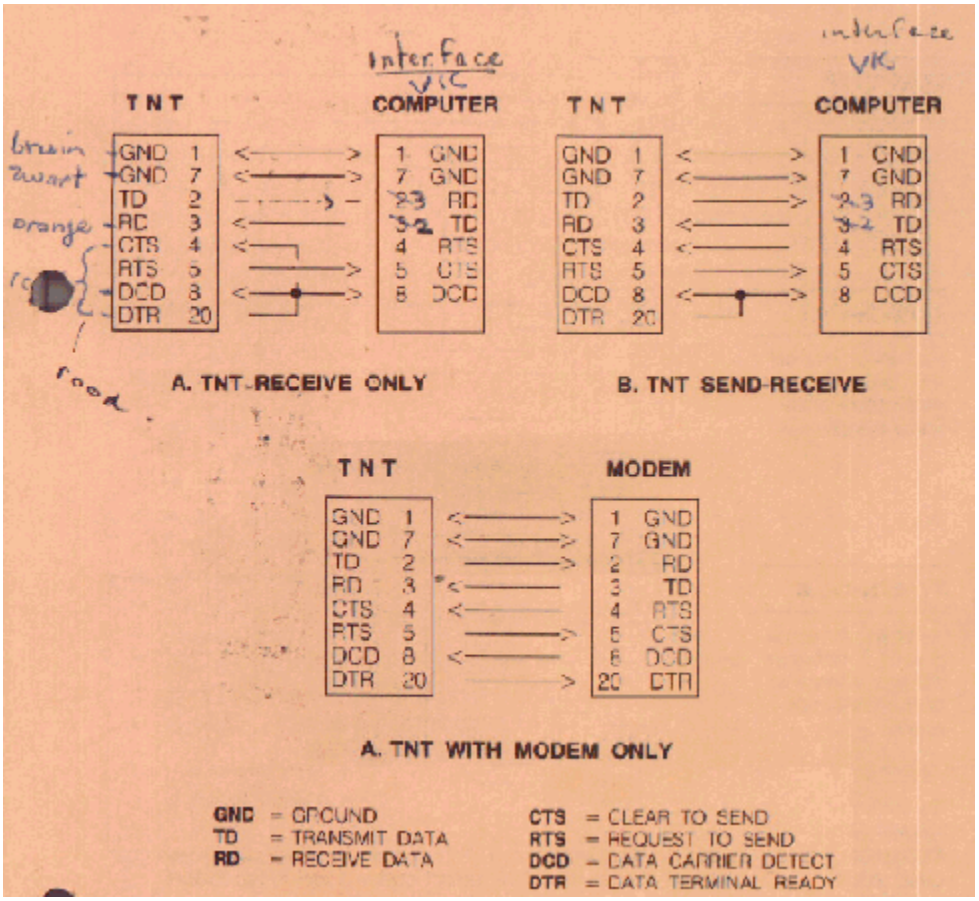
ports are located on the back panel of the unit. Note that the ON/OFF push button switch is in the farthest left position on the back panel The POWER jack, located to the right of the ON/OFF switch, will accept only a 5-pronged DIN connector, differentiating it from all other jacks An RS-232 SERlAL PORT is in the center of the back panel. To the right of this port is the BAUD SELECT switch and the SPEAKER jack respectively.

