✳ WX3/WX3R ✳

WINCHESTER DISK CONTROLLER BOARD

USER'S MANUAL

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INTRODUCTION

The **WX3/WX3R** board is easy to install. The following is a summary of the installation steps.

1. **Preliminary:** set jumpers, drive configuration
2. **Install hardware:** drive, board, connect cables
3. **Install software:** use debug, low level format, etc.
4. **Check installation:** start system, use new board & drive

CAUTION

Handle the controller board by the ends of the board. Some of the chips are static sensitive and damage may occur if the board is incorrectly handled.

ABOUT THIS GUIDE

Angle brackets < >refer to a key. Therefore the symbol <Enter> refers to the Enter key.

This guide was written using the IBM* XT computer as a model. Sometimes specific examples, such as errors refer to the IBM error code numbers. Therefore if you have an XT compatible computer your error numbers may be different.

About Menu Screens:

Because computer manufacturers are always updating their products, and this installation guide covers installing **WX3/WX3R** controller boards in many XT compatible computers, some of the menu screens may not be exactly the same on your system. Always follow the instructions on your computer screen.

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SOME PRELIMINARY STEPS

Before you begin the actual installation of the hardware and software, there are some preliminary steps that you need to do.

GATHER SUPPLIES

The installation requires that you gather the following tools and supplies.

- screwdriver
- XT compatible computer with space to hold the internal drive
- MFM hard disk drive(s)[†] with ST506 interface
- interface cables (20-pin data cables & 34-pin control cable)
- DOS version 2.0 or later (DOS 3.1 or later recommended)
- installation manual for XT compatible computer
- installation manual for hard disk drive

[†]The **WX3/WX3R** board supports 2 hard disk drives.

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IDENTIFY DRIVE

The **WX3/WX3R** board works with any hard disk drive that has the ST506/412 drive interface and no more than 1024 cylinders and 15 heads. The Seagate 225 hard disk drive unit is such a drive for WX3. The Segate 238 hard disk drive unit is such a drive for WX3R.

Look in your drive manual to verify that you have an ST506/412 MFM drive or check with your dealer.

Then check the drive manual for the drive parameters, such as those listed in Table 1-1. You'll need this information for the low level format.

Table 1-1. WX3/WX3R Default Drive Parameters

	Formatted Capacity	Number of Heads	Number of Cylinders	Pre-Comp RWC	Step Rate	Sector per Track
WX3	21MB	4	615	307/none	30μsec	19
WX3R	32MB	4	615			26

IDENTIFY BOARD

The WX3/WX3R board comes in 2 versions. One version has a drive power connector (J4) and the other version does not. These controllers are identical electrically except for the power connector.

Figure 1-1 shows the connector locations (J1, J2, J3, J4, and J5) on the WX3/-WX3Rboard and the location of the jumper pins (R17 to R23 and R25 to R28). The (J4) drive power connector is optional on the WX3/WX3R board. It is there to connect power to FileCard® drives.

BIOS ROM Incompatibility

BIOS is an acronym for Basic Input Output System. ROM is an acronym for Read Only Memory. The BIOS ROM is a program on a computer chip that tells your computer how to operate devices attached to your computer.

Some XT compatible computers do not operate with the Western Digital BIOS ROM because of an incompatibility. Most of these computers are listed in Appendix A. Check Appendix A to see if you have one of these computers.
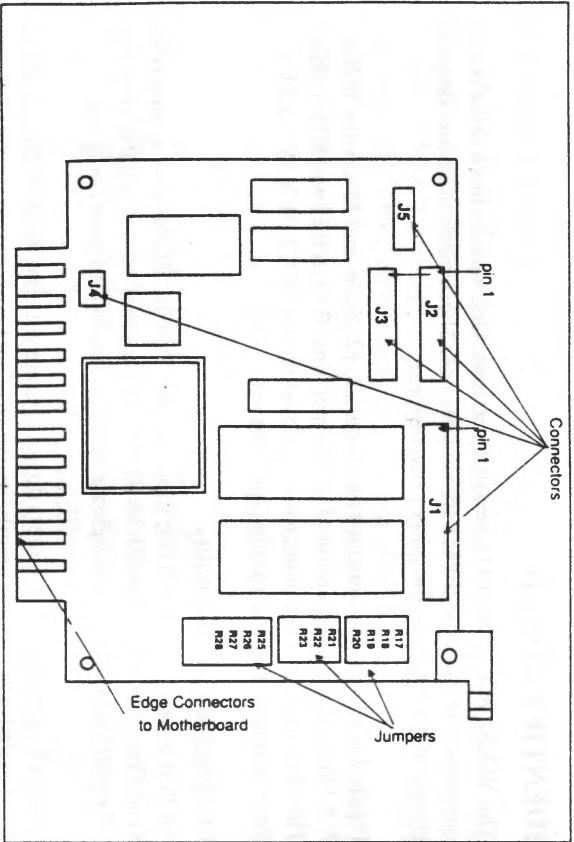
FIGURE 1-1. WX3/WX3RCONNECTOR AND JUMPER LOCATIONS

J5

J4

J3

J2

pin 1

J1

pin 1

Connectors

R25
R26
R27
R28

R21
R22
R23
R24

R17
R18
R19
R20

Edge Connectors
to Motherboard

Jumpers

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If this is the case, you need to disable the BIOS ROM by setting a jumper.[†] If you have one of these computers, omit the low level format in this guide and instead follow your computer manufacturer's software installation instructions for low level formatting.

