------------------ DOUBLETALK PC/LT USER'S MANUAL ------------------

Tech Support

Phone: (425) 355-3800
E-mail: support@rcsys.com

NOTICE

This manual is available in braille from

HotKey Systems
63-25B Bourton St. #1B
Rego Park, NY 11374
Ph: (718) 335-1788
Fax: (718) 335-1786

RC Systems, Inc.
1609 England Ave.
Everett, WA 98203
Ph: (425) 355-3800
Fax: (425) 355-1098

http://www.rcsys.com

LIMITED WARRANTY

Short Version

If anything should go wrong with your DoubleTalk, and it's not your
fault, we'll fix it for free, up to two years after you purchased it.

Long Version
(Our lawyers made us put this here. It makes them feel important.)

RC SYSTEMS, INC. ("RC Systems") warrants this product against defects
in material and workmanship for a period of TWO (2) YEARS from the
date of original retail purchase by the original consumer purchaser.

If you discover a defect in this product, RC Systems will, at its
option, repair, replace or refund the purchase price of this product
at no charge to you, provided you return it during the warranty
period, transportation charges prepaid, to the dealer from whom you
purchased it or to RC Systems. A copy of your purchase receipt or
other proof of date of original consumer purchase must be provided
with each product returned for warranty service. Please also attach
your name, address, telephone number, and a complete description of
the problem when returning any RC Systems product for warranty
service.

You may request additional information about this warranty by
contacting the RC Systems dealer from whom the product was purchased,
or by contacting RC Systems directly. This warranty applies only to
products manufactured by RC Systems; RC Systems does not warrant any
products that are not RC Systems products. This warranty does not
apply if the product has been damaged by accident, abuse, misuse or
misapplication, has been modified without the written permission of RC
Systems, or if any RC Systems serial number has been removed or
defaced.

ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN
DURATION TO TWO YEARS FROM THE DATE OF ORIGINAL RETAIL PURCHASE OF
THIS PRODUCT.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF
ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED. No RC Systems dealer,
agent or employee is authorized to make any modification, extension or
addition to this warranty.

RC SYSTEMS IS NOT RESPONSIBLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL
DAMAGES RESULTING FROM ANY BREACH OF WARRANTY, OR UNDER ANY OTHER
LEGAL THEORY, INCLUDING LOST PROFITS, GOODWILL, DOWNTIME, DAMAGE TO OR
REPLACEMENT OF EQUIPMENT AND PROPERTY, AND ANY COSTS OF RECOVERING,
REPROGRAMMING OR REPRODUCING ANY PROGRAM OR DATA STORED IN OR USED
WITH RC SYSTEMS PRODUCTS.

Some states do not allow the exclusion or limitation of incidental or
consequential damages or limitations on how long an implied warranty

lasts, 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.

TABLE OF CONTENTS

INTRODUCTION --

   DoubleTalk is a voice synthesis/sound system which supports
   virtually all of the voice technologies in use today, including
   text-to-speech (TTS), LPC, PCM, ADPCM and CVSD. With it, your
   IBM-compatible computer will be able to speak to you from your own
   programs, as well as many programs specifically written for voice or
   sound, including Windows-based (multimedia) programs. Most programs
   written for the older Echo speech synthesizers will also work with
   the DoubleTalk LT.

   Among DoubleTalk's features are a built in, 16-bit microprocessor,
   520 Kbytes of on-board memory, integrated text-to-speech converter
   and LPC decoding processor - all of which leave your computer's
   resources completely free for running your application programs.
   There's even an advanced power management system built in - less
   demanding tasks use less power than more computationally-intensive
   ones do. As a matter of fact, when DoubleTalk is doing the "least
   demanding" task of sitting idle, it consumes about 500 times less
   power than a typical 60 watt household light bulb!

   There are many ways you can use your DoubleTalk synthesizer. If you
   write your own programs, you can easily add voice output to them.
   Commercial programs specifically written to work with DoubleTalk, as
   well as many that work with IBM's Speech Adapter, can be used with
   DoubleTalk. Windows-based applications supporting digital sound can
   also be used. There's even a program on the included Utilities disk
   that allows you to install DoubleTalk as a "talking" printer or
   communications device, enabling you to read files from many
   text-based programs with voice output!

   DoubleTalk is also supported by virtually all of the major "screen
   reader" programs that give blind users access to their computers.

ABOUT THIS MANUAL --

   This manual covers both the DoubleTalk PC and DoubleTalk LT voice
   synthesizers. DoubleTalk PC is a card that plugs into a standard
   PC/AT eight or 16-bit slot in your computer. DoubleTalk LT is an
   external, stand-alone version of DoubleTalk PC that plugs into a
   serial port of your computer, instead of an internal slot. This can
   be beneficial when you need to share DoubleTalk with more than one
   computer, or where an internal slot is not available (as in many
   laptops and notebooks). DoubleTalk LT can also be used with non DOS-
   based computers, such as the Apple II family and Macintosh.

   We have attempted to write this manual as concisely and clearly as
   possible. The subjects of interest to everyone, such as installing
   DoubleTalk, are contained in the first part of the manual. The more
   complex (and usually boring to non-programmer types) subjects are
   left to the latter parts of the manual, which you may skip entirely
   if you wish. In particular, the manual enters the Twilight Zone in
   the section entitled "Operational Description," and it never really
   does return to reality after that. However, should you have
   difficulty falling asleep some night...

   For the serious user, software developer, or otherwise deranged
   person, a DoubleTalk Developer's Tools disk is available from RC
   Systems. It is not a product for the novice user or faint-hearted,
   as it is quite technical in nature (it uses words like "bits" and
   "I/O ports"). Topics covered include:

        Using the exception dictionary & compiler

        Using DoubleTalk's LPC and PCM modes

        Wave/PCM file conversion utility

        Programming DoubleTalk's tone generators

        Hardware interface with example driver source code

        QuickBASIC (QB), Basic PDS 7 (QBX) and C libraries

        Programming with the DTPRN and INT4DAPI drivers

        Programming tips

DoubleTalk PC

DoubleTalk PC will work with an IBM PC, XT, AT, 386, 486, Pentium, PS2-25, PS2-30 or any of the many "compatibles" on the market. DoubleTalk PC will not work in computers equipped with "Microchannel" style slots, such as the PS2-80. In other words, virtually any computer with a standard eight or 16 bit slot (also known as a "PC/AT" or "ISA" slot) will work with DoubleTalk PC. No interrupts (IRQ's), DMA, or system memory is used by DoubleTalk PC. (Try to find another add-in card nowadays that can claim that!)

DoubleTalk LT

DoubleTalk LT requires only a serial port operating at 9600 baud, 8 data bits, 1 stop bit, and no parity (9600, N, 8, 1). The connecting cable is designed to be plugged into a standard 9-pin serial connector, found on most PCs.

DoubleTalk PC

   Installing DoubleTalk PC in your computer is easy. Before you begin,
   be sure you have the following:

         An open 8-bit or 16-bit system expansion slot on
         your computer's motherboard

         MS-DOS or PC-DOS Version 2.0 (or later) present in
         your computer

         A medium screwdriver or 3/16" nut driver or wrench

   Then follow these steps:

   1. Turn off the power to the computer and unplug the power cord.
      Attempting to install a board in the computer while the
      computer's power is on can cause permanent damage to both the
      board and the computer.

   2. Remove the cover from your computer. Refer to your computer's
      owner's guide if you are not sure how to remove its cover.

   3. Choose any empty expansion slot and remove the small metal cover
      by removing the retaining screw with a screwdriver or nut driver.
      Be sure to keep the screw; you'll use it in a later step to
      secure the DoubleTalk board in place.

   4. Hold the DoubleTalk board firmly at the top edges, and firmly
      press the gold connector into the expansion slot. Make sure the
      board is firmly seated in the slot with the gold connector fully
      inserted. The board will fit only one way in the slot.

   5. Using the screw removed in step 3, secure DoubleTalk in the
      computer by reinstalling the screw in the retaining bracket.

   6. Replace the computer's cover and plug in the power cord.

   7. Plug the supplied speaker into the jack in DoubleTalk's retaining
      bracket. Locate the volume control shaft (just above the speaker
      jack) and adjust it to about the mid point of its movement.
      Later, you may want to further fine tune the volume, but setting
      it at the midpoint now insures you don't accidentally attempt to
      use DoubleTalk with the volume turned all the way off.

   8. Turn on the computer and run the test program supplied on the
      DoubleTalk Utilities disk. Do this by inserting the disk in drive
      A: and typing the following DOS commands:

        A: <Enter>
        TEST <Enter>

In the rare event that your DoubleTalk board does not pass the above
test, re-check your work, making sure DoubleTalk is installed per
the above instructions. Usually a mute DoubleTalk can be pinpointed
to a silly mistake, such as the speaker not being plugged in, or the
volume control on the card or speaker being turned all the way down.

