- If you press S, go to Step 7
- If you press N, go to Step 8.

7 ADDING A STANDARD DRIVE TO THE SYSTEM SET-UP

Follow the procedure below to add a standard drive to the system set-up. A standard drive is defined as any drive that is listed in the system BIOS table.

- Press the enter key. The screen will display DRIVE 1 parameters as follows:

  Select Drive Type for DRIVE 1 . . .
  Type: 1 (STANDARD TYPE)
  CYL: 306 HEAD: 4 PRECOMP: 128
  CTRL:00H L-ZONE: 305
  SECTOR/TRK: 26

- Press the up and down arrows on your key board to scroll through the various standard drive parameters. As you scroll, the parameters on the screen will change to reflect different drive types. Select the correct parameters for your disk drive. Press the enter key. The screen will display the following messages:

  Are these all correct? (Y/N)

- Type Y to indicate that these changes are correct. Press the enter key. The screen will display:

  Do you want to make these changes permanent?

- Type Y. The system will update the system set-up and display the following message:

  Hit any key to reboot the system.

- Hit any key. Your system set-up is now updated and you will be required to run the DEBUG program again to perform a low-level format of the hard disk. Proceed to Step 9 for low-level formatting instructions.

8 ADDING A NON-STANDARD DRIVE TO THE SYSTEM SET-UP

An RLL drive is defined as non-standard if it meets one or more of the following criteria:

A) A drive that is not included in the system BIOS table
B) An operating system that requires 17-sector mapping such as Novell 2.0.A.
C) A drive that requires non-standard sectors per track such as the SEAGATE ST-250R.
D) Formatting with one spare sector per track (25+1 or 30+1). (Sector sparing is useful for maintaining formatted capacity in RLL drives with media defects ranging from 100 - 600 depending on the size of the drive.)
E) A drive with more than 1024 cylinders. The DTC7287 will allow the system to access the full capacity of the drive beyond 1024 cylinders without conflicting with the BIOS or residing software that has a 1024-cylinder limitation.

Follow the procedure below to update system set-up with a non-standard drive:

- The screen will display a series of questions to define your non-standard drive. By pressing enter, you automatically call up the default for each specification. The first question that will be displayed is:

  Number of cylinders (default = 615, maximum = 2048)

- Type in the number of cylinders on your disk. If you do not know the number of cylinders, consult your drive specifications. Press the enter key. The screen will display:

  Number of heads (default = 4, maximum = 16)

- Type in the number of heads on your disk. If you do not know the number of heads, consult your drive specifications. Press the enter key. The screen will display:

  Write Precompensation cylinder (default = none, max = last cyl.)

- Type in the cylinder where the Write Precompensation should start. If you do not know where the Write Precompensation cylinder should start, consult your drive specifications or press enter for the default. Press the enter key if you have not already done so.

The screen will display:

  Landing zone cylinder (default = last cyl., max = 2048)

- Type in the cylinder where the landing zone cylinders start on your disk. If you do not know where the landing zone cylinders start, consult your drive specifications or press enter for the default. Press the enter key if you have not already done so. The screen will display:

  Drive physical sectors/track (default = 26)

- Type in the number of physical sectors. If you do not know the number of physical sectors, consult your drive specifications. Press the enter key. The screen will display the number of physical sectors on your drive:

  Spare Sector (0 = 26 no spare, 1 = 25 sec/trk 1 spare)

- If you are using the ST-250R, the drive can be formatted with 31 sectors per track by entering "0", or 30 plus 1 spare sectors per track by entering "1". Type "0" or "1". The screen will display:

  Do you want mapping mode? (Y/N)

- If you type in N, then the screen will prompt you to confirm your selection. Type Y if you need 17-, 32-, or 60-sector mapping. The screen will display:

  Enter 1 = to emulate a 17-sector/track format such as Novell 2.0.A
  Enter 2 = if drive has >1024 cylinders and a formatted capacity of <=250Mb
  Enter 3 = if drive has >1024 cylinders and a formatted capacity of >250Mb

- Type 1, 2, or 3. After you have selected the mapping mode, the screen will display:

  Are these all correct?

- Type Y. The screen will display:

  Do you want to make these changes permanent?

- Type Y to make the changes permanent. The system will update the system set-up with the new non-standard drive parameters. The screen will display:

  A system reboot is required to run DEBUG again. Hit any key to reboot.

- Your system set-up is now updated. You will be required to run the DEBUG program again to perform a low-level format on the hard disk. Proceed to Step 9 for low-level formatting instructions.