JUMPER RESISTORS

Jumper resistors are tiny wires, which when installed between pairs of pin locations on a board, turn certain functions on or off. WX3/WX3R set the jumper resistors for the most common applications. It is unlikely that you will need to change any of the jumper resistor settings.

CAUTION

Handle the controller board by the ends of the board. Some of the chips are static sensitive and damage may occur if the board is incorrectly handled.

[†] To disable the BIOS ROM, place a jumper at R23. See Appendix B for more details.

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Do I Need To Change Any Jumpers?

No. Do **NOT** change any jumper resistors on the board, **unless** you have one of the following conditions:

- The board is your second hard disk controller in the system.
- You have another peripheral unit which uses interrupt signal IRQ5.
- You have a BIOS ROM which is incompatible with Board.

See the Appendix B for a list of the jumper resistor functions.

Change Jumper Resistors

When you have one of the special conditions listed above, you need to add a jumper resistor. In all other cases, do NOT add a jumper resistor.

- If the board is the second controller, change the controller address at R21 & R22. Check the first controller manufacturer's manual for the addresses and also see Appendix B.
- If another peripheral uses IRQ5, add a jumper at R27.
- If the system BIOS ROM is incompatible, add a jumper at R23.

See Appendix B for information on changing jumper resistors.

SET HARD DISK DRIVE CONFIGURATION

This section "Set Hard Disk Drive Configuration" refers to procedures that you do to your hard disk drives and not to your WX3/R controller. Since the WX3/R board works with many hard disk drives, you need to consult your drive manufacturer's manual for exact details.

You need to set the configuration for your hard disk drive unit, before you install the unit into your computer. You set your hard disk configuration by adjusting jumpers, switches, or termination resistors on the hard disk unit.

Drive Settings

The two settings that you can change are:

- drive number
- drive termination resistor

You frequently don't have to modify the factory settings. The exact number of settings that you change depends on your disk drive and computer.

Control Cables

Setting the drive number depends on the type of control cable that connects your drive to your controller board. The two types of cables are listed below.

- flat, non-twist (ribbon) cable
- flat, twisted (ribbon) cable

Do NOT use cables from floppy drives. Hard disk cables are different!

First identify which cable you are going to use. Look at the control cable and determine whether it is twisted. The control cable has the 34-pin connectors.

If you already have one hard disk attached to your WX3/WX3R board and you plan to use the existing cable in your computer, you may have to open the computer case. *See your computer manufacturer's instructions.*
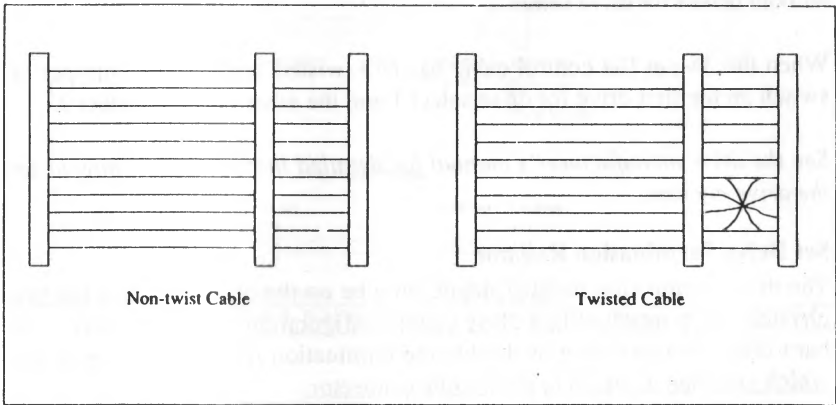
FIGURE 1-2. FLAT NON-TWIST AND TWISTED CABLES

Set Drive Number

When the 34-pin control cable is a twisted cable, set the jumpers or switches on both drives for drive select 2.

When the 34-pin flat control cable has NO twisted section, set a jumper or switch on the first drive for drive select 1 and the other for drive select 2.

See the drive manufacturer's manual for detailed instructions on how to set the drive number.

Set Drive Termination Resistor

The drive termination resistor should only be on the drive, <u>which is the last physical drive installed in a daisy chain configuration</u>. When you have two hard disk drives, remove or disable the termination resistor from the drive, <u>which you plan to attach to the middle connector</u>.

