Installation Instructions

This section contains instructions for installation of the WD1002S-WX2 (S-WX2) board. If the disk drive(s) are being installed internally, it is best to locate the S-WX2 Controller Board in the closest available expansion slot.

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.

At this time, verify that the jumper settings on the controller board are correct. Refer to pages 9 and 10 of this document for information on the jumper settings.

Next, remove the blank expansion slot bracket. Put the bracket away and save it for possible future use. The screw will be used to hold the new controller board in place.

Connect the 34-pin (wide control cable) connector to J1 on the S-WX2 board. Make sure that Pin 1 of the cable connector goes to Pin 1 on the controller board. Pin 1 of the cable connector is typically located on the color coded side of the cable.

Connect the 20-pin (data cable) to J2 (Drive 0 Data Connector) on the controller board. Make sure that Pin 1 on the cable is connected to Pin 1 on the controller board.

If a second drive is being installed, connect the Drive 1 data cable to J3 likewise.

At this time, also verify that the disk drive(s) is properly installed. This includes correct placement of drive select jumpers and drive terminator installation. Refer to the disk drive installation manual for further instructions. **DO NOT USE THE RADIAL SELECT OPTION.**

Install the controller board into the expansion slot. Make sure that the board is seated properly by pressing down on both ends of the board. Secure the board with the bracket screw.

CAUTION

When routing the 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.

Install the disk drive(s) per manufacturer's instructions.

Standard BIOS ROM Format Instructions

The following procedures are a complete set of instructions for formatting one or two disk drives when using a WD1002S-WX2 Controller Board with a standard BIOS ROM. (P/N 62-0000 42-xxx).

Running the DEBUG Utility

The DEBUG Utility is used to initiate the S-WX2 format program to physically format the drive. During execution, the user is prompted to define the interleave factor. Please refer to the DOS operating manual for detailed instructions regarding this utility.

Step Instructions

1. At the A> prompt, load and run the DOS debug utility by typing DEBUG followed by a RETURN. "CR" stands for carriage return or ENTER.

   A> DEBUG CR

The next step changes the drive address and sector interleave factor. If not modified, the drive number will default to 00 and the interleave factor will default to three. Proceed with step 2 if there are two hard disk drives configured into the system and/or the desired interleave factor is to be other than three. If neither applies, go directly to step 3.

2. At the debug prompt, type the following line to set the target drive number and interleave factor. The debug prompt is the hyphen "-".

   - rax CR

   CPU response:

   AX 0000
   :—

   At the colon prompt, enter drive number and interleave factor in hexidecimal followed by a RETURN.

   xxyy CR

   Where: xx = the relative drive number
   yy = the interleave factor

   NOTE: Relative Drive C: = 00, Relative Drive D: = 01. An interleave factor of 03 is standard. If formatting two drives, this operation must be run twice; first with the relative drive number = 00 and again with it = 01.

3. At the debug prompt, initiate the S-WX2 format program by typing in the following command line.

   -g=c800:5 CR

The S-WX2 format program will display the following:

WX2 Format Revision 7.0 (C) Copyright Western Digital Corp. 1985
(AH) = Relative drive number (0-7)
(AL) = Interleave factor (3 is standard)
Press "Y" to begin formatting drive XX with interleave YY

CAUTION

Before responding, please remember that all data on the target drive will be lost during execution of the format program. Hit any other key to abort the format program and save the data.

4. Press "Y" followed by a RETURN to begin formatting the drive.

   Y CR

   System responses:

   If any key other than "Y" is typed, the program displays the following message and returns the operator to DOS.

   CPU response:

   Nothing done exit
   A>

   If "Y" is typed, formatting is initiated. The format program can take up to five minutes. If there are no resulting errors, the program displays the following message and returns the operator to DOS.

   CPU response:

   Format Successful
   A>

   If an error occurs while formatting, the program will immediately terminate, display the following error message, and return the operator to DOS. XX is the hexidecimal S-WX2 BIOS completion code. Refer to page 8.

   CPU response:

   Error ---- completion code XX
   A>

   If a second drive is to be formatted, repeat steps 1 through 5 with the relative drive number equal to 01. Otherwise, continue with step 5.

5. Load and execute the FDISK and FORMAT utilities. Refer to your DOS manual for more information on FDISK and FORMAT.

Auto-Config Option

This section contains instructions for performing the low level or physical format of one or two ST506/ST412 Winchester disk drives when using Western Digital's WD1002S-WX2 controller board, an Auto-Config BIOS ROM, and its resident Auto-Config software. (P/N 62-0000 43-xxx).