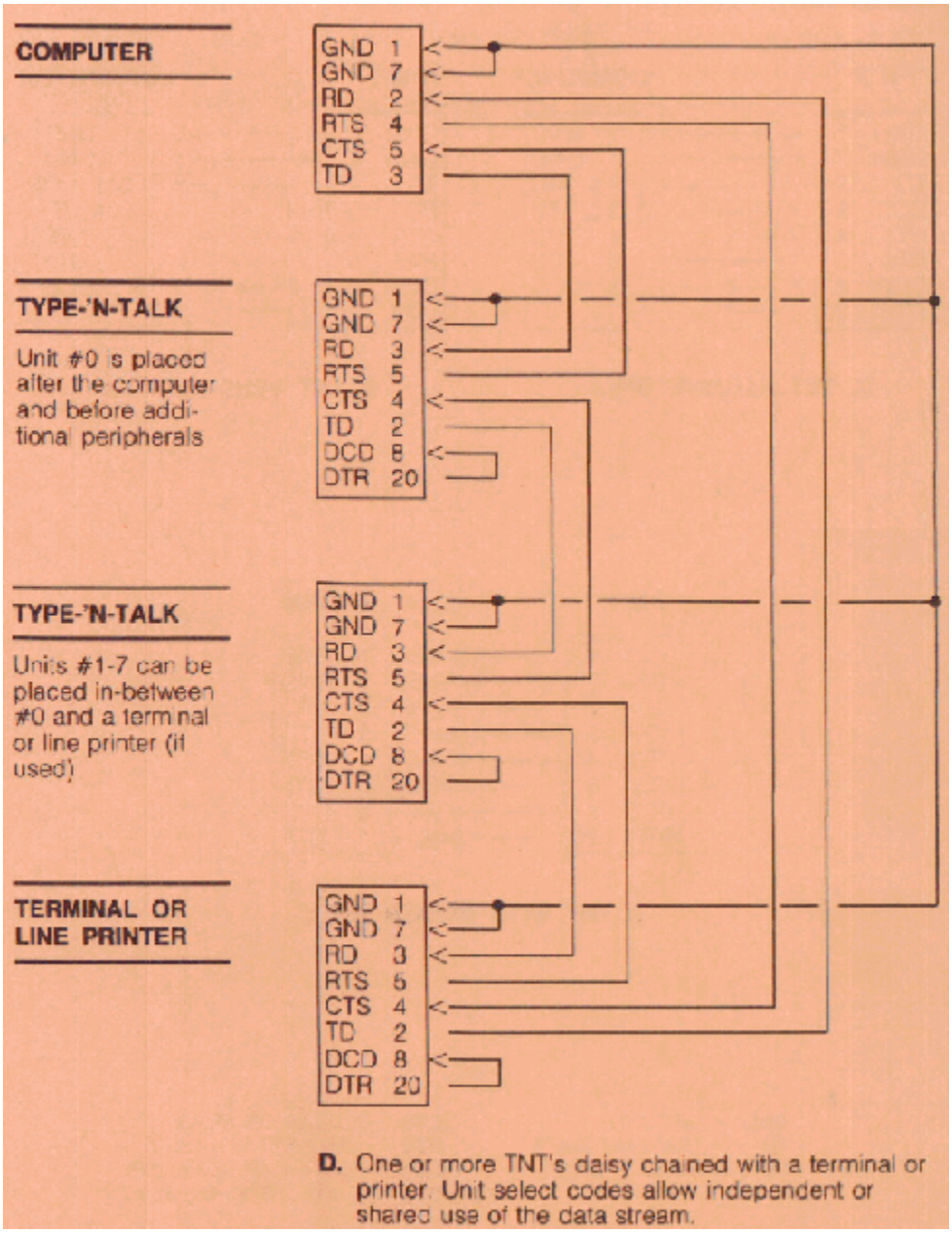
Figure 2/3. TNT Front/Back Panel



- **INTERCONNECTIONS**
  - POWER A special TNT power connector is provided which attaches directly to the TNT unit. The power connector receptacle is located on the back panel. Note: The power receptacle will only accept the 5-pronged DIN connector provided. Any 110 volt AC outlet is appropriate for the transformer end of the connector.
  - AUDIO (Speaker) Attach any 8 ohm speaker to the TNT unit for audio output. The SPEAKER jack is on the back panel of the unit.
  - RS-232 (Interface) TNT uses an RS-232C interface for receiving text and sending phonetic data from, and to, a user's computer. It is possible to configure a TNT with the user's equipment in several ways (See CONFIGURATIONS). To assure proper data transfer to TNT, the use of the RTS signal from the unit is required. This signal will tell the transmitting computer or device,that TNT is not ready to accept data. Likewise, TNT will not transmit data if the CTS signa from a computer or device is not TRUE. The DCD (Data Carrier Detect) signal is used with a modem to prevent TNT from speaking "gibberish" as a result of invalid data being received during carrier loss conditions. If a modem is not used then this input should be tied to +12 volts or the DTR (Data Terminal Ready) output on TNT. Similarly, if TNT is used in a receive-only mode, then its CTS (Clear To Send) input should also be tied to +12 volts or DTR. NOTE: Failure to connect DCD and CTS to the proper levels will prevent TNT from operating properly.

Figure 4/4a. RS-232 Cable Configurations


Interface
VK
interface
VK
TNT
COMPUTER
TNT
COMPUTER
brown
white
orange
GND 1
GND 7
TD 2
RD 3
CTS 4
RTS 5
DCD 8
DTR 20
1 GND
7 GND
RD
TD
4 RTS
5 CTS
8 DCD
A. TNT-RECEIVE ONLY
B. TNT SEND-RECEIVE
TNT
MODEM
GND 1
GND 7
TD 2
RD 3
CTS 4
RTS 5
DCD 8
DTR 20
1 GND
7 GND
2 RD
3 TD
4 RTS
5 CTS
8 DCD
20 DTR
A. TNT WITH MODEM ONLY
GND = GROUND
TD = TRANSMIT DATA
RD = RECEIVE DATA
CTS = CLEAR TO SEND
RTS = REQUEST TO SEND
DCD = DATA CARRIER DETECT
DTR = DATA TERMINAL READY



D. One or more TNT's daisy chained with a terminal or printer. Unit select codes allow independent or shared use of the data stream.

- **INSTALLATION**
  - To interface the TNT unit to a computer, modem, or other RS-232 compatible serial device, a connector cable must be obtained (see RS-232 Interface section). Connect this cable in the SERIAL PORT on the back panel of the unit. This cable is then connected to the user's computer and to any additional equipment being used. Set the BAUD select switch on the back of TNT for the desired data rate (See TABLE 1). Only one switch may be closed at a time. Connect the power transformer's DIN connector to the back of TNT, then plug the other end into a 110 volt AC outlet. Push the ON/OFF button to the ON position. The unit will say "SYSTEM READY" when the power switch is pushed to the ON position ONLY it the RS-232 signals from the computer indicate that the computer is also ready. TNT may be powered-up without the computer being READY, but there will be no audio feedback from TNT to indicate that it is operational.

Table 1 Baud Selection Switches

BAUD	SWITCH	BAUD	SWITCH
75	1	1200	5
150	2	2400	6
300	3	4800	7
600	4	9600	8

Close (down position) only one switch at a time.