If you have only one fixed hard disk drive, do **NOT** change the termination resistor. Drives are set at the factory as the first hard disk drive (i.e., to be the only drive in the system).
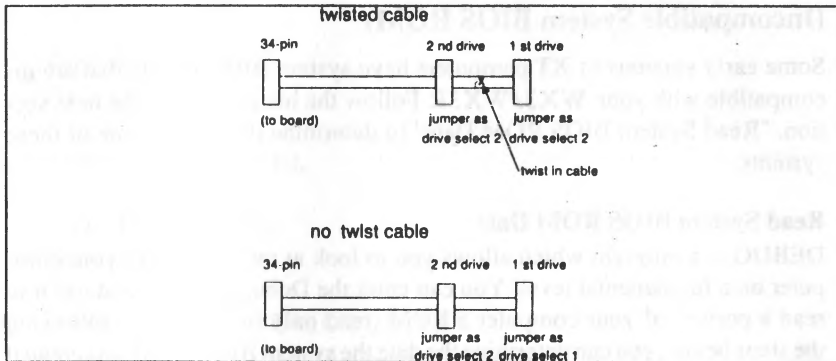
FIGURE 1-3. DRIVE SELECT CONFIGURATIONS

See the drive manufacturer's manual for detailed instructions on how to remove or disable the termination resistor.

Note: A daisy chain cable has three connectors. The electrical signal in a daisy chain configuration moves from one connection to the next in sequence.

CHECK COMPUTER
(Incompatible System BIOS ROM)

Some early versions of XT computers have system BIOS ROMs that are incompatible with your **WX3/WX3R** Follow the instructions in the next section, "Read System BIOS ROM Date" to determine if you have one of these systems.

Read System BIOS ROM Date

DEBUG is a program which allows you to look at information in your computer on a fundamental level. You can enter the Debug program and use it to read a portion of your computer's ROM (read only memory). By following the steps below, you can determine the date the system BIOS ROM was created for your computer.

The Debug program should be supplied on your DOS diskette. See your DOS system manual for complete instructions on how to use the Debug program.

Place the diskette containing the Debug program in drive A, then

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1. At the A> prompt,

    Type: **DEBUG**
    Press <Enter>

2. At the debug prompt (-),

    Type: **d f000:fff5 fffc**
    Press <Enter>

3. Date returned is 10/27/82 OR LATER[†]

4. To exit debug:

    Type: **q**
    Press <Enter>

[†]Only a date of 10/27/82 OR LATER is acceptable. If the date returned is earlier than 10/27/82, you need to update your system BIOS ROM before you can install your **WX3/WX3R** board. Contact your computer dealer for information on upgrading your system BIOS ROM.

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HOW TO INSTALL YOUR HARDWARE

This section tells you how to install the hardware portion of your WX3/-WX3R controller board. You can install the controller board in any available XT-compatible expansion slot.

Do not attempt to install your hardware unless you have set the hard disk drive configuration as explained.

The installation requires you to remove the cover from your computer. See your PC manual for exact instructions on how to remove the cover.

If you are replacing an existing controller, then you also have to remove your old hard disk controller.

If you want two hard disks on one controller, use a daisy chain cable to connect them onto one board. A daisy chain cable has 3 connectors.

1. Turn your computer power switch to OFF.

2. Use a screwdriver to loosen the cover screws. Then remove the computer cover, so that you can see the expansion slots.

3. Place your hard disk drive unit(s) into the computer case and attach per the manufacturer's installation instructions.[†]

4. Look and see which expansion slots are empty. You can use any empty slot that has the same type of edge connectors as the board, except as noted below.

Note: For IBM XT owners: DO NOT use the slot closest to the power supply. Use an expansion slot at least one position removed from the power supply.

[†] You may have to leave the drive case loosely connected, so that you can attach the cables.

Or if you are removing a controller, locate the one which has the old controller in it. Use this expansion slot.

Note: You can also install a new fixed hard disk drive on an existing controller. See Appendix A.

5A. If you are removing an old controller, loosen the screw which holds the old controller board in place. Then slide the old board out of the expansion slot and remove the cables. Locate the old bracket cover and place it on your computer case. (You probably removed this old bracket cover when you installed your old controller board.)

5B. If you are using a "new" expansion slot, remove the screw, but keep the bracket cover in place. Save the screw to hold the new controller board.

6. Connect 34-pin wide control cable to the board. Follow steps A or B. These instructions are for both one or two drives on the same controller.

A. (for 1 drive only) Connect the 34-pin (wide control cable) connector to J1 on the controller board. Attach Pin 1 of the cable connector to Pin 1 on the controller board. See Figure 1-1 on page 1-4.

Pin 1 of the cable connector is marked and is on the color coded edge of the cable. Do NOT force the cables and connectors.

B. (for 2 drives only) If you are installing two hard disk drives on one controller, use a daisy chain cable. A daisy chain cable has 3 connectors.

Connect the 34-pin wide connector on the longer length daisy chain cable to J1 on the board. See Figure 1-1 and Figure 2-1.