Auto-Config has four formatting options as follows:

1. **Format one or two physical drive(s) by entering the drive parameters and bad track list via the keyboard.**

2. **Format one physical drive as two virtual drives by entering the drive parameters, cylinder partition values, and bad track list via the keyboard.**

3. **Format one or two physical drive(s) by using the drive tables selected by SW1. The bad track list is entered via the keyboard.**

4. **Format one physical drive as two virtual drives by using the drive tables. Virtual cylinder partition values and bad track list are entered via the keyboard.**

Drive Parameters

Drive parameters that have to be established during the format procedure include the maximum number of cylinders, maximum number of heads, cylinder for reduced write current, cylinder for write precompensation, error burst length, and CCB option byte — step rate.

Auto-Config supports keyboard entry of these parameters. It also supports the pre-programmed drive table entry of parameters.

A single jumper chooses between keyboard entry or the use of drive tables. The ability to enter configuration information from the keyboard may be disabled by placing a jumper on SW1-5 of the controller board. If disabled, the drive tables are selected by SW1-1 to SW1-4. See page 9.

Virtual Formatting

Auto-Config supports virtual drive formatting. Virtual drive formatting is a method by which one physical drive is split into two logical or virtual drives. The virtual drives are referenced as Drive C: and Drive D:.

Current versions of DOS allow no more than 32 megabytes per drive. Therefore, a 40 megabyte drive may be divided into two virtual drives using the virtual option. The following table provides an example of how to calculate total drive capacity and establish virtual parameters.

The capacity of a drive can be easily calculated as follows:

Capacity =

(#Cyl.)(#Heads)(#Sectors/Track)(Sector Size in Bytes)

If a drive has 612 cylinders, 8 heads, 17 sectors per track and a 512 byte sector size, then calculate the logical split as follows:

Total capacity = 42,614,784 bytes or

(612)(8)(17)(512)

To split the drive into 2 logical drives of 30 and 10 megabytes each of X and Y respectively, do the following calculations.

Because (X)(heads)(sectors/track)(sector size) = 30 megabytes.

Note: 1 megabyte = 20^{20} bytes = 1,048,576 bytes.

X = (31,457,280)/(8)(17)(512)

X = 451.8 = 451 cylinders

Note: Round X down to the nearest whole number.

Since Y = Total capacity − X

Y = 612 − 451 or 161

The split = 451 161

Logical Format Calculation

If this option is chosen, a second physical drive may not be installed on the S-WX2 since DOS will only support two drives. The ability to virtually configure a drive may be disabled by placing a jumper on SW1-6 (page 9).

Low Level Format

The low level format is run just once on a drive that is to be virtually configured. However, the DOS FDISK and FORMAT utilities must be run on both logical drives.

If two physical drives are to be formatted, the low level format is run on each drive. As before, the DOS FDISK and FORMAT utilities are run on each drive.

Auto-Config Formatting Procedures

The following instructions contain a detailed step by step description of the actions required to execute the Auto-Config procedures.

Step Instructions

1. Verify jumper settings. Refer to pages 9 and 10.
2. Load and execute the debug utility.

3. At the debug prompt, initiate the S-WX2 format program by typing the following command line. The debug prompt is the hyphen "-".

   -g=c800:5 CR

4. The S-WX2 format program will display the following message:

   WX2 Format Revision T.8 (C) Copyright Western Digital Corp. 1985
   Key in drive no and interleave as follows: d ii where
   d = relative no (0-1)
   ii = interleave factor (1-16)

   Enter d and ii separated by a space and followed with a RETURN.

   EXAMPLE:

   0 03 CR

   NOTE: Drive C: = 0, Drive D: = 1. An interleave factor of 3 is standard. If formatting two drives, this option must be run twice; once with d = 0 and again with d = 1.

5. The following message will be displayed.

   Key in disk characteristics as follows: ccc h rrr ppp ee oo where
   ccc = total number of cylinders (1-4 digits)
   h = number of heads (1-2 digits)
   rrr = starting reduced write cylinder (1-4 digits)
   ppp = write precomp cylinder (1-4 digits)
   ee = max correctable error burst length (1-2 digits)
   oo = CCB option byte (1 hex digit)

   Enter each value separated by a space and follow the complete entry with a RETURN.