If you still cannot get any sound out of DoubleTalk after trying the
above suggestions, try changing its port address by moving the small
black plastic connector, located at the lower left edge of the
DoubleTalk board, to a different pair of pins on the jumper block.
When moving the connector, make sure it remains oriented from left
to right, not up and down. DoubleTalk requires two adjacent I/O
addresses in your computer; the hexadecimal numbers printed on the
left side of the jumper block indicate the first ("base") address
used when the black connector is placed in that position. (The I/O
address is the only configurable aspect of DoubleTalk, since it
doesn't use DMA or IRQ's. The factory-set address is 29Eh,
configuring DoubleTalk to use addresses 29Eh and 29Fh.)

As a last resort, try using another speaker, if one is available.

         HINT   If headphones are plugged into the speaker's
                headphone jack, the speaker will be muted to
                allow private listening through the headphones.
                The speaker's volume control can be used to
                adjust the listening level.

                If you are experiencing excessive noise coming
                through the headphones (all PCs generate some
                noise; some are worse than others), try the
                following: increase the volume by adjusting the
                volume control on the DoubleTalk card, and
                compensating by reducing the volume level with
                the speaker's volume control.

DoubleTalk LT

  To set up DoubleTalk LT, follow these steps:

  1. Plug the cord that is attached to the back of DoubleTalk into a
     serial (COM) port in your computer.

2. Plug the AC adapter that came with DoubleTalk into any convenient
   wall outlet. Firmly plug the cord from the AC adapter into the
   power jack at the back of DoubleTalk. Don't be afraid to press
   the plug in hard - it's designed to be a tight fit!

   NOTE   DoubleTalk LT can also run from a 9 volt
          alkaline battery for periods of up to 10 hours
          or more, depending on usage habits, volume
          level, etc. If you remove the battery, be sure
          to replace the foam that was originally in the
          battery compartment, or undesirable resonances
          (vibrations) may occur during speech production.
          You may use DoubleTalk with the AC adapter even
          though a battery is installed; no battery energy
          will be expended as long as the adapter is
          plugged into the DoubleTalk unit.

3. If you will be using headphones, plug them into the headphone
   jack in the front of DoubleTalk. (Note: The headphone jack is of
   the monaural type. A stereo/mono adapter must be used if you are
   using stereo headphones, or the sound will be heard from only one
   ear.)

4. Turn the small black wheel in the front of DoubleTalk until you
   hear a small click. This is DoubleTalk's power switch and volume
   control. Shortly after turning the unit on, you should hear the
   words "DoubleTalk ready" come from the internal speaker or
   headphones. If you do not, check to make sure that the AC adapter
   is properly connected. If you are using headphones, try
   unplugging them and turn DoubleTalk's power off and back on. If
   you hear the power-on message from DoubleTalk's speaker now, you
   may have defective headphones (plugging headphones into the
   headphone jack mutes the internal speaker, to allow private
   listening).

5. Turn on the computer and run the test program supplied on the
   DoubleTalk Utilities disk. Do this by inserting the disk in drive
   A: and typing the following DOS commands:

     A: <Enter>
     TEST <Enter>

   NOTE   If you are running a screen reader program at
          the time the test program is run, the test may
          report that DoubleTalk couldn't be found. This
          is because the screen reader and test programs
          are fighting each other for control of
          DoubleTalk. Be sure to disable your screen
          reader software before running the above test,
          to avoid this situation.

Utilities Installation

  The Utilities disk includes an installation program for copying
  DoubleTalk's utility programs to your hard disk. If you would like
  to copy the utilities to your hard disk, type "A:INSTALL" and follow
  the instructions on the screen.

      NOTE   The INSTALL program simply copies the utilities
             files to the directory you specify on your hard
             disk. None of your programs or setup information
             will be modified on your computer. Also,
             DoubleTalk's operation does NOT depend on the
             utility programs being copied to your hard disk.

Windows 95/98 System Registration

  DoubleTalk does such a good job of being unobtrusive to your
  computer, that other hardware may not notice it, and render
  DoubleTalk inoperable. This is particularly true of Plug and Play
  devices.

  An information (INF) file is included in the DoubleTalk Utilities
  \DRIVERS\WIN95 directory, which will make Windows 95/98 "DoubleTalk
  aware." It is recommended that you install this file as soon as you
  install DoubleTalk in your system (it can even be installed
  beforehand, if you prefer). Here's how to do it:

  1. Open the "Add New Hardware" icon in the Windows Control Panel.
     This will bring up the Add New Hardware Wizard. Click "Next."

  2. The wizard should now be asking you if you want Windows to search
     for your new hardware. Click the "No" button, then "Next."

  3. In the Hardware types list box, click on "Sound, video and game
     controllers," then "Next."

  4. You are now shown lists of manufacturers and models. Click on the
     "Have Disk..." button.

  5. In the File name text box, type "A:\DRIVERS\WIN95" and click the
     "OK" button.

  6. Choose the type of DoubleTalk you have from the Models list box,
     then click "OK."

  7. Click the "Finish" button to install the file.

  If you have DoubleTalk PC and changed the port address jumper
  setting during installation, you will need to change the setting in
  System Properties:Device Manager:DoubleTalk PC:Resources
  accordingly.

What's Next?

  Now that you have your DoubleTalk installed and have verified that
  it is working, you're probably wondering what software and/or
  drivers need to be installed. In most cases, the answer is none. Use
  the following checklist to help you determine what, if any, software
  needs to be installed from the Utilities disk.

  1. I will be using DoubleTalk with a screen reader program other
     than IBM Screen Reader.

     Install and configure your screen reader for DoubleTalk. With the
     exception of IBM Screen Reader, all screen reader programs
     install their own DoubleTalk driver. These include ASAP, ASAW,
     JAWS, JAWS for Windows, Vocal Eyes, Window Eyes, Tiny Talk, and
     OpenBook. You do not need to install anything from the DoubleTalk
     Utilities.

  2. I will be using DoubleTalk with IBM Screen Reader.

     IBM Screen Reader does not directly support DoubleTalk - you must
     install the necessary drivers from the DoubleTalk Utilities disk.
     See "DoubleTalk Drivers/IBM Screen Reader," below, for
     installation instructions.

  3. I want to use DoubleTalk as a Windows sound card.

     In order for DoubleTalk to play sounds from Windows applications,
     the Windows sound driver must be installed. See "DoubleTalk
     Drivers/Windows sound driver," below.

  4. I want to be able to use DoubleTalk as a "talking printer" in DOS
     and Windows 3.1 applications.

     See "DoubleTalk Drivers/Talking printer," below.

  5. I want to use DoubleTalk with software written for the IBM Speech
     Adapter.

     See "DoubleTalk Drivers/IBM Speech Adapter emulator," below.

  6. I want to use DoubleTalk with programs published by Davidson.

     See "DoubleTalk Drivers/Davidson drivers," below.

  7. I want DoubleTalk to be able to speak in Spanish.

     See "Speaking Spanish," below.

UTILITIES --

   The Utilities disk that came with your DoubleTalk contains a number
   of useful and fun programs. They can be run directly from the floppy
   disk they came on, or from your hard disk (if you ran the INSTALL
   program during DoubleTalk's installation).

Disk Contents

   The Utilities disk contains the following programs and files:

   MANUAL.TXT   - This file
   INSTALL.COM   - Copies the utilities to your hard disk
   TEST.COM   - DoubleTalk test program
   DTINFO.COM   - Talking DoubleTalk statistics
   SMARTALK.EXE   - DoubleTalk demo program
   SMARTALK.HLP   - Help system file for SMARTALK.EXE
   WORDS1.LPC   - LPC data file for SmartTalk (male)
   WORDS2.LPC   - LPC data file for SmartTalk (female)
   *.PCM   - PCM/ADPCM data files for SmartTalk
   *.TGN   - Tone generator data files for SmartTalk
   SPANISH.EXA   - TTS Spanish dictionary for DTPRN.COM
   SPANISH.EXS   - TTS Spanish dictionary for SmartTalk
   SPANISH.BAT   - Batch program for changing to Spanish
   \DRIVERS   - Drivers for Windows, MS-Word, SSIL, etc.

SmartTalk

   The SmartTalk program enables you to explore most of your new
   DoubleTalk's functions and features. To run SmartTalk, type

        SMARTALK <Enter>

   at the DOS prompt.

   You should be able to navigate around SmartTalk by following the
   help line at the bottom of the screen, and using the
   context-sensitive help available with the F1 key. SmartTalk works
   with a mouse or keyboard.

   The SmartTalk screen is made up of four distinct areas, or windows,
   which control the four major functions of DoubleTalk. Any one of
   these windows can be activated at a given time; the remaining three
   inactive windows are dimmed. A different window can be activated by
   clicking on it with the mouse, or using the PgUp and PgDn keys.

   The LPC window controls DoubleTalk's LPC synthesizer, the PCM window
   controls the PCM synthesizer, and so on. Inside each of these
   windows are various parameter fields, or "hotspots," so named
   because they are activated whenever they are clicked on with the
   mouse. Each of these fields performs a specific function, such as
   setting the text-to-speech synthesizer's speed or pitch, or loading
   a data file. If you don't have a mouse, you can select each field in
   turn by repeatedly pressing the Tab key. The Shift-Tab key

combination works similarly, except it moves through the fields in
the opposite direction.