7. Connect 34-pin wide control cable to drive unit.

A. (for 1 drive only) Connect the free end of the wide control cable to the hard disk drive.
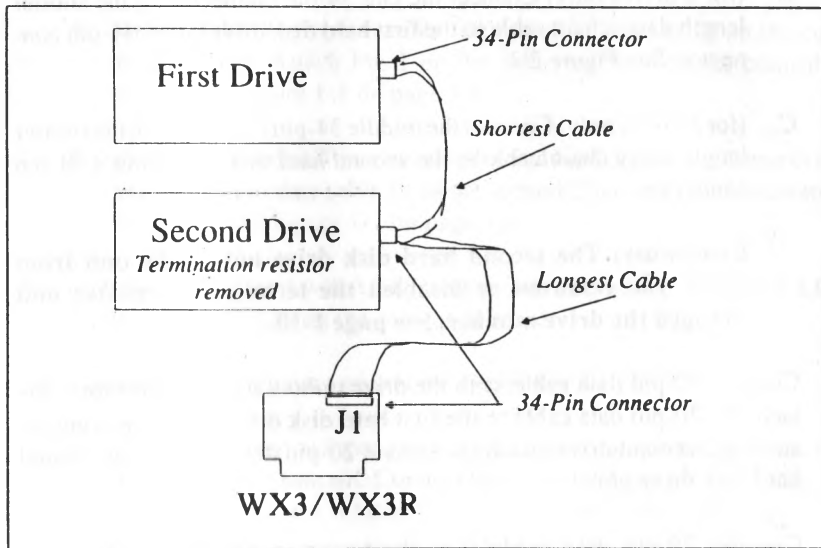
FIGURE 2-1. DAISY CHAIN CABLE CONNECTIONS

B. (for 2 drives only) Connect the end 34-pin connector on the shorter length daisy chain cable to the first hard disk drive unit's 34-pin connector. See Figure 2-1.

C. (for 2 drives only) Connect the middle 34-pin connector on the shorter length daisy chain cable to the second hard disk drive unit's 34-pin connector.

   Remember: The second hard disk drive unit is the unit from which you removed or disabled the termination resistor and changed the drive number. See page 1-10.

8. Connect 20-pin data cable(s) to the drive unit(s) 20-pin connectors. Attach one 20-pin data cable to the first hard disk drive unit. If you are installing a second drive attach the second 20-pin data cable to the second hard disk drive unit.

9. Connect 20-pin data cable(s) to the board as described below.

A. Connect the 20-pin data cable from the first drive to J2 on the controller board. Attach Pin 1 on the cable to Pin 1 on the controller board. See Figure 1-1 on page 1-4.

B. (for 2 drives only) If you install a second hard disk drive, connect the second 20-pin data cable from the second drive to J3 on the controller board. See Figure 1-1 on page 1-4.

10. (optional for systems with LED cables) Connect the 4-pin external LED cable connector to J5 on the controller board.

11. Connect the 4-pin power connector. See either A or B.

A. Locate the internal 4-pin power connector(s) on your computer. *See your computer manual.* Connect this internal 4-pin power connector to your new fixed hard disk drive unit's power connector plug.

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B. (for 2 drives only) If you are installing 2 drives, you need either two internal power connectors on your computer or you need to split the power connector. *See the manufacturer's manual.*

Connect the second drive unit to the second power connector plug.

12. Install the controller board into the expansion slot that you selected in step 4. the WX3/WX3R's edge connectors (shown in Figure 1-1, fit firmly into the computer's motherboard.). *See your computer manual for the location of your computer's motherboard.* Press firmly on the board as you insert it into the expansion slot. Check that the board is seated properly by pressing down firmly on both ends of the board.

13. After the board is seated firmly in the expansion slot socket, secure the board using the clip that is on the end of your board. Place the bracket screw (which you removed in step 5) over the clip and bracket cover. Then screw the clip and bracket cover to the computer chassis.

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CAUTION

When routing cables, be careful not to pinch them. Cables must not get caught between the cover and the boards nor should they obstruct any air flow path from fans or vents.

14. Place extra cable lengths so that they are out of the way.[†]

15. Replace the computer cover. Your hardware controller installation is complete. However, your **WX3/WX3R** controller board is really a complex circuit composed of both hardware and software, so that while the hardware installation is complete, you still need to install the software. Proceed to the next section for the software installation steps.

[†] Tighten hard disk unit(s) to computer case, etc. if not already done so in step 3.

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HOW TO INSTALL YOUR SOFTWARE

Now that you have installed the **WX3/WX3R** hardware, you need to install the software that tells your computer how to use the hardware.

Software Installation Summary
The software installation consists of the following three procedures:
- Low Level Format
  use pre-selected configuration (factory default drive table)
  use dynamic configuration
- Partition Hard Disk
  use DOS FDISK utility program
- High Level Format
  use DOS FORMAT utility program

You may find it easier to install the **WX3/WX3R** software, if you first look over the complete set of instructions and determine beforehand which instal-

lation path you are going to use. During the low level format, you decide whether to use the pre-selected configuration or the dynamic configuration.

The pre-selected configuration uses a factory default drive table. A drive table contains characteristics, which describe the hard disk to the computer. The factory default drive table supplied on the WX3 drive board has the characteristics for a 21MB drive and WX3R for 32MB. See Table 1-1 for these characteristics.

Alternately, during the low level format, you can choose the dynamic configuration. The dynamic configuration is a process whereby you type the disk characteristics of your hard disk drive into the computer rather than using a drive table.