9 LOW-LEVEL FORMATTING THE DRIVE

You will be using the DTC on-board utility to perform a low-level format, to debug, do a surface verification, and to update the defect map of the hard drive. The following steps are required to perform a low-level format on your drive:

- Load the DEBUG file using the same procedures as in Step 6. You will see the parameters for your drive(s) displayed. The system will ask you if you want to change drive types.

- Type N. The drive has already been added to the system set-up in Steps 6, 7, and 8 and does not require further modification. The screen will display:

  Select a drive number to FORMAT or VERIFY.
  (1st drive = 1, 2nd drive = 2 or "Q" for quit)

- Type 1 to format Drive 1. The screen will display the parameters for Drive 1. It will then prompt:

  Do you want to low-level format this drive? (Y/N)

- Type Y to format the drive.
Note: If you enter "Y" to verify the disk, a low-level surface verification will be performed and all defects discovered will be displayed, but not automatically mapped out of the drive. Press the enter key. The screen will display:

  All the data in Drive 1 will be erased.
  Are you sure? (Y/N)

- Type N. Press the enter key. The screen will display:

  Do you want to enter a defect list?

- Type Y to enter the manufacturer's RLL drive defect list. Enter "N" if the drive has no defects or if you do not want to enter the defect list written on the drive. The screen will display the number of defects entered. Following the entry of defects, the screen will display:

  Are all these correct? (Y/N)

- Type Y to confirm the defect entry. Press the enter key. The screen will display:

  Enter interleave factor (maximum = 9, default = 1)

- Type 1. An interleave factor of 1 allows for optimum system performance. Press the enter key. The screen will display:

  All the data in the drive will be erased. Are you sure?

- Type Y. The system will now low-level format the drive. When the format is completed, a verify pass is performed automatically. When the verify is complete, the screen will display:

  Format complete, verification complete.
  Total number of tracks assigned as bad____.

- Exit the program as indicated. The screen will display:

  (A>) prompt

- Repeat to perform a low-level format on a second drive.

10 PARTITIONING AND DOS FORMATTING THE DISKS

Once you have completed the low-level format, you will need to partition and perform a high-level format on the disk drive for your operating system. Under the DOS environment, use the FDISK and FORMAT commands to partition and format the drives. The number and size of the partitions you create will depend on your DOS or partitioning software program. See Table 3 for partitioning information on several commonly used programs. Consult your system or partitioning utility manual to complete the disk drive preparation.

Table 3. Number and Size of Partitions

Program	Number of Partitions	Maximum Partition Size
DOS 3.2 or earlier	One	32
DOS 3.3	Multiple	32
DOS 4.0 or later	Multiple	32 or greater
Speedstor, Disk Manager, VFeature, etc.	Multiple	32 or greater

Partitioning the Hard Disk Using the FDISK Command

- Insert the DOS system disk into Drive A and boot-up the computer. The screen will display the DOS prompt (A>).
- At the prompt, type FDISK and press the Enter key. The screen will display the FDISK menu.
- Follow the menu instructions or refer to your DOS system manual to complete the partitioning operation. You may have to run FDISK more than once to create multiple partitions.

Formatting the Hard Disk Using the FORMAT Command

- Insert the DOS system disk into Drive A and boot-up the computer. The screen will display the DOS prompt (A>).
- At the prompt, type FORMAT C:/S and press the Enter key. The screen will display a message asking if you want to FORMAT your disk.
- Type Yes. The /S option of the FORMAT command will copy system files onto your hard disk so that you can boot-up the system directly from the hard disk.
- Consult your DOS system manual if you are formatting more than one drive or if you need additional FORMAT command options.

11 REASSEMBLE YOUR COMPUTER

Refer to your computer manual for the proper procedure. If a drive does not operate correctly, check the cable and power connections to the drive. If a problem exists, contact Data Technology at (408) 262-7700.

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DTC7287

HARD AND FLOPPY DISK CONTROLLER INSTALLATION GUIDE

DATA TECHNOLOGY
A DIVISION OF QUME CORPORATION

INSTALLING THE DTC7287

This guide provides complete instructions for installing the DTC7287 Hard and Floppy Disk Controller Board in an IBM PC/AT compatible computer. Included in this guide are step-by-step procedures for setting the jumpers, connecting the ribbon cables, and formatting and partitioning the hard disk drives. Steps 1 through 5 detail the hardware installation procedures. Steps 6 through 10 describe how to use the DTC Hard Disk Format Utility to update the system set-up parameters for standard and non-standard drives, and to perform a low-level format on the drive. Instructions are also provided for partitioning and formatting the disks using DOS commands.