Each field also has a corresponding "hotkey," designated by the
highlighted letter in the field's name. To select a field in this
manner, press and hold the Alt key and the corresponding letter key;
e.g., Alt+S selects the TTS synthesizer's Speed field; Alt+L loads a
data file, and so on.

After a field has been selected, its value can be changed in any of
several different ways. If you have a mouse, pressing the right
button will decrease the field's value; pressing the left button
will increase its value. If you prefer to use the keyboard, the
right and left arrow keys can be used to increase and decrease the
field's value in one-step increments; the up and down arrow keys do
so in larger steps. To return to the text-entry box, press Enter or
click anywhere inside the box.

The F9 key will cause an Info box to be displayed, indicating how
many LPC and PCM words and sounds are currently loaded in memory, as
well as PCM encoding type, etc. The F7 key temporarily suspends
SmartTalk and returns you to DOS, without quitting SmartTalk. You
may use any DOS commands while in this mode. The F10 (or Esc) key
exits SmartTalk.

The four SmartTalk function windows, TTS, LPC, PCM and TGN, are
described next.

TTS
  This window gives you access to DoubleTalk's text-to-speech
  synthesizer. You can enter any word or phrase you wish and change
  any of the voice parameters by modifying the corresponding parameter
  field directly, or by typing the equivalent commands in the
  text-entry box. A special "View" mode can be activated with the Mode
  field, enabling you to actually see the phonemes DoubleTalk used to
  speak the text in the text-entry box. This can be a valuable tool in
  choosing the correct phonemes during the creation of an exception
  dictionary (described in the Developer's Tools).

LPC
  The LPC window activates DoubleTalk's LPC synthesizer. Two sample
  LPC data files, WORDS1 and WORDS2, are supplied. A list of the words
  contained in these files can be found in Appendix A. DoubleTalk
  supports 5220 and D6 LPC-10 data formats and two speeds of playback.
  The largest data file that can be loaded is 32K.

PCM
  This window allows you to play back digitized sounds which have
  either PCM or ADPCM encoding. A number of sample data files are
  included on the disk. You can manipulate the playback sampling rate
  with the Rate field (note that by default, the sampling rate is
  automatically set to the rate at which the sounds were originally
  recorded). The volume is controlled by the TTS synthesizer's volume
  parameter (in the TTS window). The largest data file that can be
  loaded is 256K.

TGN

   This window activates DoubleTalk's musical tone generators. Simply
   load one of the sample tone generator data files from the disk and
   press the Play button. Press the Cancel button to cancel the
   playback at anytime. The largest data file that can be loaded is
   16K. DoubleTalk's sinusoidal generators are not accessible through
   this window.

DoubleTalk Drivers

   The \DRIVERS directory of the Utilities disk contains files which
   enable DoubleTalk to operate with a number of programs. These
   include a "talking printer" driver, which enables DoubleTalk to read
   text from your favorite word processor or text editor; a Windows
   "Wave" driver, which brings your Windows-based programs alive with
   sound; and others more specific to certain application programs that
   you may have.

Talking printer

   DTPRN.COM is a resident (TSR) program that enables your programs to
   access DoubleTalk's TTS synthesizer as a printer (LPT1 - LPT3) or
   communications port (COM1 - COM4). This enables most DOS and
   Windows-based programs (such as word processors) and programming
   languages to communicate with DoubleTalk by simply "printing" the
   text to be spoken to the port. DTPRN requires only 700 bytes of
   memory, and can be loaded into upper memory on machines supporting
   this feature using the DOS LOADHIGH command.

      NOTE   DTPRN will not work with native Windows 95/98
             applications. It only works in a Windows 95/98
             DOS shell, Windows 3.1, and standard DOS
             environments. A version of DTPRN which works
             with native Windows 95/98 applications is
             available for use with the DoubleTalk PC;
             contact RC Systems for details.

Installing DTPRN

   DTPRN is invoked from the DOS command line by typing the command

        DRIVERS\DTPRN <port> [/N] [/Cx] [/R]

   where <port> is one of the seven system ports LPT1 thru LPT3 or COM1
   thru COM4. For example, DTPRN can be installed as LPT2 by typing

        DRIVERS\DTPRN LPT2 (or LPT2:)

   If no port specification is given, DTPRN will install as LPT3.
   During installation, DTPRN will initialize DoubleTalk; if DoubleTalk
   cannot be located in the computer, DTPRN will abort the installation
   procedure and notify you as such.

If an error occurs during the installation of DTPRN, such as the use
of an invalid port name, DoubleTalk wasn't found, or DTPRN is
already resident, an error code is returned to the program that
invoked DTPRN. This code can be processed in a batch program using
the IF ERRORLEVEL command, so appropriate action can be taken. The
following is a summary of the return codes returned by DTPRN:

        0   DTPRN was successfully installed (no errors).
        1   DTPRN is already resident.
        2   An invalid port name was specified.
        3   Too many or invalid parameter(s) (DTPRN still loads).
        4   Incompatible version of DOS (must be 2.0 or later).
        5   DoubleTalk could not be located.

  During operation, DTPRN intercepts the appropriate BIOS software
  interrupt vector (14h for COM ports or 17h for LPT ports).
  Therefore, programs that bypass the BIOS interrupts by accessing the
  port's hardware directly (as some terminal programs do) will not
  speak, since DoubleTalk will never receive the output characters.

Disabling DoubleTalk's buffer

  The optional command line switch /N is used to disable DoubleTalk's
  text buffer. This can be beneficial in applications where it is
  important that the voice stay synchronized with the text being read
  from the screen.

Removing DTPRN from memory

  DTPRN can be removed from memory by typing

        DRIVERS\DTPRN /R

  Removing DTPRN from memory frees the 1000 or so bytes of RAM that it
  uses, as well as allow the printer or communications port assigned
  to DTPRN to function normally again.

Sending text and commands

  Any combination of text and commands can be sent to DoubleTalk via
  DTPRN. Note, however, that DoubleTalk will not begin speaking until
  it receives at least one Carriage Return (0Dh) or Null (00h), except
  when in Character mode. Additional text may be sent while DoubleTalk
  is speaking.

  A special feature of DTPRN is the way in which it handles DoubleTalk
  commands. DoubleTalk itself accepts only a control character for its
  command character (^A by default - see "Commands," below), which can
  be somewhat difficult, if not impossible, to enter in some
  applications, such as a word processor. For this reason, DTPRN has
  been designed to also accept an asterisk (*) as the command
  character, besides the standard ^A character. A so-called "asterisk
  command" must be followed by an alphanumeric character, '+', '-', or
  '@' to be considered a valid command by DTPRN. Examples of valid
  asterisk commands are:

        *8s   *3F   *+10P

If the text being read contains asterisk characters, you may find
DoubleTalk's voice changing unexpectedly, if the characters
following an asterisk evaluate to a valid command. For this reason,
DTPRN allows you to change its command character to any other
printing character, with the optional /Cx command line switch. For
example, /C& changes the command character from '*' to '&'. To
disable DTPRN's command recognition altogether, use /C by itself.
For example,

        DRIVERS\DTPRN LPT1 /N /C

installs DTPRN as LPT1, with the buffer and command recognition both
disabled. Note that even when DTPRN's command character has been
changed (or disabled), commands can still be issued to DoubleTalk
using DoubleTalk's command character (^A).

Stopping speech production

  You can momentarily silence DoubleTalk by pressing the left and
  right Shift keys simultaneously. Keep in mind, however, that this
  action will not terminate the file being printed to DoubleTalk - you
  must stop the "printing" of the file from the application program
  (usually by pressing the Escape key or Control-C). Pressing the
  Shift keys only purges the text currently in DoubleTalk's input
  buffer.

Word 5.0 talking printer

  The SPEECH.PRD file is a printer definition file for turning
  DoubleTalk into a versatile "talking printer" with Microsoft Word
  5.0. Simply copy the SPEECH.PRD file to your Word directory, and a
  new printer named "SPEECH" will appear in Word's Print Options
  printer list.

      NOTE The printer emulator DTPRN (described in an
            earlier section) must be installed in order for
            Word (or any other word processor, for that
            matter) to read its files through DoubleTalk. We
            recommend that you install DTPRN as port LPT3,
            so as not to interfere with your "real" printer.

  When selecting the SPEECH printer in Word, make sure you choose the
  same port that DTPRN is using (LPT3, if you followed the suggestion
  given above) in Word's Printer Options setup.