- **OPERATION**
  - **INPUTTING DATA** Data in the form of ASCII codes can be sent to TNT whenever the handshake line (RTS) indicates that it is not busy (logical 0). This data is classified in three ways: mode controls/commands, speech data, and null data. Mode controls and commands are discussed in their own sections below. Speech data is broken down into two classes: text and phonetic. All data types, with the exception of a Unit Select sequence, can only affect TNT when its input switch is ON (see UNIT SELECTION).
  - **TEXT** Text is defined as any printable ASCII character that was not preceded by an ESCAPE code (see NULL DATA), or a phoneme delimiter. All text received is stored in the input buffer until it is spoken. Of all the printable characters, only a subset produces audible speech. This subset includes the characters: "ABCDEFGHIJKLMNOPQRSTUVWXYZ" "abcdefghijklmnopqrstuvwxyz0123456789." The rest of the printable characters produce durations of silence or have no effect.
  - **PHONETIC** Phonetic data is defined to be any printable character enclosed by phoneme delimiters (see APPENDIX B for Phoneme Table). The phoneme start and stop delimiters are the "~" and the "?" characters respectively. Phonetic data is stored in the input buffer along with text (they can be mixed). When data in the input buffer is being spoken, phonetic data is routed directly to the output queue, bypassing the text-to-speech translator (refer to FIGURE 5).
  - **NULL DATA** Certain ASCII characters will have no effect on the operation of TNT; however, they will be ECHOed if this option is selected. The codes are as follows: 1) Any non-printable character that is not specified in the COMMANDS section with the exception of the ESCAPE code. 2) Any character preceded by an ESCAPE code that is not specified in the UNIT ASSIGNMENT/SELECTION and MODE CONTROLS sections. SPECIAL CASE: The sequences ESCAPE, "Y" and ESCAPE, "=" cause the next two characters received to be ignored. These four characters are used for cursor addressing found on several commercially available video terminals.
  - **UNIT ASSIGNMENT/SELECTION** Data can be selectively sent to a particular TNT unit in a daisy chain. This has value when the user desires to send different data to a TNT than to a printer/terminal, or other TNT units. All TNT's will have a unit number (UN IT-NUM) associated with it. Upon power-up all TNT units automatically assume the UNIT-NUM 0. This can be changed by the user to any number 0-7 via the codes shown below. An assignment or selection code must be preceded by the ESCAPE code in order to validate it. When a TNT receives an assignment code it will store the corresponding UNIT-NUM as its own. It then adds one to the assignment code and transmits this downline. In essence, the TNT units are counting off. This allows multiple

TNT units in a daisy chain to all be assigned with only one assignment code sent from the user's computer. After an assignment has been made all units will be deselected (switch 2 in FIGURE 5 is OFF). When a particular unit receives its UNIT-NUM, it will become selected (switch 2 is ON) and transmit UNIT-NUM 0 downline. Only the TNT unit corresponding to the last sent UNIT-NUM will be selected at any time!

Table 2 Unit Assignment/Selection Codes

UNIT-NUM	ASSIGN CODE	SELECT CODE
0	8 = BS	0 = NUL
1	9 = HT	1 = SOH
2	10 = LF	2 = STX
3	11 = VT	3 = ETX
4	12 = FF	4 = EOT
5	13 = CR	5 = ENQ
6	14 = SO	6 = ACK
7	15 = SI	7 = BEL

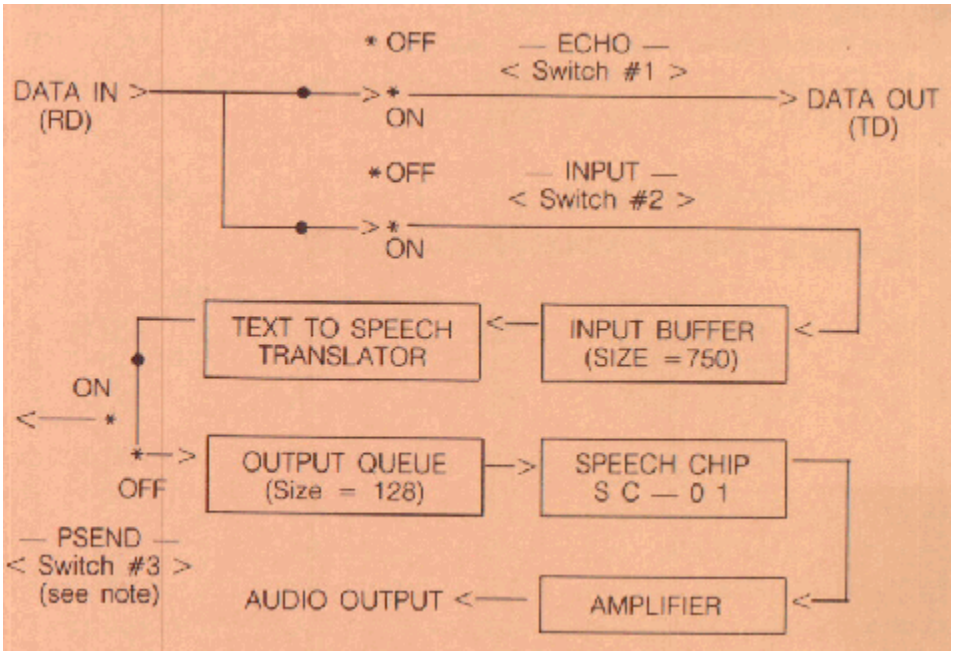
- **MODE SELECTION** There are several optional modes of operation for a TNT that can be selected using control codes. These modes can be dynamically set in accordance with the user's application. TABLE 3 lists the various control codes along with a mnemonic descriptor of the feature. They will be discussed further below. To invoke a particular mode, an ESCAPE code (HEX 1 B, DECIMAL 27) followed by the corrsponding mode control code must be sent to a TNT while its input mode is ON. NOTE: If the TIMER is enabled then an ESCAPE code must be followed by any code within the timer interval (about 3-4 seconds) or TNT will lock-up and must be powered-down. A block diagram showing data flow within a TNT is given in FIGURE 5. This figure will aid the reader in understanding the effect of the mode controls as they are described in detail below.