If you use the dynamic configuration, you need to locate and enter values for the drive. You will also need to decide whether to do a virtual split. Your software installation ends by using the DOS utilities: FDISK and FORMAT.

Where the instructions require you to shift between the text in this chapter and the Appendix, step numbers are kept consistent in both sections.

CAUTION

Do NOT start the low level format until you have a backup copy
of the information on your hard disk. This warning usually
applies to previously used hard disks.

When you have a new hard disk, you usually do not have
information to backup except in the case where your dealer
installs some applications software on your unit.

START LOW LEVEL FORMAT

Before you start, turn your computer ON and make sure that a DOS diskette
containing the Debug program is in drive A. Then proceed to the A> prompt.

See your DOS manual if you need help getting to the A> prompt.

1.   At the A> prompt,

Type: **DEBUG**

Press <Enter>

2. At the debug prompt (-),

Type: **g=c800:5**

Press <Enter>

3. The low level format program displays the following:

```
Super Bios Formatter II Rev 1 0 (C) Copyright Western Digital Corp 1988
Current Drive is C . Select new Drive or RETURN for current
```

Go to either step 3A or step 3B.

3A. To change the drive from C to D

Type: **D**

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Press <Enter>

This changes the drive that you will format. Now go to step 3C.

3B. To remain at drive C

Press <Enter>

3C. The system displays the following:

```
Current Interleave is 3. Select new Interleave or RETURN for current
```

Press <Enter>

Go to either step 3D or 3E. See Appendix A for explanation of interleave.

3D. To change the current interleave value, type a new value and

Press <Enter>

3E. To keep the current interleave value

Press <Enter>

4. The following displays:

> Are you dynamically configuring the drive - answer Y/N

At this point you need to make a selection.

- If you have a drive whose parameters are the same as those in Table 1-1, then go to section "Use Pre-Selected Configuration."

- All other drives, go to section "Use Dynamic Configuration."

USE PRE-SELECTED CONFIGURATION

To use the pre-selected configuration, follow the instructions below.

4. When the prompt appears:

> Are you dynamically configuring the drive - answer Y/N

Type: **N**

Press **<Enter>**

The following prompt appears,

> Press "y" to begin formatting drive C with interleave 03

5. To start the format for drive C with interleave 3,

Type: **Y**

Press **<Enter>**

Then follow the instructions on your computer screen. When the format starts several messages may appear or you may see the word "formatting ..."

6. When the format is completed, the following displays:

> Format Successful

If you have a second drive to format repeat the steps for the low level format. Otherwise, skip to section "Final Steps" in this chapter.

USE DYNAMIC CONFIGURATION

To use the dynamic configuration and enter the disk drive parameters yourself, follow the instructions below.

4. When the prompt appears:

> Are you dynamically configuring the drive answer Y/N

Type: **Y**

Press **<Enter>**

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The following prompt displays:

```
Key in disk characteristics as follows: ccc h rrr ppp ee o

where:

ccc = total number of cylinders (1-4 digits)
h = number of heads (1-2 digits)
rrr = starting reduced write current cylinder (1-4 digits)
ppp = write precomp cylinder (1-4 digits)
ee = max correctable error burst length (1-2 digits), range (5-11 bits), default 11 bits
o = ccb option byte, step rate select, (1 hex digit), range = 0 to 7, default = 5
refer to controller and drive specifications for step rates
```

Check the literature supplied by your hard disk drive manufacturer for these values.

5. Enter each value separated by a space and follow the completed entry by pressing the <Enter> key.

   EXAMPLE 1: (FOR WX3)

   For a ST 225 (Seagate model 225 hard disk drive)

   Type: **615 4 616 300 11 7**

   Press <Enter>

   EXAMPLE 2: (FOR WX3R)

   For a ST 238 (Seagate model 238 hard disk drive)

   Type: **615 4 616 616 11 7**

   Press <Enter>

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After you enter these values, you have to make another choice.

- do a virtual split
- skip the virtual split

6. When the following prompt displays:

> Are you virtually configuring the drive - answer Y/N

See Appendix A section "Virtual Split" for more information on a virtual split and instructions to select the virtual split.

To ignore the virtual split configuration,

Type: **N**

Press **<Enter>**

The system displays the following prompt:

> Press "y" to begin formatting drive C with interleave 03

Type: **Y**

Press **<Enter>**

Then follow the instructions on your computer screen. When the format starts several messages may appear or you may see the word "formatting..."

7. At the prompt,

| Do you want to format bad tracks - answer Y/N |

See Appendix A section "Bad Tracks" for more information on the bad tracks option and instructions to select the bad tracks option. Normally, you can ignore the selection here.

To ignore the bad tracks option,

Type: **N**

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Press **\<Enter>**

When the format is complete, the following message displays:

Format Successful

If you want to format a second drive, repeat the low level format steps. Otherwise you are done with this phase of the installation and can go to the next section, "Final Steps."

FINAL STEPS

After you complete the low level format on your hard disk drive, you need to partition your drive and do a high level format before you can use your hard disk for the first time. The DOS programs: FDISK and FORMAT do this.