  When you print a document to the SPEECH printer, DoubleTalk always
  begins speaking with the voice parameters set to the following
  values:

          Fmt Freq = 5
             Pitch = 50
             Speed = 5
        Dictionary = Disabled

The SPEECH printer also recognizes seven font attributes and acts
upon them as shown in the following table:


```
        Font Attribute       Voice Change
        --------------------------------
        Underline            Low volume
        Dbl underline        High volume
        Strike thru          Low pitch
        Italics              High pitch
        Subscript            Slow speed
        Superscript          Fast speed
        Bold                 Use dictionary
```

The reason a command was included to use or not use DoubleTalk's
exception dictionary ("Bold" attribute) is to enable you to use
foreign languages, as well as English, in your documents. This has
proven to be of great potential in classroom environments, where the
teacher is able to set up talking foreign language lessons
containing both English and foreign words and phrases. To set up
such a system for Spanish and English, for example, follow these
steps:

1. Run DTPRN.COM.
2. Load the Spanish dictionary SPANISH.EXA into DoubleTalk.
3. Run Word.

This procedure can be automated by creating a batch file similar to
the following:

```
    @echo off
    drivers\dtprn
    if errorlevel 2 goto Exit
    type spanish.exa > lpt3
    word
    :Exit
```

DoubleTalk/DTPRN "asterisk" commands, described in the section
above, can also be used with the SPEECH printer.

IBM Speech Adapter emulator

  INT4DAPI.COM is a small TSR program which enables you to use
  DoubleTalk with a number of talking educational software programs,
  designed to work with IBM's Speech Adapter. To install it, simply
  type INT4DAPI at the DOS prompt. Note that INT4DAPI must be
  installed prior to running the talking software.

  INT4DAPI can be removed from memory by typing

        INT4DAPI /R

  Software that has been tested and known to work with INT4DAPI is
  IBM's Bouncy Bee Learns Letters, Bouncy Bee Learns Words, Writing to
  Read, and Hartley Courseware's Project Star and Brick by Brick

series. Not tested, but "probables," are IBM's Measurement, Time &
Money and Hartley's Money Series.

IBM Screen Reader

The files in the IBMSRD subdirectory enable DoubleTalk to work with
the DOS IBM Screen Reader program. After installing the Screen
Reader (choose any synthesizer when prompted), copy the appropriate
files to the Screen Reader directory, as follows:

DoubleTalk PC:
     SRDPROG.EXE (Screen Reader version 1.1 ONLY!!)
     DTPCASYN.EXE (rename as SRDASYNC.EXE after copying)
     DTPC.TTS (rename as SRD.TTS after copying)

DoubleTalk LT:
     SRDPROG.EXE (Screen Reader version 1.1 ONLY!!)
     DTLTASYN.EXE (rename as SRDASYNC.EXE after copying)
     DTLT.TTS (rename as SRD.TTS after copying)

An installation program, SRDINST.BAT, is included in the IBMSRD
subdirectory which will copy the necessary files for you, automating
the above process. To use the installation program, type

     A: <Enter>
     CD \DRIVERS\IBMSRD <Enter>
     INSTALL [type] [path] <Enter>

where [type] is the synthesizer type (pc or lt), and [path] is the
drive/directory of where your Screen Reader software is installed.
For example,

     INSTALL LT C:\SRD12 <Enter>

will install the DoubleTalk LT driver in directory \SRD12 on drive
C:.

Screen Reader version 1.1 has a bug in the program file SRDPROG.EXE,
which degrades Screen Reader's performance with DoubleTalk. This
file should be replaced with the SRDPROG.EXE file, included in the
IBMSRD directory, but ONLY if you have Screen Reader version 1.1.
The bug was fixed in Screen Reader version 1.2. Do NOT replace the
SRDPROG.EXE file shipped with version 1.2, or the program will
become non-functional! The INSTALL program will update this file for
you automatically, if appropriate.

If you are setting up Screen Reader for use with the DoubleTalk LT,
note that it will initially be set up for port COM1. If your
DoubleTalk LT is connected to a port other than COM1, you must
change Screen Reader's port setting with the SRDUTIL utility
program.

The following Special codes have been included in the DTPC.TTS and
DTLT.TTS files:

```
        AA1 - Disable exception dictionary
        AA2 - Enable exception dictionary
        AA3 - Bass
        AA4 - Treble
        AA5 - Formant frequency "3"
        AA6 - Formant frequency "5" (normal)
        AA7 - Formant frequency "7"
        AA8 - Monotone (no intonation)
        AA9 - Inflected (automatic intonation)
```

  Note that Special codes 1 and 2 may be used to switch between
  English (code 1) and a foreign language (code 2), such as Spanish.
  Of course, you may re-assign any DoubleTalk commands you wish to the
  Special codes using the SRDUTIL program that came with your Screen
  Reader.

  When Screen Reader initially loads, it looks in the current
  directory for a user exception dictionary named SRD.EXA. If the file
  exists, it is automatically loaded into DoubleTalk. (This is the
  easiest way to make Screen Reader speak in a foreign language; to
  speak in Spanish, for example, simply copy the SPANISH.EXA file to
  your Screen Reader directory, and rename it SRD.EXA.) It is not
  necessary that the dictionary be present for Screen Reader to
  function.

SSIL driver

  A number of Windows-based screen readers and scanning programs use
  what is known as the "Speech Synthesizer Interface Library," or
  SSIL, standard. When you install one of these programs on your
  computer, the appropriate DoubleTalk SSIL driver is installed with
  the program. An Open Book Unbound, ASAW and JAWS for Windows are
  examples of such programs.

  The files in the SSIL subdirectory are meant to replace the older
  SSIL DoubleTalk drivers, which probably came with your program. They
  correct some bugs in the older drivers, and add new functionality.
  To update your drivers, perform the following steps:

  1. Copy the two files from the Utilities disk SSIL subdirectory,
     SSIL.INI and DUBLTALK.DLL, to your Windows directory (usually,
     C:\WINDOWS). If you have DoubleTalk PC, you're done. If you have
     DoubleTalk LT, proceed to step 2.

  2. Using any text editor (or word processor that can save files as
     standard text, or ASCII, files), load the SSIL.INI file from your
     Windows directory.

  3. Note the following three lines in the beginning of the file:

     [SSIL]
     Device=DoubleTalk
     Port=Internal

     The "Port" entry tells the SSIL driver how your DoubleTalk is
     connected to the computer. If this entry is not set correctly, it

will very likely cause your computer to "hang" when the driver is
used. The default setting is for the DoubleTalk PC
(Port=Internal). If you have a DoubleTalk LT, change the Port
entry to the port DoubleTalk is connected to: COM1, COM2, COM3,
or COM4. For example,

```
[SSIL]
Device=DoubleTalk
Port=com1
```

will properly configure the driver for DoubleTalk LT connected to
COM port 1. Case is not significant; COM1 is the same as com1, as
far as the driver is concerned. Be sure to save the modified
file, if you made any changes!

Davidson drivers

The two drivers in the DAVIDSON subdirectory enable DoubleTalk PC to
work with DOS-based programs from Davidson. For Windows-based
Davidson programs, use the Windows driver in the WINDOWS
subdirectory.

When installing the Davidson software for use with DoubleTalk PC,
choose any one of the supported sound devices in the installation
program. (If you want to follow the examples in the following steps,
choose the Covox driver.) Then, follow these steps:

1. Locate the batch file used for starting the program, in the
   directory of your hard disk that the program was installed. The
   file name will be the same name you type to start the program,
   with a .BAT extension. For example, the correct batch file for
   Zoo Keeper is ZOOKEEP.BAT.

2. Using any text editor (such as EDIT that comes with DOS), load
   the batch file located in step 1, and locate the line that loads
   the sound driver. This is usually the second or third line, and
   contains the word SOUND??? (??? = three letters dependent on
   driver chosen during installation). If you chose the Covox driver
   when you installed the program, you will find a line that says
   either "\DRIVERS\SOUNDCVX" or simply "SOUNDCVX."

3. Okay, you've made it this far. Now here's the tricky part (!!!).
   In March 1993, Davidson changed the way their programs work with
   sound drivers, due to a conflict with Sony CD-ROM drives. This
   made it necessary for us to supply two versions of essentially
   the same driver, SOUNDDBL.EXE (for post-March '93 program
   releases), and SOUNDDBT.EXE (pre-March '93).

   What you've got to do now is take your best guess as to which of
   the two drivers will make your Davidson program happy, and change
   the name of the driver located in step 2 to SOUNDDBL or SOUNDDBT,
   as well as copy the corresponding driver from the DoubleTalk
   Utilities disk to the directory of drivers in the Davidson
   program. If you choose the wrong one, you simply won't get any
   sound through DoubleTalk. In this case, install the other driver
   and try again. (Another clue that you gambled wrong is, if you

see the message "No sound driver loaded" when quitting the
program.)

Of the five DOS-based Davidson programs we found in our archives, we
found Reading Adventures in Oz and Zoo Keeper to work with
SOUNDDBT.EXE. Likewise, SOUNDDBL.EXE worked with Word Attack 3,
Spell It 3 and Kid Keys.

Windows sound driver

The Windows sound driver located in the WAVE subdirectory enables
DoubleTalk to play Wave (.WAV) files from Windows-based
applications. When the driver has been installed, your DoubleTalk PC
or LT will be compliant with Windows programs supporting sound.

Follow these steps to install the sound driver:

Windows 3.1

1. Open the "Drivers" icon in the Windows Control Panel.

2. Inside the Drivers window, click the "Add" button and choose
   "Unlisted or Updated Driver."

3. In the text box, type "A:\DRIVERS\WAVE" and click the "OK"
   button. If your Utilities disk is in a drive other than A:,
   substitute the appropriate drive letter.