Features

The DTC7287 is a Run Length Limited (RLL) hard and floppy disk controller. The DTC7287 can control a maximum of two 5.25" or 3.5" RLL hard drives or up to two 5.25" or 3.5" floppy drives. These drives can be in any combination. The DTC7287 includes the following features:

- 1:1 interleaving
- 17-, 32-, 60-sector mapping
- 2, 7 RLL encoding
- No added wait states to the computer's request to transfer a byte or a word
- On-board BIOS supporting sector sparing, entry of media defects, variable sector-track and formatting RLL drives with more than 1024 cylinders.

System Requirements

The DTC7287 requires a standard IBM PC/AT, (or compatible), ribbon cables and DOS formatting utilities:

Hardware: IBM PC/AT or bus-compatible computer:
- One 20-pin flat ribbon data cable for the hard disk drive
- One 34-pin twisted or flat ribbon cable for the hard disk drive(s)
- One 34-pin twisted daisy-chained ribbon cable for the floppy disk drive(s)
- Two 20-pin flat ribbon data cables are required if two hard disks are being connected

Software: OS/2, or
DOS 2.1 or later, with these 3 files: DEBUG, FDISK, and FORMAT

1 CONFIGURE THE JUMPERS

The DTC7287 can be configured to your specific system environment via the seven jumpers listed below. Set the jumpers according to your system requirements prior to installing the board in the computer. Please refer to Figure 1 for jumper locations. For a quick summary of the jumper settings, refer to Table 1.

Table 1. DTC7287 Jumper Connections Summary

Jumper	Jumper Function	Default	Installed Y/N
W1	W1 Jumper is not on the DTC7287		
W2 & W3	Port Address Jumpers	Primary Port	NO
W4	Floppy Data Rate Jumper	250kHz	YES
W5	Firmware/Hardware Drive Select Jumpers	Hardware Select Mode	YES
W6	Auto-Deselect Jumper	Auto-Deselect On	YES
W7	Floppy Precompensation Jumper	Data-Rate-Dependent	NO
W8	Reserved Jumper	Must be Installed	YES
W9	BIOS PROM Address Jumper	C800:0000	NO
W10	BIOS PROM Enable Jumper	BIOS PROM Enabled	YES

W2 & W3 - Port Address Jumpers

The primary port addresses for the DTC7287 are 1F0H to 1F7H and 3F2H to 3F7H and are specified as the defaults. However, if this setting results in a system conflict, the secondary addresses, 170H to 177H and 372H to 377H, can be selected.

Installed:	Secondary port address
Not Installed:	Primary port address

W4 - Floppy Data Rate Jumper

The W4 jumper is used to control the power-up data transfer rate for the floppy drives. The DTC7287 uses the low-density 250kHz rate as a default because it provides a power-up pathway for both high- and low-density disks.

Installed:	250kHz
Not Installed:	500kHz

W5 - Firmware/Hardware Drive Select Jumper

The W5 jumper is used for selecting the hardware and firmware select modes. In the hardware select mode (default), the drive number is passed directly to the hard drive. Systems that require the Drive Select Signal to be delayed should use the Firmware Select Mode for selecting the hard drive.

Installed:	Hardware Select Jumper
Not installed:	Firmware Select Jumper

W6 - Auto-Deselect Jumper

The W6 jumper is used to control the hard disk drive selection. If the jumper is installed (default), the drive can only be selected when the command is issued or pending. Removal of this jumper causes the drive to be selected from the first selection of that drive until another drive is selected.

Installed:	LED auto-deselect on
Not Installed:	LED auto-deselect off

W7 - Floppy Precompensation Jumper

The W7 jumper is used to specify the amount of precompensation to be used for the floppy drives. The precompensation is scaled to the data rate of the floppy drive when this jumper is not installed. Most floppy drives require data-rate-dependent precompensation.

Installed:	Fixed at 125ns
Not Installed:	Data-Rate-Dependent:

Data Rate	Precomp
500kHz	125ns
300kHz	208ns
250kHz	250ns

W8 - Reserved Jumper

Jumper W8 is for internal use only and must be installed (closed) for proper operation of the controller.

W9 - BIOS PROM Address Jumper

When enabled, the BIOS resides in 16K of memory space. The first 14K is for the BIOS and the last 2K for RAM. Jumper W9 allows the user to relocate the 16K block in memory. If W9 is not installed, the address starts from C800:0000 (default value). If W9 is installed, the address starts at D800:0000.