Table 3 Mode Control Codes

	—CONTROL CODES—			
MODE	HEX	DEC	ASCII	
PSEND ON	11	17	DC1	CRSR
*PSEND OFF	12	18	DC2	RVS ON
*ECHO ON	13	19	DC3	CLR HOM
ECHO OFF	14	20	DC4	INST DE
CAPS ON	15	21	NAK	
*CAPS OFF	16	22	SYN	
TIMER OFF	17	23	ETB	
RESET	18	24	CAN	

*indicates automatic power-up selections

Figure 5 Block Diagram of a TNT
with the software controlled switches at their power-up positions



1. NOTE: When PSEND Switch #3 is ON, the phoneme code stream from the text-to-speech translator is routed to DATA OUT (TD). This is not depicted in the above diagram.
2. The output queue allows the text-to-speech translator to accumulate up to 128 phonemes ahead of where the voice synthesizer is currently at (approximately 12 seconds of speech). This allows TNT to input subsequent messages while other ones are output pending.
3. The input buffer can hold more than 750 characters which is approximately one minute of speech. At 9600 baud this buffer takes less than one second to fill.

- **PSEND ON** When this mode is selected, all phoneme codes resulting from a translation of the input buffer are directed to the TD output of the TNT's RS-232 interface. This feature allows the user's computer to collect the phoneme codes corresponding to the text that's sent to the TNT, and to create a phonetic library or change the phonemes for diflerent pronunciation.
- **PSEND OFF** This is the standard mode of operation where all phonemes generated from the input buffer are placed into the output queue where they can be removed by the speech synthesizer upon demand.
- **ECHO** This feature is used to selectively (ON/OFF) relay data received by a TNT unit to the next unit or peripheral in a daisy chain. Refer to Switch #1 in FIGURE 5 for a graphical description.
- **CAPS ON** In this mode capitalized letters are treated in two diflerent manners. It only the first letter of a word is capitalized, such as a proper noun would be, then the word is translated by the text-to-speech algorithm. When two or more letters are capitalized at the beginning of a word, then the whole word is spelled out, letter by letter. This automatically separates acronyms, which are capitalized, from an English text string. For example: the words "TIN" and &BOB& are pronounced &tee eye en" and "bee owe bee" the words "Tin" and "Bob" are pronounced "tin" and "bob"
- **CAPS OFF** This mode is useful for systems that can only use upper case characters. All upper case characters are folded into their lower case equivalent so all text is translated and not spelled out. Mixed upper and lower case text is treated as all lower case.
- **TIMER OFF** While text is being sent to TNT, if more than approximately 4 seconds elapses

after the last character was received, the text in the input bufler is translated and spoken. This input timer is useful when ONLINE applications send a prompting message without being followed by a carriage return (this is the talk control character). If for any reason this timer feature is not desired it can be disabled with the TIMER OFF command.

- **RESET** This command resets all TNT modes and assignment number to their power-up settings.
- **COMMANDS** BACKSPACE (HEX 8): This command has the eflect of deleting the last character in the input buffer. TALK-CLR (HEX D): This command (carriage return=CR) will cause the data in the input bufler to be spoken, then cleared. There are two alternate ways that TALK-CLR can be executed without sending a CR. The first is the result of an input buffer full condition. The second is the result of the input timer expiring (see TIMER OFF). When text is being translated, data input will momentarily be halted by the RTS signal going TRUE. STOP-TALK (BREAK = RD spacing for more than one data frame): This command (condition) causes all pending speech output to be cancelled.

- **VOCABULARY PROGRAMMING** To program vocabulary into the computer, the user must first be familiar with the computer language in which the programs are to be written. For the purpose of this manual, BASIC will be referenced throughout. lt is assumed that the user is familiar enough with their own computer's language so as to be able to adapt the general information shown in this manual to the appropriate syntactical structure for their programming language. Vocabulary may be entered into the user's computer the same way in which other data or programs are entered. The messages may be typed in as literal statements, using standard English text. This is exemplified in several one-line samples of hypothetical BASIC programs shown below:

e.g. 100 PRINT#-2, "Hello, my name is Votrax"
e.g. 200 A$="That is incorrect": PRINT #-2,AS
e.g. 300 IF I$="blue" THEN PRINT #-2,I$; "is correct" ELSE PRINT #-2,"The color ";I$;" is wrong. Try again."

- **VOCABULARY PROGRAMMING continued** The above examples would have TNT connected to a serial port that is accessed by the command PRINT #-2. In general, data transfer to TNT can occur via the same commands or device drivers used to send data to a CRT, a printer, or a tape drive. Vocabulary programming is as simple as typing a sentence. The greater task is deciding where in the software program to put the vocabulary and, also, when to activate TNT. Once users have predefined their vocabulary in their software program, ii can be sent to any 1 or more output systems simply by defining it within that same software. The user need only beome familiar with the computer's command to write this directive. For example, if the voice output is to be used in an error-prompting scheme, the message might be written: PRINT "Warning. Disc drive not ready."
  The software may be programmed to send this message to TNT and/or a printer for output whenever an attempt is made to use the disc drive before it is ready. If the computer is functioning as a Computer Aided Instruction (CAl) system, the software may be adjusted so that the messages intended for display on a CRT will, instead, be spoken by TNT. This will free the CRT for displaying other, more visually appropriate, material. A TNT advantage is that it can speak messages independently of what is happening with other output devices. It can verbally draw attention to a specific piece of information that otherwise might be lost in a visual

presentation. This could eliminate the errors made by a user who is searching a long, crowded listing for a single piece of data.