4. Click the "OK" button to install the driver.

5. Configure the driver for your DoubleTalk, per the instructions
   below.

Windows 95

1. Open the "Add New Hardware" icon in the Windows Control Panel.
   This will bring up the Add New Hardware Wizard. Click "Next."

2. The wizard should now be asking you if you want Windows to search
   for your new hardware. Click the "No" button, then "Next."

3. In the Hardware types list box, click on "Sound, video and game
   controllers," then "Next."

4. You are now shown lists of manufacturers and models. Click on the
   "Have Disk..." button.

5. In the File name text box, type "A:\DRIVERS\WAVE" and click the
   "OK" button. If your Utilities disk is in a drive other than A:,
   substitute the appropriate drive letter.

6. Confirm that "RC Systems DoubleTalk Wave" is displaying in the
   Models list box, then click "OK."

7. Click the "Finish" button to install the driver.

Configuring the sound driver

  Immediately after installing the sound driver, a setup dialog box
  will appear. The left half of the box lists the six possible I/O
  addresses for the DoubleTalk PC; the right half lists the possible
  COM ports for DoubleTalk LT. Check the appropriate box for your
  DoubleTalk (29E is the factory default for DoubleTalk PC). This
  setting can be changed later, if necessary, using the "Drivers" icon
  in the Windows 3.1 Control Panel, or the "Multimedia" icon in
  Windows 95.

  Note that performance is somewhat limited with the DoubleTalk LT,
  since all of the digital sound data must be pumped out your
  computer's serial port (not a very efficient arrangement, but it
  works!).

Speaking Spanish

  Teaching DoubleTalk how to speak in Spanish is quite simple. A
  special exception dictionary, defining the letter-to-sound rules for
  the Spanish language, is included on the Utilities disk.

  The Spanish dictionary is provided in the file named SPANISH.EXA,
  which need only be loaded into DoubleTalk. How it actually gets
  loaded varies, depending on the program that will be using it. The
  batch file SPANISH.BAT is designed to automate the procedure by
  running the DTPRN program, transferring SPANISH.EXA to DoubleTalk,
  and finally removing DTPRN from memory. To run SPANISH.BAT, type

        SPANISH <Enter>

     NOTE   If a screen reader program is used with the
            Spanish dictionary, be sure to start the screen
            reader first, before running SPANISH.BAT.
            Otherwise, the screen reader will purge the
            dictionary when it initializes DoubleTalk.

  Keep in mind that when the Spanish dictionary is loaded into
  DoubleTalk and enabled, DoubleTalk will apply Spanish rules of
  pronunciation to all text it receives, regardless of whether the
  text is actually Spanish or not. Use the Text mode command (*T) to
  switch to the normal English pronunciation rules built into
  DoubleTalk, and the Enable Exceptions (*U) command to switch back to
  Spanish.

Configuring SSIL-based screen readers for Spanish

  Windows screen reader programs utilizing the SSIL standard can be
  easily adapted to Spanish:

  1. Locate the screen reader's SSIL.INI file (usually
     C:\WINDOWS\SSIL.INI).

2. Using any text editor (or word processor that can save files as
   standard text, or ASCII, files), load the SSIL.INI file.

3. Note the following line near the beginning of the file:

   Dictionary=none

The "Dictionary" entry tells the SSIL driver which DoubleTalk
dictionary to load during startup. Enter the complete pathname of
where the SPANISH.EXA file is located. For example, if you installed
the DoubleTalk Utilities in the default location on drive C:, the
entry should look like:

   Dictionary=c:\dt\spanish.exa

4. Save the SSIL.INI file back to disk.

OPERATIONAL DESCRIPTION --

   This section describes the operational characteristics of
   DoubleTalk. Since this is somewhat technical in nature and is not
   necessary to successfully use DoubleTalk, you may wish to stop
   reading here.

TTS Operating Modes

   DoubleTalk's TTS synthesizer has three operating modes which
   determine how text is processed by the internal algorithms. These
   modes are the Text, Character and Phoneme modes, treated separately
   in the following paragraphs. The operating mode can be changed
   anytime, even within the same string of text.

      NOTE   The operation of DoubleTalk's LPC, PCM and CVSD
             synthesizers are not discussed here, as they are
             technical in nature and require some programming
             skills to be used effectively. Obtain the
             Developer's Tools disk if you require more
             information about these DoubleTalk functions.

   In the text-to-speech operating modes, DoubleTalk does not make any
   distinction between uppercase and lowercase characters. Text and
   commands may be sent as all uppercase, all lowercase, or any
   combination thereof.

Text mode

   In this mode, all text sent to DoubleTalk are spoken as complete
   sentences. Punctuation is also taken into consideration by the
   intonation generation algorithms. DoubleTalk will not begin speaking
   until it receives a CR (0Dh) or Null (00h) character-this ensures
   that sentence boundaries receive the proper inflection. This is the
   default operating mode.

Character mode

   This mode causes DoubleTalk to translate input text on a
   character-by-character basis; i.e., text will be spelled instead of
   spoken as words. DoubleTalk does not wait for a CR/Null in this
   mode.

Phoneme mode

   This mode disables DoubleTalk's text-to-phonetics translator,
   allowing DoubleTalk's phonemes to be directly accessed. Phonemes in
   the input buffer will not be spoken until a CR or Null is received.

Translation Accuracy

  Because DoubleTalk must handle the highly irregular spelling system
  of English, as well as proper names, acronyms, technical terms, and
  borrowed foreign words, there inevitably will be words that it will
  mispronounce. If a word is mispronounced in your application, there
  are three techniques available to you for correcting it:

  1. Respell the word for the desired pronunciation.

  2. Redefine the way the word should be pronounced by creating an
     exception for it in DoubleTalk's exception dictionary. This
     method allows words to be corrected without having to modify the
     original text, and it automatically corrects all instances of the
     word.

  3. Use DoubleTalk's Phoneme mode.

  The first technique is the easiest way to fine tune word
  pronunciations - by tricking DoubleTalk into the desired
  pronunciation. Among the more commonly mispronounced words are
  compound words (baseball), proper names (Sean), and foreign loan
  words (chauffeur). Compound words can usually be corrected by
  separating the two words with a space, so that "baseball" becomes
  "base ball." Proper names and foreign words may require a bit more
  creativity, so that "Sean" becomes "Shon," and "chauffeur" becomes
  "show fur." Heteronyms (words with identical spelling but different
  meanings and pronunciations) can also be modified using this
  technique. For example, if the word "read" is to be pronounced as
  "reed" instead of "red," respell it "reed."

Commands

  The commands described in the following pages provide a simple means
  of controlling DoubleTalk under software control. They can be used
  to vary voice attributes, such as the speed or pitch, to suit the
  requirements of a particular application or your listening
  preferences. Commands are also used to change operating modes.

  Commands can be freely intermixed with the text that is to be
  spoken, allowing the voice to be dynamically controlled. Commands
  affect only the text that follows them in the text stream.

      NOTE DoubleTalk commands can generally be used only
            with application programs that you write
            yourself. This is because most programs prevent
            the commands from reaching DoubleTalk, virtually
            becoming a brick wall between you and
            DoubleTalk. Many talking programs, however,
            usually provide an indirect means of changing
            DoubleTalk's attributes via some sort of voice
            menu or command system.

            This restriction does not apply, however, if you
            are printing files from a program to DoubleTalk

via DTPRN. Although DTPRN is essentially a
program capable of blocking commands, it was
specifically written to pass commands on to
DoubleTalk. Furthermore, DTPRN enables you to
use an asterisk (*) or other user-defined
character as the command character, besides
Control-A (see discussion below).

Command formats

  All DoubleTalk commands are composed of the command character, a one
  or two-digit ASCII parameter n, and an ASCII character which
  uniquely identifies the command. Some commands simply enable or
  disable a feature of DoubleTalk; these commands do not require a
  parameter. The command formats is:

      <command character><n><letter>

The command character

  The default DoubleTalk command character is Control-A (01h). The
  command character itself can be spoken by DoubleTalk by sending it
  twice in a row: Control-A Control-A. This special command allows the
  command character to be spoken without affecting the operation of
  DoubleTalk, and without having to change to another command
  character and then back again.

Changing the command character

  The command character can be changed to another control character
  (01h-1Ah) by sending the current command character, followed by the
  new character. To change the command character to Control-D, for
  example, issue the command Control-A Control-D. To change it back,
  issue the command Control-D Control-A. It's generally a good idea to
  change the command character if the forthcoming text contains
  characters which may otherwise be interpreted as command characters
  (and hence commands).

  The command character can be unconditionally reset to Control-A by
  sending Control-^ (1Eh) to DoubleTalk while operating in the Text,
  Character, or Phoneme modes.

Command parameters

  Command parameters are composed of one or two-digit ASCII numbers.
  DoubleTalk supports two types of parameters: absolute and relative.
  Absolute parameters explicitly specify the parameter's new value,
  such as 9S or 3B. Relative parameters specify a displacement from a
  parameter's current value, not the actual new value itself.