FDISK and FORMAT are usually located on the supplemental DOS diskette.

Partition Drive

A partition divides the drive into units and prepares your hard disk for use with an operating system, such as MS-DOS.* You can select one partition which takes up your entire disk or several partitions, each occupying a portion of the disk. Each unit can have its own operating system.

FDISK Utility

If you just completed the low level format, the DOS diskette is in your computer and the A> prompt is on your screen.

To partition your hard disk with FDISK, follow the instructions below.

1. Make sure that the DOS diskette with FDISK is in drive A.

2. At the A> prompt,

   Type: **FDISK**

---

* MS-DOS is a registered trademark of Microsoft Corporation.

Press <Enter>

FDISK displays a series of menus. *See your operating system manual for details.* If in doubt, use the default values.

Partition Second Disk Drive

If you have two hard disk drives or created a virtual disk on your hard disk drive, then you must partition each drive.

After you partition drive C, repeat the above steps. To partition drive D, select partition second hard disk.

High Level Format

As the final step to the software installation, you need to use the DOS FOR-MAT utility, which prepares the hard disk to accept MS-DOS files.

The DOS utility program, FORMAT, will locate and deallocate media defects (bad tracks). Therefore if you did not mark the tracks bad during the low level format, this step does it for you automatically.

FORMAT Switch "/S"

FORMAT allows you to set certain "switches" which control various aspects of the procedure. The /s switch copies the operating system from the disk in the default drive (or the A drive) to the newly formatted disk.

This is a simple way to get your operating system onto your hard disk.

To use the FORMAT utility and load the operating system onto your newly installed hard disk drive, follow the steps below.

1. Make sure that the diskette with FORMAT is in drive A.

2. At the A> prompt

    Type: **FORMAT C:/S**

    Press <Enter>

Follow the instructions on the screen to complete the process. *See your operating system manual for details.*

At this point your hard disk is initialized and the system can read DOS from your hard disk, if you only have one partition.

High Level Format Second Disk Drive
If you partitioned your hard disk drive into more than one partition, you must format each logical drive.

After you format drive C, repeat the above steps to format drive D, except for

At the A> prompt,

Type: **FORMAT D:**

Press **<Enter>**

You are now ready to go to the next chapter.

HOW TO CHECK YOUR INSTALLATION

After you completed the hardware installation, software installation, and use the FDISK and FORMAT C:/S utilities, you are ready to start using your system.

Start System From Hard Disk

You are ready to start your system using your newly installed hard disk drive and **WX3/WX3R** board.

Remember: You must remove the diskette from drive A or else the system will start from drive A.

To start the system

1. Simultaneously press the **<Ctrl> <Alt> <Del>** keys.

2. The system should respond, several screens may flash, and finally the C> prompt will appear.

    You may have to enter the date and time before the C> prompt appears. This depends on how your system is set.

Installation Complete

You are now done. The next time you can start your system from the hard disk.

HOW TO HANDLE PROBLEMS

If you had a problem with your system, first re-read the instructions to be sure that you followed them correctly. Check that you typed information EXACT-LY as instructed.

Repeat the procedure a second time to verify that you get the same error, then check the next section, "If You Have a Problem."

If You Have a Problem
First check your physical installation. Check for reversed cables, an over-loaded system power supply, incorrect drive selection, etc.

This section lists some common problems and possible solutions to try if you have problems when you install your controller.

PROBLEM: No response.

SOLUTION: Change cables. Do NOT use floppy cables.

PROBLEM: Winchester activity LED always on.

SOLUTION: Check cable connections. Try to reverse cables or replace cables. Check whether the drive has malfunctioned.

PROBLEM: "Nothing done exit" appears when you start the low level format program.

SOLUTION: You did not press the <Y> key. Restart low level format at step 1.

PROBLEM: "Error Reading Fixed Disk" when booting the system.

SOLUTION: DOS partition not active. See FDISK instructions in your DOS manual.

PROBLEM: "Hard Disk Drive Not Ready" or "01" Error Code.

SOLUTION: System BIOS ROM does not support Winchester (WX3/WX3R)controller and drive. Update system BIOS ROM. Overloaded power supply. Update system power supply.

PROBLEM: Error code "80" while doing the low level format.

SOLUTION: Drive select jumper on the hard disk drive unit is set incorrectly (see Chapter 1), or the cables are backwards, i.e., Pins 1 & 34 switched or connector cables J2 & J3 switched. Also bad cables, no power to drive, or bad drive.

PROBLEM: Error code "40" or "20" appears on screen.

SOLUTION: Check cable connections. Try to reverse cables or replace cables. Also possibly the drive has malfunctioned.

PROBLEM: After you do a high level format (Format C:/S), the message "Insert disk and press ENTER." appears. The system thinks drive C is a floppy disk drive.

SOLUTION: Motherboard switches are set for the incorrect number of floppy disk drives. Check to see if RAM disk drivers are present.

PROBLEM: "Bad Track 0" using DOS 3.1.

SOLUTION: Make a config.sys file with BUFFERS=99. Reboot to load the configuration.