Below is a hypothetical example of a software program using TNT output:

```
100 RESTORE
110 FOR x = 1 to 3 : READ Q$,A$
120 PRINT Q$ : PRINT #-2, Q$
130 INPUT R$: IF R$<>A$ THEN PRINT #-2,R$; "is wrong. Try again . . .": GOTO 120
140 PRINT "*** CORRECT ***"
150 PRINT #-2,R$;"is correct."
160 NEXT X : STOP
200 REM------- DATA TABLE -----------
210 DATA "How many bits are in a byte?", "8"
220 DATA "How many bytes are in a K or memory?", "1024"
230 DATA "RAM stands for?", "Random access memory"
```

- Because every application of a TNT unit is different, users must create a specific set of vocabulary to accommodate their individual voice output needs. The examples above are very brief agendas intended to inspire creative use of TNT by its new owner.

- **CORRECTING MISPRONOUNCED VOCABULARY** As you are undoubtedly already aware, the TNT translation system is the most compact system of its kind. In order to accommodate its unlimited vocabulary capabilities while maintaining its small size and low cost, the text-to-speech translator's design is extremely concentrated. A number of words may not be produced with the most acceptable pronunciations. However, the user may easily correct pronunciation errors by following one of several procedures: misspell the word, separate the word into smaller component parts, or phonetically program the word (create a sound sequence). The first two techniques are explained below. Phonetic Programming is handled in its own section immediately following.
- **Misspelling Words** The first and simplest procedure for correcting mispronounced words is to misspell them. For example, the first vowel sound in the word "english" is not accurately pronounced by TNT. To correct this, the user might misspell the word as "inglish." This letter sequence will produce an acceptable pronunciation of the sample word. The concept behind the misspelling process is that the user already has a command of the language and this knowledge will assist in determining which letter combinations will produce the desired sounds. In the example, the pronunciation of "... ing" is known from its use as a verb form ending. Since this letter sequence produces the sounds needed for "english," a quick substitution is made.

- *CONSONANTS*: In most cases, the consonant sounds are easily identified by their letter symbols. The user, however, needs to be auditorially aware of those occasions when a consonant can be pronounced in two different ways. For example, the letter "c" is pronounced either like a "k" or an "s". When a pronunciation error involving the letter "c" occurs, simply substitute it with a "k" or an "s". The table below will identify several other letters with double pronunciations.

Table 4 Consonants with more than one pronunciation

Letter	Pronounced Like . . .	Examples	
c	/K/ or /S/	corn	city
d	/D/ or /T/	paid	passed
g	/G/ or /J/	log	page
q	/K+W/ or /K/	quit	technique
s	/S/ or /Z/	cats	dogs
x	/K+S/ or /G+Z/	six	example

- *VOWELS*: Correcting the pronunciation of the vowels involves more substitution efforts than those used for the consonants. This is because there are only 5 vowel letters to represent 18 different vowel sounds. Spelling rules accommodate this situation by combining the vowel (and, occasionally, the consonants) letters in many different ways in order to achieve the specific sounds. There are 3 categories of vowel sounds defined within the American English spelling system: short vowel sounds, long vowel sounds, and diphthongs (2 vowel sounds in sequence spoken as a single unit). Some long vowels overlap with diphthongs but the user need only be concerned about what letter sequences are required to say the sounds they desire.
- *LONG VOWELS*: One spelling rule known by most is when a vowel letter is doubled, it will usually produce a long vowel sound. The word "keep," for example, has a long "e" vowel sound. Therefore, when TNT pronounces the word "read" like "red," the user may quickly replace the "ea" with "ee" ("reed") to achieve the appropriate pronunciation for the present tense form of this word. Examples of other letter sequences that produce long vowel and diphthong sounds may be found in the table below. The user may experiment with these sequences whenever the need exists.

Table 5/6 Letter Sequences (Long Vowel/Diphthongs)

Table 5

LETTER SEQUENCES PRODUCING LONG VOWEL SOUNDS

Long Vowel Sound	Letter Sequence	Example Word
a	ai	maid
a	ay	day
a	a-e	save
e	ee	keep
e	cei	receive
e	ie	retrieve
e	y	every
i	ey	eye
i	ye	type
i	i-e	line
i	y	my
o	o-e	home
o	oa	goat
o	ow	grow
o	a	war
u	oo	soon
u	ou	group
u	u-e	tune

Table 6

DIPHTHONG LETTER SEQUENCE

Diphthong Sequence	Example Word
ow	power
ou	house
oi	noise
oy	boy
you	you
u	music
ew	few

- *SHORT VOWELS*: To create a short vowel sound, the user may have to manipulate the consonants that follow the vowel. For single syllable words with short vowel sounds, TNT has a high degree of pronunciation accuracy. The words "bat," "spot," and "net" are produced correctly. To maintain the short vowel sounds when adding more syllables to these words, the user. already knows to double the consonant before adding ".....er," "..... ing, or "....ed": "batter," "spotted" and "netting." Without the double consonant, the vowel sound is automatically assumed to be long. To misspell the word "definition" to get a short vowel pronunciation of "e," double the "f": "deffinition." Refer to the table below for other short vowel examples.