  Relative parameters can specify either a positive or negative
  displacement from a parameter's current value. For example, the
  Volume command +2V increases the current volume by two (V + 2 -> V).

If the current volume is 4, it will increase to 6 after the command
has executed. The command -2V will have a similar effect, except the
volume will be decreased by two.

If the value of a parameter falls outside the command's range, the
value will wrap around, instead of being truncated. For example, if
the current volume is 7 and the command +4V is issued, the resultant
volume will be (7 + 4) - 10, or 1, since the volume range is 0-9.

When writing application programs for DoubleTalk, it is recommended
that relative parameters be used for temporarily changing voice
attributes (such as raising the pitch of a word), using
absolute-parameter commands only once in the program's
initialization routine. This way, if the base value of an attribute
must be changed, it only needs to be changed in the initialization
routine.

Command Descriptions

  This section describes the software commands supported by
  DoubleTalk. With the exception of the Volume command, these commands
  only affect the text-to-speech synthesizer.

Voice (nO)

  DoubleTalk's TTS synthesizer has eight standard voices to choose
  from, as well as a number of individual voice controls that can be
  used to independently vary the voice characteristics. The Voice
  command enables DoubleTalk's voice to be changed anytime, such as
  for identifying text attributes (italics, bold, underline, etc.).
  Voices are selected with the commands 0O through 7O, as shown in
  Table 1. Note that because this command alters numerous internal
  voice parameters (pitch, tone, etc.), it should precede any
  individual voice parameter commands.

        n   Voice Name
        ----
        0   Perfect Paul (default)
        1   Vader
        2   Big Bob
        3   Precise Pete
        4   Ricochet Randy
        5   Biff
        6   Skip
        7   Robo Robert

  Table 1. Voice Selections

  Some programs, such as screen readers for the blind, often send
  voice control commands (such as pitch) to DoubleTalk. This can
  change the way a voice sounds, or even completely negate any voice
  change you might make. If this happens with your screen reader, try
  adjusting its pitch command to restore the desired voice (some

screen readers allow you to do this permanently by editing one of
its parameter files - check your screen reader documentation for
details).

Articulation (nA)

  This command adjusts the articulation level, from 0A through 9A.
  Excessively low articulation values tend to make the voice sound
  slurred; very high values, on the other hand, can make the voice
  sound choppy. In general, the articulation should be increased as
  the speed (nS) is increased. The default articulation is 5A.

Expression (E/nE)

  Expression, or intonation, is the variation of pitch within a
  sentence or phrase. When expression is enabled (n > 0), DoubleTalk
  attempts to mimic the pitch patterns of human speech. For example,
  when a sentence ends with a period, the pitch drops at the end of
  the sentence; a question mark will cause the pitch to rise.

  The optional parameter n determines the degree of intonation. 0E
  provides no intonation (monotone), whereas 9E is very animated
  sounding. 5E is the default setting. If the parameter is omitted,
  the current (last set) value will be used. This is useful for re-
  enabling intonation after a Monotone command.

Monotone (M)

  This command disables all intonation (expression), causing
  DoubleTalk to speak in a monotonic voice. Intonation should be
  disabled whenever manual intonation is applied using the Pitch
  command or phoneme attribute tokens. Note that this command is
  equivalent to the 0E command.

Formant Frequency (nF)

  This command adjusts the synthesizer's overall frequency response
  (vocal tract formant frequencies), over the range 0F through 9F. By
  varying the frequency, voice quality can be fine-tuned or voice type
  changed. The default frequency is 5F.

Speed (nS)

  The synthesizer's overall rate (speed) of speech can be adjusted
  with this command, from 0S (slowest) through 9S (fastest). The
  default speed is 5S.

Pitch (nP)

   This command varies the synthesizer's pitch over a wide range, which
   can be used to change the average pitch during speech production,
   produce manual intonation, or create sound effects (including
   singing). Pitch values can range from 0P through 99P; the default is
   50P.

Volume (nV)

   This command controls the synthesizer's volume level, from 0V
   through 9V. 0V yields the lowest possible volume; maximum volume is
   attained at 9V. The default volume is 5V. The Volume command can be
   used to set a new listening level or create emphasis in speech. PCM
   mode and the sinusoidal/DTMF generators are also affected by this
   command.

Tone (nX)

   The synthesizer supports three tone settings, bass (0X), normal
   (1X), and treble (2X), which work much like the bass and treble
   controls on a stereo. The best setting to use depends on the speaker
   being used and personal preference. Normal (1X) is the default
   setting.

Reverb (nR)

   This command is used to add reverberation to the voice. 0R (the
   default) introduces no reverb; increasing values of n
   correspondingly increase the reverb delay and effect. 9R is the
   maximum setting.

Punctuation Filter (nB)

   Depending on the application, it may be desirable to limit the
   reading of certain punctuation. For example, if DoubleTalk is used
   to proofread documents, the application may call for only unusual
   punctuation to be read. On the other hand, an application which
   orally echoes keyboard entries on a computer for a blind user may
   require that all punctuation be spoken.

   DoubleTalk supports four primary levels of punctuation filtering, as
   shown in Table 2. Besides determining which punctuation characters
   will be spoken and which will not, the punctuation filter also
   determines how number strings will be read.

```
       n   Punctuation Spoken
       --------------------------------
       0   All
       1   Most (all but CR, LF, Space)
       2   Some ($%&#@=+*^<>|\)
       3   None
```

Table 2. Base Punctuation Settings

The values of n listed in the table cause number strings to be read
a digit at a time (e.g., 0123 = "zero one two three"). Adding 4 to
these values (n = 4-7) causes number strings to be read as numbers
(0123 = "one hundred twenty three"). N = 6 and 7 also cause currency
strings to be read as they are normally spoken - for example, $11.95
is read as "eleven dollars and ninety five cents." Finally, adding 8
to these values (n = 8-15) disables leading zero suppression; number
strings beginning with zero will always be read a digit at a time.

The default filter setting is 6B (Some punctuation, Numbers mode,
leading zero suppression on).

Timeout Delay (nY)

The Text and Phoneme modes of DoubleTalk defer translating the
contents of the input buffer until a CR or Null is received. This
ensures that text is spoken smoothly from word to word, and that the
proper intonation is given to the beginnings and endings of
sentences. If text is sent to DoubleTalk without a CR or Null, it
will remain untranslated in the input buffer indefinitely.

DoubleTalk contains a programmable timer which will force it to
translate its buffer contents after a predetermined time interval.
The timer is enabled only if the Timeout parameter n is non-zero,
DoubleTalk is not active (not talking), and the input buffer
contains no CR or Null characters. Any characters sent to DoubleTalk
before timeout will automatically restart the timer.

The Timeout parameter n specifies the number of 200 millisecond (0.2
sec) periods in the delay time, which can range from 200
milliseconds to 3 seconds (Table 3). The default value is 0, which
disables the timer.

       n   Delay
       ----
       0   Indefinite (wait for CR/Null)
       1   200 milliseconds
       2   400 milliseconds
       .   .
       .   .
       15 3000 milliseconds (3 sec.)
```

Table 3.  Timeout Delays

Load Exceptions (L)

  This command purges DoubleTalk's exception dictionary and stores
  subsequent output from the host in DoubleTalk's exception dictionary
  RAM. Because the memory used by the dictionary is the same physical
  RAM used by the input buffer, the space available for the input
  buffer is decreased proportionally by the size of the dictionary.

  The dictionary can be purged from DoubleTalk with the Reinitialize
  command, or by loading a "null" dictionary file into DoubleTalk.
  Both methods reallocate the memory space occupied by the dictionary
  to the input buffer.

  Exception files must be compiled into the internal format used by
  DoubleTalk before they can be used. A compiler program is included
  on the Developer's Tools disk for performing this task.

  The topic of writing exception dictionaries is somewhat complex for
  the average (sane) user, and is therefore left to the Developer's
  Tools.


Enable Exceptions (U)

  The exception dictionary is enabled with this command. If DoubleTalk
  is in Phoneme mode, or if an exception dictionary has not been
  loaded, the command will have no effect. The exception dictionary
  can be disabled by issuing one of the mode commands D, T, or C.


Reinitialize (@)

  This command clears the input buffer (see "Clear" command) and
  restores all of the voice parameters to their default settings. The
  exception dictionary memory is also cleared and reallocated to the
  input buffer.


Zap Commands (Z)

  This command prevents DoubleTalk from honoring subsequent commands,
  enabling it to read commands as they are issued. Any pending
  commands in the input buffer will still be honored. The only way to
  restore command recognition after the Zap command has been issued is
  to write Control-^ (1Eh) or perform a hardware reset.


DTMF Generator (n*)

  The DTMF (Touch-Tone) generator generates the 16 standard tone pairs
  commonly used in telephone systems. Each tone pair generated by
  DoubleTalk is 100 ms in duration, more than satisfying the telephone
  signaling requirements (this can be extended to 500 ms with the
  Protocol Options command). The mapping of the command parameter n to
  the buttons on a telephone is shown in Table 4.

The "pause" tone is used to generate the inter-digit delay in phone
number strings. The generator's output level can be adjusted with
the Volume (nV) command. DTMF commands are buffered, and can be
intermixed with text for the TTS synthesizer without restriction.