Installed:	D800:0000 to DC00:3FFF
Not Installed:	C800:0000 to CC00:3FFF

W10 - BIOS PROM Enable Jumper

The BIOS PROM Enable Jumper controls the DTC7287's on-board BIOS PROM. If enabled (default), the BIOS firmware will be accessed when the system boots-up.

Installed:	Enable the on-board BIOS PROM
Not Installed:	Disable the on-board BIOS PROM

2 DISASSEMBLE YOUR COMPUTER

- Turn off the power to your computer and all devices connected to it.
- Remove the cover from your computer. Refer to your computer manual for the proper procedure.

3 INSTALL THE DTC7287

- Remove one of the metal brackets from any 16-bit, full-height, empty expansion slot in the rear of the chassis.
- Slide the connector of the DTC7287 controller board into the expansion slot on the motherboard and screw the mounting bracket to the chassis.
- Install the 4-pin drive light connector from the front panel of the system to the J5 connector. Refer to Figure 1 for the J5 location.

Figure 1. DTC7287 Switch and Jumper Locations

4 CONNECT THE FLOPPY DRIVES

The DTC7287 controller has four cable connectors: J1, J2, J3, and J4. The connector locations and Pin 1 orientation for these connectors are shown in Figure 1. The colored edges of the ribbon cables must always be aligned with Pin 1 of both the controller board(s) and the disk drive(s).

Connecting One Floppy Drive

- Connect the 34-pin header connector of the twisted ribbon cable to the J1 connector on the controller board.
- Connect the other end of the 34-pin twisted ribbon cable to the drive's edge connector.
- Check to see that the terminating resistor is installed on the floppy disk drive.
- Set the Drive Select switches for Drive Select 2.

Connecting Two Floppy Drives

- Connect the 34-pin twisted ribbon cable to the J1 connector of the controller board.
- Connect the other end of the 34-pin twisted ribbon cable to the disk drive.
- Be sure that the terminating resistor is installed on the last physical floppy disk drive on the daisy-chained cable. Drive A will be the drive at the end of the cable, if the twist is the last connector.
- Set both drives to Drive Select 2.

NOTE: All instructions regarding the drive selections assume that the Drive Selects are numbered 1-4. Please refer to the drive specifications for the proper drive termination and selection.

5 CONNECT THE HARD DRIVES

The hard drives are connected with the J2, J3, and J4 connectors. The connector locations and Pin 1 orientation for these connectors are shown in Figure 1. The colored edges of the ribbon cables must always be aligned with Pin 1 of both the controller board(s) and the disk drive(s). Table 2 summarizes the Drive Select settings for connecting two hard drives.

Connecting One Hard Drive

- Connect the 34-pin header connector of the ribbon cable to the J2 connector of the controller board.
- Connect one end of the 20-pin header connector of the ribbon cable to the J3 connector of the controller board.

- Connect both the 20- and the 34-pin ribbon cables to the disk drive edge connectors.
- Be sure that the terminating resistor is installed on the disk drive.
- Set the disk Drive Select switches for Drive Select 1 when using a flat 34-pin ribbon cable.
- Set the Drive Select switches for Drive Select 2 when using the end connector of a 34-pin hard disk twisted ribbon cable.

Connecting Two Hard Drives

- Connect the 34-pin header connector of the daisy-chained ribbon cable to the J2 connector on the controller board.
- Connect the 20-pin header connectors of the ribbon cables to the J3 connector on the controller for Drive 1 and to the J4 connector for Drive 2.
- Connect the edge connectors of the two 20-pin ribbon cables and the 34-pin daisy-chained ribbon cable to the edge connectors of both disk drives.
- Be sure that the last physical drive on the daisy-chained ribbon cable has the terminating resistor installed.
- If you use a 34-pin flat daisy-chained ribbon cable, set Drive 1 to Drive Select 1 and set Drive 2 to Drive Select 2.
- If you use a 34-pin twisted daisy-chained ribbon cable, set both Drives 1 and 2 to Drive Select 2. Refer to Table 2 for a summary of these steps.

Drive Select Settings: All instructions regarding the drive selections assume that the Drive Selects are numbered 1-4. Please refer to your drive specifications for the proper drive termination and selection.