Table 7 Letter Sequences Producing Short Vowels Sounds

Short Vowel Sound	Letter Sequence	Example
a	a	hat
a (schwa)	a	about
a (schwa)	a	success
e	e	bet
e	ai	fair
e	er	merry
i	i	trip
i	y	symbol
i	ea	fear
o	o	mop
o	a	father
o	oll	doll
o	all	ball
o	ough	bought
o	au	August
o	ong	song
o	oo	book
o	ou	should
u	u	cup
u	io	nation
u	ou	double
er	er	verse
er	ir	bird
er	or	word
er	ur	turtle
er	ear	heard

- Reiterating the spelling rules necessary to solve all the user's mispronunciation problems would require an enormous number of pages. However, the user will quickly begin to recall many other letter/sound sequences once the pronunciation tables have been reviewed. A list of words known to be mispronounced by TNT are presented in APPENDIX A. Each word has one misspelled version listed with it. From this list, patterns for correcting mispronounced words NOT listed may be elicited. The user should not be limited to just those versions listed. There may be more than one letter sequence which produces the same sound sequence. The APPENDIX will act as a guide for this purpose.

- **Separating Words**
    - Another technique used to correct mispronounced words is to separate the words into 2 or more smaller segments. This procedure is used effectively for words with a structure like "baseball." To avoid the error in this example, type "baseball" as 2 words: "base ball." Other words with similar structures that may be adjusted with this technique are:

"typewriter" - "type writer"
"output" - "out put"
"everyone" - "every one"

- **Separating Words continued**
    - As the user's vocabulary needs increase, it will become evident how both the misspelling and word separation techniques will have combined use. To correct "computer," for example, separate the word into two segments at an appropriate boundary: "com puter." Now, misspell the second segment: "com pewter."
    - As an experiment, enter each of the following words into the computer. Enter both the correctly spelled and incorrectly spelled versions of each. Listen for the pronunciation error in the first, and note the letter changes made in the second to produce the more acceptable pronunciation heard.

"definition-deffinition"
"country-kuntry"
"today-tuday"
"ware-wayr"
"shoes-shoos"
"replace-reeplace"
"capacity-cuppacity"
"baseball-base ball"

- **PHONETIC PROGRAMMING** There are some instances where words cannot be corrected utilizing the forementioned techniques. This situation may occur with Proper Names and English words based in a foreign language. The user may then wish to access the phoneme synthesizer directly to create a phonetic version (sound sequence) of a word.
- **Phonetic Programming - Operation** To access the phoneme synthesizer, bypassing the TNT translator, the user must type the "~" character. This creates a Phoneme Block into which ASCII characters (representing phoneme characters) may be inserted. If the "~" character does not exist on the user's computer, another character may be defined in soffware to take over this function. The "~" character acts as a prompt for the computer to send all the data that follows the "~" directly to the synthesizer. Once all the ASCII (Phoneme) characters desired have been inserted, a "?" must be typed to end the string. This, again, is the computer's prompt to return to the mode of sending data through the translator. A Phoneme Block may be created anywhere in the literal statement that contains the vocabulary program.
- **Phonetic Alphabet** Every speech sound (phoneme) in English is represented by an alphanumeric symbol known as a Phonetic Character or Symbol, TNT utilizes the VOTRAX Phonetic Symbols. One symbol could be a single letter character: /E/ = long "e" vowel sound. Another symbol could be an alphanumeric symbol: /EH3/ = short "e" unstressed vowel sound. Note that phonetic characters are enclosed in slash marks to differentiate them from the standard alphabet characters when both occur in running text. In order to make the phonetic symbol system compatible with a computer, every phoneme symbol is represented by a single ASCII

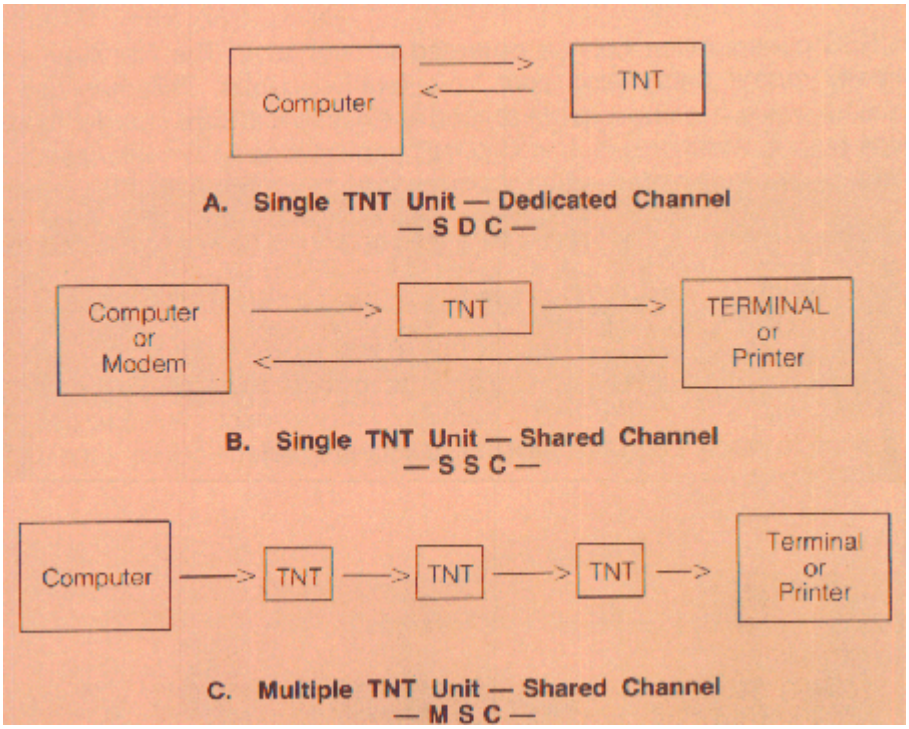
character. The user types into the computer only the ASCII character that represents the phoneme when programming phonetically. A Phoneme Conversion Chart is provided in APPENDIX B. Each Phonetic Symbol is listed along with its associated ASCII character. Example words to define the pronunciations are also listed.