```
        n         Button
        ----------------
        0           0
        .           .
        .           .
        9           9
        10          *
        11          #
        12          A
        13          B
        14          C
        15          D
        16         pause
```

Table 4. DTMF Generator

Tone Generators (J/nJ)

  DoubleTalk's tone generators are activated with these commands. The
  operation of the tone generators are beyond the scope of this
  manual, but are described in detail in the Developer's Tools.

Text Mode/Delay (T/nT)

  This command places DoubleTalk in the Text operating mode. The
  optional delay parameter n is used to create a variable pause
  between words. The shortest, and default delay of 0, is used for
  normal speech. For users not accustomed to synthetic speech, the
  synthesizer's intelligibility may be improved by introducing a
  delay. The longest delay that can be specified is 15. If the delay
  parameter is omitted, the current (last set) value will be used and
  the exception dictionary will be disabled. This feature is useful
  for returning from another operating mode or disabling the exception
  dictionary (see "Enable Exceptions" command).

Character Mode/Delay (C/nC)

  This command puts DoubleTalk in the Character operating mode. The
  optional delay parameter n is used to create a variable pause
  between characters. Values between 0 (the default) and 15 provide
  pauses from shortest to longest, respectively. Values between 16 and
  31 provide the same range of pauses, but control characters will not
  be spoken. If the delay parameter is omitted, the current value will
  be used and the exception dictionary will be disabled.

Phoneme Mode (D)

   This command disables the text-to-phonetics translator, allowing
   DoubleTalk's phonemes to be accessed directly. Table 5 lists the
   phonemes that can be produced by DoubleTalk.

   When concatenating two or more phonemes, each phoneme must be
   delimited by a space. For example, the word "computer" would be
   represented phonetically as K AX M P YY UW DX ER.

Phoneme Symbol	Example Word	Phoneme Symbol	Example Word
A	dAs (Spanish)	M	Me
AA	cOt	N	New
AE	cAt	NG	ruNG
AH	cUt	NY	ni¥o (Spanish)
AW	cOW	O	nO (Spanish)
AX	bottOm	OW	bOAt
AY	bIte	OY	bOY
B	BiB	P	PoP
CH	CHurCH	PX	sPot
D	DiD	R	Ring
DH	eiTHer	RR	tRes (Spanish)
DX	ciTy	S	Sell
E	sEr (Spanish)	SH	SHell
EH	bEt	T	Tin
EI	mEsa (Spanish)	TH	THin
ER	bIRd	TX	sTick
EW	actEUr (French)	U	Uno (Spanish)
EY	bAke	UH	bOOk
F	Fee	UW	bOOt
G	GaG	V	ValVe
H	He	W	We
I	lIbro (Spanish)	WH	WHen
IH	bIt	Y	maYo (Spanish)
IX	rabbIt	YY	You
IY	bEEt	Z	Zoo
J	aGe	ZH	viSion
K	Cute	space	variable pause *
KX	sKi	,	medium pause
L	Long	.	long pause

   Table 5. Synthesizer Phonemes
   * Normally used between words; duration determined by nT command

Phoneme attribute tokens

   Table 6 lists the voice attribute tokens that can be used in the
   Phoneme mode, in addition to the standard DoubleTalk commands. These
   tokens do not require the command character or any parameters.

   As indicated in the table, the / and \ tokens temporarily increase
   and decrease the pitch by m steps. Besides being temporary, the
   difference between using the pitch tokens and the Pitch command (nP)

is that the effective pitch range is extended beyond the normal 0-99
range by approximately ñ20 steps, and if the pitch should fall out
of range, it will simply bottom or top out, instead of wrap around.

All other phoneme attribute token commands remain in effect until
explicitly changed.

        Symbol   Function
        ----
        nn   Set pitch to 'nn' (0-99)
        /   Increase pitch m steps *
        \   Decrease pitch m steps *
        +   Increase speed 1 step
        -           Decrease speed 1 step
        >   Increase volume 1 step
        <   Decrease volume 1 step

   Table 6. Phoneme Attribute Tokens
   * Step size determined by nE command; m ÷ 2.5n

Applications of Phoneme mode

  Phoneme mode is useful for creating customized speech, when the
  normal text-to-speech modes are inappropriate for producing the
  desired voice effect. For example, Phoneme mode should be used to
  change the stress or emphasis of specific words in a phrase. This is
  because Phoneme mode allows voice attributes to be modified on
  phoneme boundaries within each word, whereas Text mode allows
  changes only at word boundaries. This is illustrated in the
  following program examples.

      100 A$ = CHR$(1)
      105 LPRINT A$;"D";A$;"M"
      110 LPRINT "70H AW -/D>/EH R +<\\YY UW   S P\IY K   T UW
          \M IY   DH AE T -\W EY .+/"

  Note in line 105 that expression is disabled, since the pitch
  variations due to the internal intonation algorithms would otherwise
  interfere with the pitch tokens. Compare this with the same phrase
  produced in Text mode with expression enabled:

      100 A$ = CHR$(1)
      105 LPRINT A$;"T";A$;"E"
      110 LPRINT "How dare you speak to me that way!"

  Phoneme mode is also useful in applications that provide their own
  text-to-phoneme translation, such as the front end of a custom
  text-to-speech system.

Sleep Timer (nQ)

  This command places the DoubleTalk LT in a nearly powered-down
  state, in order to help conserve battery power (the command has no
  effect on the DoubleTalk PC). If you tend to forget to turn off your

DoubleTalk at the end of the day or during lunch breaks, for
example, the Sleep mode timer can be used to turn it off
automatically. (DoubleTalk doesn't actually turn completely off - it
enters a low-power state which consumes about one-tenth the power it
would otherwise.) An audible reminder tone can even be programmed to
sound every ten minutes, to remind you that you have left DoubleTalk
on.

The sleep timer is reset anytime DoubleTalk is accessed from your
computer (such as when reading). In this way, DoubleTalk will not
shut itself off during normal use, as long as the programmed timer
interval is longer than the maximum time DoubleTalk is inactive. The
sleep timer is also disabled when DoubleTalk is running from the AC
adapter, i.e., the timer runs only when operating from DoubleTalk's
internal battery.

Once DoubleTalk has entered Sleep mode, it can be woken only by
turning the power off and back on. The serial port control signal
DTR is forced to its "not ready" state when DoubleTalk is asleep,
preventing application programs from attempting to send DoubleTalk
any more data. Just before going to sleep, DoubleTalk emits the
ASCII character "S" from the serial port, which the host computer
can use to detect DoubleTalk's sleep state.

The command parameter n determines when Sleep mode will be entered.
You can place DoubleTalk in Sleep mode immediately, program the
sleep timer to any of 15 ten-minute intervals (10 to 150 minutes),
or disable Sleep mode altogether. Table 7 summarizes the Sleep mode
command.

            n   Delay
            ----
            0   Sleep timer disabled
            1   10 min
            2   20 min
            .   .
            .   .
            15   150 min
            16   0 (immediate)
            17   10 min w/reminder
            18   20 min w/reminder
            .   .
            .   .
            31   150 min w/reminder

Table 7. Sleep Mode Timer

Note that the delay interval is simply n x 10 minutes for 0 < n <
16. Adding 16 to n (16 < n < 32) yields the same interval range, but
also enables the reminder tone, which sounds at the end of each ten
minute interval. Programming n = 0 disables the Sleep mode; setting
n = 16 forces DoubleTalk to go to sleep as soon as it has stopped
speaking (even when running from the AC adapter). Delay 22 (60
minutes with the reminder tone) is the default setting.

PCM Mode (#/n#)

   These commands activate DoubleTalk's PCM modes. This is an advanced
   topic discussed in the Developer's Tools.

Protocol Options (nG)

   This command controls various internal operating parameters in
   DoubleTalk. Refer to the Developer's Tools for more information.

Index Marker (nI)

   Index markers are non-speaking "bookmarks" that a program can use to
   monitor the progress of the TTS synthesizer's output. Since this is
   a command only programmers would use, it too is covered in the
   Developer's Tools.

Interrogate (?)

   This command enables a program to read DoubleTalk's current
   settings. Yep, you guessed it - you're gonna need the Developer's
   Tools to learn more about this one, too.

Clear (Control-X)

   The Clear command stops the synthesizer and clears the input buffer
   of all text and commands. None of the synthesizer settings are
   affected, but any untranslated commands will be ignored.

   Note that the format of this command is unique in that the command
   character (Control-A) is not used with it. The Control-X (18h)
   character is written directly to DoubleTalk's I/O port, which
   enables DoubleTalk to react immediately, even if its input buffer is
   full. To be most effective, the states of DoubleTalk's handshaking
   signals should be ignored when writing the Clear command.

Command Summary

Table 8 is a summary of the commands supported by DoubleTalk.