PROBLEM: "Bad Track 0" using DOS 2.1. (DOS 2.1 cannot support bad tracks above 16.7 MB.)

SOLUTION: Upgrade system to DOS 3.1 or LATER.

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PROBLEM: None of the suggestions seem to help.

SOLUTION: Call your dealer.

NOTES

APPENDIX A
INSTALL A SECOND DRIVE ON AN EXISTING CONTROLLER

This section tells you how to install a second fixed hard disk drive on an existing controller board. You do not have to remove the existing controller board,† but you may have to remove the fixed hard disk so that you can remove the termination resistor. (This depends on the location of the fixed disk and the termination resistor.)

Do not attempt to install your hardware unless you have compared your drive against the default drive parameters on page 4 and set the drive number and removed a termination resistor as explained.

This installation requires you to remove the cover from your computer. *See your computer manual for exact instructions on how to remove the cover*.

You need a 34-pin hard disk control cable in a daisy chain configuration and you also need a second 20-pin data cable.

†XT hardware limits you to two fixed hard disks. If you are installing a second drive on the board, then the board must be the only hard disk controller in your system.

1. Turn your computer power switch to OFF.

2. Use a screwdriver to loosen the cover screws. Then remove the computer cover, so that you can see the expansion slots.

3. Place the new hard disk drive unit into the computer case and attach per the manufacturer's installation instructions.[†]

4. Look and see which expansion slot has the board. You may have to lift the board out of the slot to access the connectors.

5. Check if your existing 34-pin wide control cable is a daisy chain cable. A daisy chain cable has 3 connectors. If the cable is not a daisy chain cable, then remove the 34-pin wide control cable from the board and the existing hard disk drive unit. You will replace this cable with a daisy chain cable in the next step.

   Leave the 20-pin cable attached to the board and the drive unit.

6. Connect cables to new hard disk drive unit. Follow steps A, B, and C.

[†] You may have to leave the drive case loose to connect the cables.

Remember: Connect Pin 1 to Pin 1. Pin 1 of the cable connector is marked and is on the color coded edge of the cable. Pin 1 on the controller board is shown in Figure 1-1.

A. (Omit this step if you are using an existing daisy chain cable)
Connect the 34-pin (daisy chain wide control cable) end connector on the shorter length cable to the first hard disk drive unit's 34-pin connector.

B. Connect the 34-pin middle connector on the shorter length daisy chain cable to the second hard disk drive unit's 34-pin connector.

The longer length cable is unattached for now.

C. Connect the second 20-pin data cable to the second hard disk drive unit's 20-pin connector.

7. Locate the internal 4-pin power connector(s) on your computer. *See your computer manual*. You need either two internal power connectors on your computer or you need to split the power connector.

Connect the second drive unit to the second power connector plug.

8. Connect the free end of the 34-pin (wide control cable) connector to J1 on the controller board. Attach Pin 1 of the cable connector to Pin 1 on the controller board.

   Note: Pin 1 on the controller board is shown in Figure 1-1

9. Connect the free end of the 20-pin data cable from the second drive to J3 on the controller board. Attach Pin 1 on the cable to Pin 1 on the controller board.

10. Place extra cable lengths so that they are out of the way.[†]

CAUTION

Do NOT pinch the cables when you arrange them inside your computer case. Do not let the cables lay between the cover and an internal board. Do not obstruct air flow from fans or vents.

11. Replace the computer cover. Your hardware controller installation is complete. However, your controller board is really a complex circuit composed of both hardware and software, so that while the hardware installation is complete, you still need to install the software. Proceed to Chapter 3 for the software installation steps.

   [†] Tighten hard disk unit to computer case, if not already done so in step 3.

INTERLEAVE FACTORS

Interleave is a technique that allows the computer to read or write more than one sector per track during a single disk rotation. **Example:** An interleave factor of 3:1 means that after the disk rotates 3 times, the computer has accessed all the information on a track.

The interleave factor is system dependent. For WX3/WX3R boards and XT compatible computers an interleave factor of 3 is the default. You cannot have an interleave value less than 3 with the WX3/WX3R board.

VIRTUAL SPLIT

A virtual split is an "imaginary" dividing of the disk drive. When you do a virtual format, you make one physical drive appear as two or more disks to the system.

DOS 2.0 allows a maximum of 16 megabytes per drive and DOS 2.1 permits 32 megabytes per drive. Therefore a 40 megabyte drive must be virtually split in order to use all 40 megabytes.

Only use the virtual split format when you have one physical hard disk in your system. If you have two physical hard disks, do not use the virtual split format.

Select Virtual Split

6.   To select the virtual configuration for your drive, answer the prompt,

> Are you virtually configuring the drive - answer Y/N

Type: **Y**

Press **<Enter>**

The following prompt displays:

> Key in cylinder number for virtual drive split as vvvv.:.
> where:vvvv = number of cylinders for drive C: (1-4 digits)

Enter the value for your starting cylinder number,

Follow the completed entry by pressing the **<Enter>** key.

The number you entered represents the number of cylinders on drive C. The remaining cylinders are assigned to drive D during the virtual split process.