- **Phonetic Programming - Procedure & Example**
  When all other techniques are unsuitable for correcting pronunciations, the user may create a word phonetically. First, identify the number and type of sounds contained in the word. There will be at least one vowel sound in every English word. However, a vowel is usually combined with one or more consonant sounds. It may help the user to speak the word aloud in order to identify the sounds. Next, match each of the sounds identified with the appropriate symbol from the Phoneme Conversion Chart. Now create a Phoneme Block in the vocabulary program (see Phonetic Programming Operation for creating Phoneme Blocks). Insert the selected ASCII characters into the Phoneme Block in the appropriate order. Once the sequence has been completely inserted, type a "?" to end the Block.

Following the procedure outlined above, phonetically program the name "Robert":
1. say the name "Robert"
2. # of vowel sounds = 2 ("o" and "er")
3. # of consonant sounds 3 ("r," "b," & "t")
4. match the sounds in 2, & 3, with characters in Phonetic Conversion Chart (APPENDIX B)
5. phonetic characters = /R, AH, B, ER, T/
6. ASCII characters = K, d, N, z, j
7. create Phoneme Block (type "~")
8. insert ASCII character sequence (type KdNzj)
9. end Phoneme Block (type " ? ")
10. activate speak command ("Robert" spoken)

- **Phonetic Programming - Procedure & Example continued**
  - The same procedure may be used to create any word in the English language. The most familiar pronunciations are names. A good exercise for practicing phonetic programming is to sequence the sounds necessary to pronounce one's own name, or other familiar names of people or places. Refer to APPENDIX B frequently to become familiar with the sounds available for programming and the characters that represent them. Again, it should not be beyond the creativity of the user to substitute a word that is not acceptably pronounced with another word more suitable for the auditory environment. Additional assistance may be provided by a standard dictionary, where every word entry is phonetically represented. Each dictionary uses their own phonetic symbol system. Conversion charts for translating the dictionary symbols into sounds are usually located in the front section of the publications. The user must engage in a matching procedure to convert the dictionary's pronunciation suggestions into TNT characters.

CONFIGURATIONS
TNT maybe configured in 3 different ways:
Figure 6 TNT Configurations



- **Configurations**
  - In a dedicated channel configuration (SDC), a single TNT unit may be interfaced to either a computer or a modem. This configuration is best used when no other TNT or serial peripherals are attached to the user's computer.
  - With the shared channel configurations (SSC and MSC), multiple serial devices may share a single RS-232C serial data channel. This saves the cost of adding additional RS-232C interfaces to the user's computer if one already exists.
  - An SSC configuration can be operated in two ways. The first way is to verbally repeat data being sent to a terminal/printer. This has use in systems where it is undesirable to modify existing software in order to add voice output. Another use is in ONLINE applications where information is interactively being accessed from a large data base and sent to a terminal.
  - The second way of using an SSC configuration is to send independent message packets to the TNT and terminal/printer. An example of this use is when a CRT is filled with information and the computer would like to prornpt the user without destroying any portion of the screen. The CRT terminal can be de-selected while the TNT is speaking a prompting message (see ECHO OFF and UNIT SELECTION).
  - In an MSC configuration two to eight TNT units can be linked together (daisy chained) with a computer and a terminal. Independent message packets are sent to each TNT and terminal using unit select codes (see UNIT SELECTION).

SPECIFICATIONS

Physical

Width 7.7 inches (19.3 mm)

Depth	5.2 inches (12.3 mm)
Height	3.1 inches (6.5 mm)
Weight	2 lbs. (0.896 Kg.

Environment

Temperature	Operating	40 to 100 degrees F (4 to 38 degrees C)
	Storage	- 35 to 150 degrees F (-37 to 65 degrees C)
Humidity	Operating	20% to 90% (no condensation)
	Storage	5% to 95% (no condensation)

Electrical

Power	Input to transformer*	120 VAC, 60Hz, 20 W
	Input to TNT* (see note below)	- pins 1-3, 26 VAC, 180 mA
		- pin 2, 20 VDC, 50 mA
		- pin 4 is 0 volt reference
Interface	RS-232C compatible, 75-9600 baud	Frame bits = 1 start, 8 data, 1 stop
Audio	1 watt into 8 ohm speaker	AC coupled

*** USE ONLY VOTRAX APPROVED TRANSFORMER PART #01p-1224B**

APPENDIX A
VOCABULARY PROGRAMMING

Pronunciation Correction Guide

Word List	Correction	Word List	Correction
advertisement	advertise ment	everyone	every one
baseball	base ball	extensive	extensiv
beautiful	butiful	generator	generayter
break	brake	goto	go to
breakfast	brekfest	item	ightem
bringing	bring mg	machine	mosheen
calculation	cal culation	machinery	mosheenery
capacity	cuppacity	output	out put
cassette	case et	paste	payst
certain	certin	phoneme	phone eem
character	kerekter	procedures	prowceejers
children	chilldren	program	prowg ram
circuit	cirkit	promise	promiss
clients	clyents	pronunciation	pronunsiation
clothes	doze	radio	radeo
close	near by	replace	reeplace

color	cuhler	requirement	require ment
comfortable	comfterble	rodeo	rowdeo
customer	custummer	scissors	scizors
data	dayta	shoes	shooz
definition	deffinition	singer	sing er
delete	deleet	software	softwayr
easiest	easy est	specify	specifuy
english	inglish	today	tuday
equivalent	eequivalent	typewriter	type writer
error	airor	vocabulary	vowcabulary
error	mistake	ware	wair