```
        Command     Function                    Range    Default
        -----------------------------------------------------------
          nA        Articulation                0-9        5
          nB        Punctuation filter          0-15       6
          C/nC      Character mode/delay         0-31       0
          D         Phoneme mode                 -         -
          E/nE      Expression                  0-9        5
          nF        Formant frequency           0-9        5
          nG        Protocol options            0-63       2
          nI        Index marker                0-99       -
          J/nJ      Musical/sine tone generators 0-99      -
          L         Load exception dictionary    -         -
          M         Monotone                     -         -
          nO        Voice                       0-7        0
          nP        Pitch                       0-99       50
          nQ        Sleep mode (LT only)        0-31       6
          nR        Reverb                      0-9        0
          nS        Speed                       0-9        5
          T/nT      Text mode/delay             0-15       0
          U         Enable exception dictionary  -         -
          nV        Volume                      0-9        5
          nX        Tone                        0-2        1
          nY        Timeout delay               0-15       0
          Z         Zap commands                 -         -
          @         Reinitialize                 -         -
          ?         Interrogate                  -         -
          n*        DTMF generator              0-16       -
          #         Non-buffered PCM mode        -         -
          n#        Buffered PCM mode           0-99       -
```

Table 8. Command Summary

APPENDIX A
LPC Word Lists

File: WORDS1
Gender: male
words: 206

zero	1	one	6	two	11
three	16	four	2	five	7
six	12	seven	17	eight	3
nine	8	ten	13	eleven	18
twelve	4	thir-	9	fif-	14
teen	19	twenty	5	hundred	10
thousand	15				

A	39	abort	73	about	79
adjust	148	alert	147	all	112
alpha	46	amps	97	and	173
area	139	at	110	automatic	70

B	20	between	149	bravo	49
break	187	button	151		

C	27	calibrate	189	call	74
cancel	113	caution	176	change	63
charlie	51	check	178	circuit	140
clock	152	complete	102	connect	141
control	108	crane	190	cycle	75

D	33	danger	61	days	114
degrees	179	delta	48	device	153
direction	191	display	76	door	115
down	183				

E	40	east	154	echo	47
electrician	109	enter	192	equal	77
exit	116				

F	21	fail	155	farad	174
fast	78	feet	193	fire	100
flow	117	foxtrot	50	frequency	156
from	194				

G	28	gallons	130	gate	157
gauge	118	get	195	go	80
golf	52	green	119		

H	34	henry	53	hertz	136
high	158	hold	196	hours	188

I	41	inch	81	india	92
inspector	120	intruder	159	is	146

J	22	juliet	131		

K	29	kilo	169		

L	35	left	197	light	177
lima	54	line	67	low	82
M	42	machine	106	manual	121
measure	160	mega	98	meter	60
micro	137	mike	93	mill	198
milli	175	minus	64	minutes	150
motor	83	move	122		
N	23	north	161	not	65
november	132	number	184		
O	30	of	199	off	68
ohms	138	on	107	open	84
operator	91	oscar	170	out	185
over	123				
P	36	papa	55	pass	162
passed	200	percent	85	pico	99
plus	124	point	186	position	163
power	101	press	201	pressure	62
probe	86	pull	125	push	164
Q	43	quebec	94		
R	24	range	202	ready	87
red	111	repair	103	repeat	126
right	165	romeo	133		
S	31	safe	203	seconds	142
service	180	set	88	shut	127
sierra	171	slow	166	smoke	72
south	204	speed	89	start	66
stop	105	switch	181		
T	37	tango	56	temperature	104
test	128	the	58	time	69
timer	144	tool	167	turn	205
U	44	under	90	uniform	95
unit	143	up	145		
V	25	valve	182	victor	134
volts	129				
W	32	wait	71	watts	59
west	168	whiskey	172		
X	38	x-ray	57		
Y	45	yankee	96	yellow	206
Z	26	zulu	135		

```
File: WORDS2
Gender: female
# words: 35

the              1    time             2    is               3
a.m.             4    p.m.             5    oh               6
o'clock          7    one             8    two              9
three           10    our             11    five            12
six             13    seven           14    eight           15
nine            16    ten             17    eleven          18
twelve          19    thirteen        20    fourteen        21
fifteen         22    sixteen         23    seventeen       24
eighteen        25    nineteen        26    twenty          27
thirty          28    forty           29    fifty           30
good            31    morning         32    afternoon       33
evening         34    (pause)         35
```

APPENDIX B
DoubleTalk LT Cable Connections

```
                 _____
               /                   \
          5   |  o   o   o   o   o  |  1
              |                     |
          9   \    o   o   o   o   /   6
               _____/
```

Figure B-1. DB9-F Connector


```
        Pin No.    Symbol      Description        Direction
        -------------------------------------------------------
           1       NC          No Connection
           2       TXD         Transmit Data      Output
           3       RXD         Receive Data       Input
           4       DSR         Data Set Ready     Input
           5       SG          Signal Ground
           6*      DTR         Data Terminal      Output
                               Ready
           7       NC          No Connection
           8*      RTS         Request To         Output
                               Send
           9       RI          Ring Indicator     Output
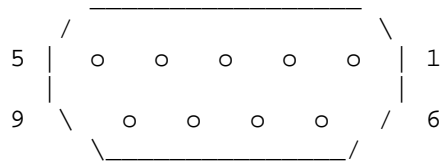
           * Jumpered together in cable
```

Table B-1. Cable Connections

  DoubleTalk PC

      Processor (CPU) - Intel 12.5 MHz 80C188EB

     On Board Memory - 512K ROM
                        8K RAM

   Supported Speech
       Technologies - Text-to-speech (TTS)
                        Linear Predictive Coding (LPC)
                        Pulse Code Modulation (PCM)
                        Adaptive Delta Pulse Code Modulation (ADPCM)
                        Continuously Variable-Slope Delta (CVSD)

     Tone Generators - 3 musical
                        2 sinusoidal
                        Touch-Tone

     TTS Synthesizer - 3K input buffer
                        3 operating modes
                        8 voices
                        10 speeds
                        10 formant frequencies
                        100 pitches
                        10 volume levels
                        10 expression levels
                        10 articulation levels
                        10 reverb levels
                        3 tone levels
                        16 word/character delays
                        16 timeout delays
                        16 punctuation levels

     LPC Synthesizer - 4K data buffer
                        5220 and D6 data formats
                        2 speeds
                        8 kHz sampling rate

     PCM Synthesizer - PCM/ADPCM 8 bit mono
                        4K sample buffer
                        100 sampling rates (4 kHz to 11 kHz)
                        10 volume levels
                        0 to 48 kHz non-buffered mode

    CVSD Synthesizer - 32 kbps sampling rate

        Audio Output - 0.5 W (8 ohms)
                        Bridge-tied (live ground), dc-coupled
                        1/8" monaural jack

```
        System IRQ
   Requirements -  none


        System DMA
   Requirements -  none


     System Memory
    Requirements -  none


        System I/O
   Requirements -  Two 8-bit ports: 25E/F, 29E/F, 2DE/F, 31E/F,
                   35E/F, or 39E/F (jumper selectable)


 Power Consumption -  75 mA maximum active at min. volume
                      25 mA standby (+5 V)


             Size -  3.9" x 5.1"
```

DoubleTalk LT

```
   Processor (CPU) -  Intel 10 MHz 80C188EB


  On Board Memory -  512K ROM
                     8K RAM


  Supported Speech
     Technologies -  Text-to-speech (TTS)
                     Linear Predictive Coding (LPC)
                     Pulse Code Modulation (PCM)
                     Adaptive Delta Pulse Code Modulation (ADPCM)
                     Continuously Variable-Slope Delta (CVSD)


  Tone Generators -  3 musical
                     2 sinusoidal
                     Touch-Tone


  TTS Synthesizer -  3K input buffer
                     3 operating modes
                     8 voices
                     10 speeds
                     10 formant frequencies
                     100 pitches
                     10 volume levels
                     10 expression levels
                     10 articulation levels
                     10 reverb levels
                     3 tone levels
                     16 word/character delays
                     16 timeout delays
                     16 punctuation levels
```

```
        LPC Synthesizer -  4K data buffer
                           5220 and D6 data formats
                           2 speeds
                           8 kHz sampling rate


        PCM Synthesizer -  PCM/ADPCM 8 bit mono
                           4K sample buffer
                           100 sampling rates (4 kHz to 11 kHz)
                           10 volume levels


       CVSD Synthesizer -  32 kbps sampling rate

           Audio Output -  Internal speaker: 8 ohms, 0.5 W
                           Headphones: 1/8" monaural jack, 75 ohms

             System IRQ
           Requirements -  none

             System DMA
           Requirements -  none

          System Memory
           Requirements -  none

             System I/O
           Requirements -  One serial port: 9600 baud, 8 data bits,
                           1 stop bit, no parity, RTS/CTS handshaking

      Power Consumption -  75 mA maximum active at min. volume
                           25 mA standby
                           4 mA sleep
                           AC adapter or 9 V alkaline battery

                   Size -  5.3" x 4.0" x 1.5"

                 Weight -  11 oz (without battery)
```