Table 2. Drive Select Settings (for Two Drives)

Cable Type	Drive	Drive Select Setting
Flat 34-pin daisy-chained ribbon cable	1	1
	2	2
Twisted 34-pin daisy-chained ribbon cable	1	2
	2	2

6 ACCESS THE DTC HARD DISK FORMAT UTILITY SOFTWARE

Once the controller and disk drives are installed, the system set-up must be updated with the RLL drive parameters. The DTC Hard Disk Format Utility Software allows you to sel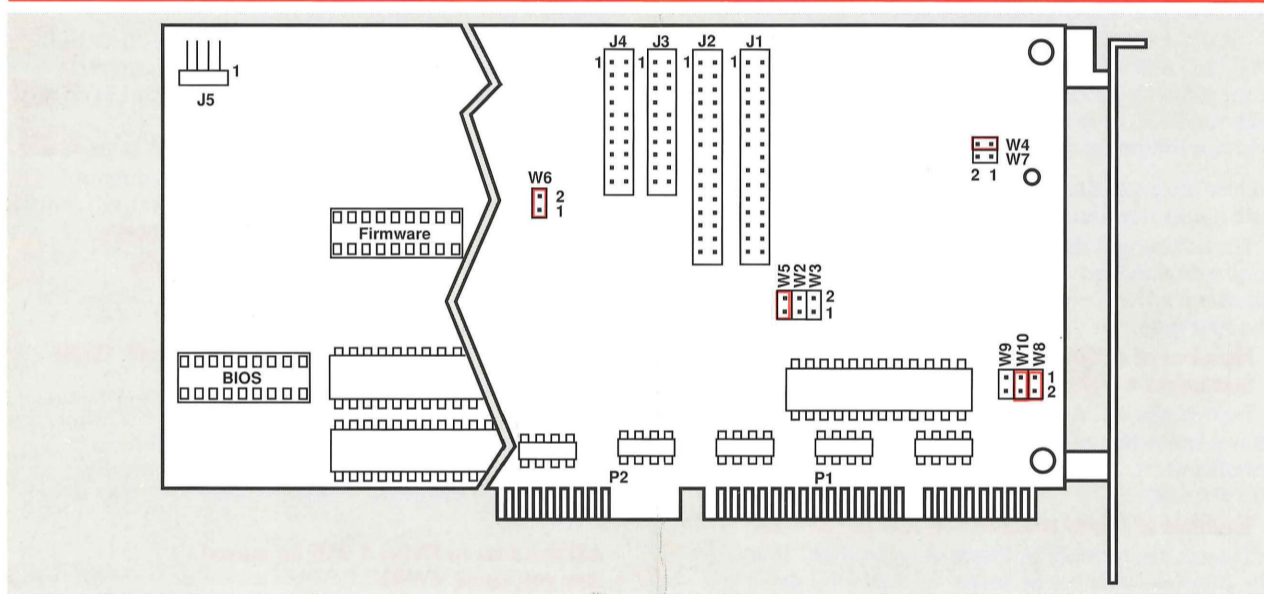ect a drive type (standard or non-standard), to enter the drive's parameters on the system set-up, perform a low-level format, to verify and to update the drive's defect map. To update the system set-up, you will first need to specify a BIOS address. Install DOS and boot the DOS disk for your computer system from the floppy drive. Proceed as follows:

- Type DEBUG at the A> prompt to load the DEBUG utility. Press the enter key. The screen will display:

  - (A hyphen)

- Type G=C800:5, which is the default BIOS address. If the alternate address is selected (see W9 jumper for an explanation):

- Type G=D800:5; press the enter key.

Warning: You will see the following message if prior to entering DEBUG, the system has been set up for one drive selected as drive type 1. The screen will display the drive parameters currently in use by the system. Please check these parameters against those listed in your drive specifications to ensure that they are correct. Change them to the proper standard or non-standard drive type if necessary. If your system has never been set-up prior to running DEBUG, the DTC Utility Software will enable you to do a set-up. If the correct current drive parameters are listed with no required modification, proceed to Step 9 for low-level formatting instructions. The screen will display:

> **DATA TECHNOLOGY**
> **AT RLL (2, 7) Hard Disk Format Utility V2.15**
> **This program provides drive-type selection, low-level formatting, verification and defect mapping of the drive.**
> **Current drive types selected are:**
> **DRIVE 1 is Type: 1 (STANDARD TYPE)**
> **CYL: 306 HEAD: 4 PRECOMP: 128**
> **CTRL: 00H L-ZONE: 305**
> **SECTOR/TRK: 26**
> **Drive 2 is Type: NONE**
> **Do you want to change drive types? (Y/N)**

- Type Y. Press the enter key. The screen will display a message describing standard and non-standard drive types.

- Press the enter key again. The screen will prompt you to select a drive type:

  Press "S" for standard
  Press "N" for non-standard
  Press the enter key for no change