Appendix B Phoneme Conversion Chart

APPENDIX B

PHONEME CONVERSION CHART

Hex Code	ASCII Char.	Phoneme Symbol	Duration (ms)	Example Word
40	@	EH3	59	jackEt
41	A	EH2	71	Enlist
42	B	EH1	121	hEAvy
43	C	PA0	47	-PAUSE-
44	D	DT	47	buTTer
45	E	A2	71	enAble
46	F	A1	103	mAde
47	G	ZH	90	meaSure
48	H	AH2	71	hOnest
49	I	I3	55	inhibIt
4A	J	I2	80	Inhibit
4B	K	I1	121	inhIbit
4C	L	M	103	Mat
4D	M	N	80	suN
4E	N	B	71	Bag
4F	O	V	71	Van
50	P	CH *	71	CHip
51	Q	SH *	121	SHop
52	R	Z	71	Zoo
53	S	AW1	146	AWful
54	T	NG	121	thiNG
55	U	AH1	146	fAther
56	V	OO1	103	lOOking
57	W	OO	185	bOOk
58	X	L	103	Land
59	Y	K	80	Kitten
5A	Z	J	47	JuDGe
5B	[	H	71	Hello
5C	\	G	71	Get
5D	]	F	103	Fast
5E	^	D	55	paiD
5F	_	S	90	paSS
60	`, SP	A	185	mAIn
61	a, !	AY	65	mAIn
62	b, "	Y1	80	Yard
63	c, #	UH3	47	missIOn
64	d, $	AH	250	gOt
65	e, %	P	103	Past
66	f, &	o	185	mOre

Appendix B1 Phoneme Conversion Chart

Hex Code		ASCII Char.	Phoneme Symbol	Duration (ms)	Example Word
67	103	g,	I	185	pIn
68	104	h, (	U	185	tUne
69	105	i,)	Y	103	anY
6A	106	j, *	T	71	Tap
6B	107	k, +	R	90	Red
6C	108	l, ,	E	185	mEEt
6D	109	m, -	W	80	Win
6E	110	n, .	AE	185	dAd
6F	111	o, /	AE1	103	After
70	112	p, 0	AW2	90	sAlty
71	113	q, 1	UH2	71	trAdition
72	114	r, 2	UH1	103	About
73	115	s, 3	UH	185	cUp
74	116	t, 4	O2	80	fOr
75	117	u, 5	01	121	abOArd
76	118	v, 6	IU	59	yOU
77	119	w, 7	U1	90	yOU
78	120	x, 8	THV	80	THe
79	121	y, 9	TH	71	THing
7A	122	z, :	ER	146	bIRd
7B	123	;{	EH	185	gEt
7C	124	|, <	E1	121	bEfore
7D	125	}, =	AW	250	cAll
7E	126	~, >	PA1	185	-PAUSE-
7F	127	DEL, ?	STOP	47	-STOP-

NOTE: Durations listed will vary depending on the FREQUENCY setting.
* /T/ phoneme must precede /CH/ to produce "ch" sound.
* /D/ phoneme must precede /J/ to produce "J" sound.

DIPHTHONG CHART

ASCII Combination	Phoneme Combination	Example Words
Fai	A1-AY-Y	gAme, mAId, dAY
U @	AH1-EH3-Y	tIme, skY, gUY
cHi	UH3-AH2-Y	flght, mIce
Uvw	AH1-UH3-U1	cOW, lOUd
cHw	UH3-AH2-U1	hOUse, abOUt
uw	O1-U1	bOAt, nOte
uci	O1-UH3-Y	tOY, nOIse
bvw	Y1-IU-U1	YOU, mUsic

- FEDERAL COMMUNICATIONS COMMISSION REGULATION STATEMENT This unit generates radio frequency energy and if not installed and used properly that is, in strict accordance with the manufacturer's instructions - it may cause interference to radio and television reception. It has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules,

which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this unit does cause interference to radio or television reception, which can be determined by turning the unit OFF and ON, the user is encouraged to try to correct the interference by following one or more of the following measures: (1) reorient the receiving antenna; (2) relocate the unit with respect to the receiver; (3) move the unit away from the receiver; (4) plug the unit into a different outlet so that the unit and receiver are on different branch circuits. If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radi~TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington D.C. 20402, Stock #004-000-00345-4.

- LIMITED WARRANTY We warrant, for a period of thirty (30) days from the date of shipment to the original purchaser, that all Votrax products are free from defects in workmanship and materials under normal use and service, provided the equipment is used in accordance with the user's manual. This Warranty shall be void if the product case is opened or modified. If any failure to conform to this Warranty appears during the thirty (30) day period, we will correct the defect by either suitable repair or replacement, at our option and at our expense, if you return the product, transportation prepaid, to Votrax Division of Federal Screw Works, 500 Stephenson Highway, Troy, Michigan 48084. We will pay the cost of returning the repaired or replaced equipment to you. Any product modification or repair other than that authorized by us in writing will void this Limited Warranty. THE DURATION OF ANY IMPLIED WARRANTIES, INCLUDING ANY IM-PLIED WARRANTIES OF MERCHANTABILITY OR FITNESS, IS LIMITED TO THE DURATION OF THE LIMITED WARRANTY WE MAKE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED. ALL WARRANTIES OF MER-CHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE EXCEED-ING THE DURATION OF THE LIMITED WARRANTY ARE DISCLAIMED. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. WE WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM ANY PRODUCT DEFECT. Some states do not allow exclusion or the limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights and
- you may also have other rights which vary from state to state. This Limited Warranty does not apply if the product is used for commercial purposes. VOTRAX DIVISION FEDERAL SCREW WORKS