The system displays the following prompt:

> Press "y" to begin formatting drive C with interleave 03

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Type: **Y**

Press <Enter>

7. When the prompt for bad tracks displays, see the section on bad tracks. When the format is complete, the following message displays:

> Format Successful

Do not use the low level format program on the second "virtual" drive. The virtual drive is formatted when you select the virtual format option. Go to section, "Final Steps," in Chapter 3.

BAD TRACKS

Because a hard disk is a physically manufactured item, it sometimes has physical defects. Each drive manufacturer tests their drives and gives you a bad track media list, when you purchase the drive. This bad track list is usually located on the top of the disk drive case. Locate this list before you answer the prompts.

7. During the format program, you are asked if you want to map the bad tracks by the following prompt:

> Do you want to format bad tracks - answer Y/N

Because of the logical addressing used by DOS, marking an entire track bad results in more than one logical address being marked as bad. Since DOS limits the number of defects that it accepts, a drive with excessive media defects can cause the FORMAT program to terminate with an error, "TRACK 00 BAD - DRIVE UNUSABLE."

Alternately, you can use the DOS utility program, FORMAT, to locate and deallocate media defects. Therefore we recommend that you do not mark the tracks bad; but if you decide that you want to mark the bad tracks, follow the steps below.

Select Map Bad Tracks

To map the bad tracks,

Type: **Y**

The system displays the following prompt:

> Key in bad track list as follows: ccc h...

where:

        ccc=bad track cylinder number
        h=bad track head number

Enter each value separated by a space and follow the completed entry by pressing the <Enter> key.

EXAMPLE:

For a disk with a bad cylinder 160 on head 1 and bad cylinder 161 on head 3.

Type: 160 1 161 3
Press <Enter>

The bad tracks program displays the following prompt:

More? Y/N

Enter additional bad tracks.

To terminate the bad tracks program.

Type: N

Press <Enter>

Then the following displays:

```
BAD TRACK MAP

TRACK ADDR          PROBLEM

cccH                USER-SUPPLIED
```

When the format is completed, the message displays:

```
Format Successful
```

Now go to section "Final Steps" in Chapter 3, to partition your drive and do a high level format.

BIOS ROM Incompatibility

The following is a list of XT compatible computers which do not operate with the Western Digital BIOS ROM because of a system BIOS incompatibility.

Table A-1. Computers Incompatible with BIOS

Computer	Model
AT&T	6300
AT&T	6300T

If you have one of these computers, you must disable the BIOS ROM by placing a jumper resistor at R23 and check that integrated circuits U7 and U8 are **NOT** installed. When you do the low level format, skip the directions in this guide and instead follow your computer manufacturer's software installation instructions for low level formatting.

NOTES

APPENDIX B
JUMPER RESISTORS

The WX3/WX3R board has several jumper resistors which can be added for specific hardware configurations.

Jumper Functions (R17 to R23 and R25 to R28)

The following list explains the jumper resistor functions.

- R17 & R18 sets factory drive tables for the first hard disk
- R19 & R20 sets factory drive tables for the second hard disk
- R21 and R22 set the controller and BIOS address ranges
- R23 disables the BIOS ROM on the board
- R25 and R26 always OUT on WX3, and Set Sector translation and dynamic configuration
- R27 sets the hardware interrupt (IRQ) value for the hard disk drive
- R28 sets the computer as XT when the jumper is OUT

Default Values

Tables B-1 through B-5 list the jumper resistor settings. Default factory settings are marked with a "†" symbol.

Table B-1. Pre-selected Drive Tables

Table Number	First R17	Drive R18	Second R19	R20	WX3/WX3R Capacity	Heads	Cylinders
0	in	in	in	in	21/65MB	4/6	612/820
1	out	in	out	in	10/42MB	4/4	306/782
2	in	out	in	out	10/21MB	2/2	615/782
3†	out	out	out	out	21/32MB	4/4	615/615

Table B-2. Select Controller and BIOS Ranges

R21	R22	Controller	BIOS
out†	out†	320-323	C8000-C9FFF
in	out	324-327	CA000-CBFFF
out	in	328-32B	CC000-CDFFF
in	in	32C-32F	CE000-CFFFF

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Table B-3. Select BIOS ROM

R23	Select BIOS
in	selects external BIOS
out[†]	selects internal BIOS

Table B-4. Select Hardware Interrupt (IRQ)

R27	Select IRQ
in	selects IRQ2
out[†]	selects IRQ5

Table 8-5 Select Sectors and Configuration Option

R25	R26	Table	Sector	Translate	Dynamic
in*	out*	RLL	17	yes	no
out	in	RLL	26	no	yes

How To Change Jumpers

To change a jumper, you need to solder electrical connections.

CAUTION

Do not attempt to change the jumper resistors unless you know how to solder electrical connections. Contact your dealer for advice on soldering jumper resistors.

Note that the factory default settings have the jumper resistors out (i.e., not installed).

To add a jumper, you can solder 24 gauge wire to the pin positions that you want to connect.

To remove a jumper that has been soldered into place, you can use a soldering iron to remove the connection.