   EXAMPLE:

   306 4 128 128 11 5CR

6. CPU response:

   Are you virtually configuring the drive — Answer Y/N

   Enter a "Y" and RETURN for yes or "N" and RETURN for no.

   Y CR or **N CR**

7. If Yes, the following message is displayed.

   Key in virtual drive size list as vvvv . . .
   where vvvv = virtual drive size (1-4 digits)

   Enter two cylinder numbers, separated by a space and followed by a RETURN. See page 5.

   NOTE: The sum of these two numbers cannot exceed the maximum number of available cylinders.

EXAMPLE:

153 153CR

If no, continue to next step.

8. The following message will be displayed.

Press "y" to begin formatting drive d with interleave ii.

NOTE: d = relative drive number and ii = interleave factor.

Type "Y" followed by a RETURN.

Y CR

9. System responses:

If any key other than "Y" is typed, the program displays the following message and returns the operator to DOS.

CPU response:

Nothing done exit — returning to system . . .
A>

If an error occurs while formatting, the program will immediately terminate, display the following error message, and return the operator to DOS. XX is the hexidecimal S-WX2 BIOS completion code. See page 8.

CPU response:

Error ---- completion code XX
A>

If "Y" is typed, formatting is initiated. If there are no resulting errors, the program displays the following message.

CPU response:

Do you want to format bad tracks — answer Y/N

The user should type "Y" and a RETURN for yes; "N" and a RETURN for no.

Y CR or **N CR**

The user is prompted to enter, via the keyboard, a bad track list. This list should be provided by the drive manufacturer. However, due to DOS limitations, this procedure is not recommended.

Because of the logical addressing used by DOS, marking an entire track bad will result in more than one logical address being marked bad. As DOS can only accept a limited number of defects, a drive with excessive media defects may cause the FORMAT program to terminate with an error. The displayed error is typically, "TRACK 00 BAD - DRIVE UNUSABLE."

As a recommended alternative, execution of the DOS utility program FORMAT should correctly locate and deallocate all media defects.

10. If yes, the following message is displayed.

Key in bad track list as follows: ccc h . . .
where
ccc = bad track cylinder no (1-4 digits)
h = bad track head number(1-2 digits)

Type is the cylinder and head numbers for the bad tracks, separate them with spaces, and follow with a RETURN.

EXAMPLE:

160 1 161 1 304 3 223 4 223 2 CR

The bad track message will be displayed again. To terminate bad track entry, type "N" followed by a RETURN.

N CR

11. The following message is displayed.

Format Successful — Returning to system

If a second drive is to be formatted, repeat steps 2 through 12 with d = 01. Otherwise, continue with step 12.

12. Load and Execute the FDISK and FORMAT UTILITIES. Refer to your DOS Manual for further information on these utilities.

CODES	COMPLETION CODE SUMMARY
01	Bad Command
02	Address Mark Not Found
04	Sector Not Found
05	Reset Failed
07	Set Parameters Failed
09	Attempt to DMA Across 64K Boundary
0B	Bad Track
10	Uncorrectable Data Error
11	ECC Error Corrected
20	Controller Failure
40	Seek Failure
80	Time-out
BB	Undefined Error
FF	Read Status Failed

S-WX2 Error Codes

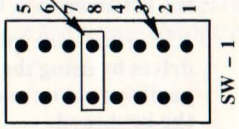
BIOS TABLE	DRIVE 1 SW1 – 1	DRIVE 1 SW1 – 2	DRIVE 0 SW1 – 3	DRIVE 0 SW1 – 4	FORMATTED CAPACITY	HEADS	CYLINDERS	PRE-COMP RWC
0	CLOSE	CLOSE	CLOSE	CLOSE	20 MB	4	612	None (613) None (613)
1	OPEN	CLOSE	OPEN	CLOSE	10 MB	2	612	128 128
2	CLOSE	OPEN	CLOSE	OPEN	20 MB	4	612	128 None (613)
3*	OPEN*	OPEN*	OPEN*	OPEN*	10 MB	4	306	All (0) None (306)

*Factory setting.

SW1 1 through 4 Settings

POSITION	STATUS	STATE
SW1 – 8	OPEN	Reserved for BIOS ROM
SW1 – 7	OPEN	Reserved for BIOS ROM
SW1 – 6	OPEN	Reserved for BIOS ROM Virtual option
SW1 – 5	OPEN	Reserved for BIOS ROM Auto-Config Option

SW1 5 through 8 Settings

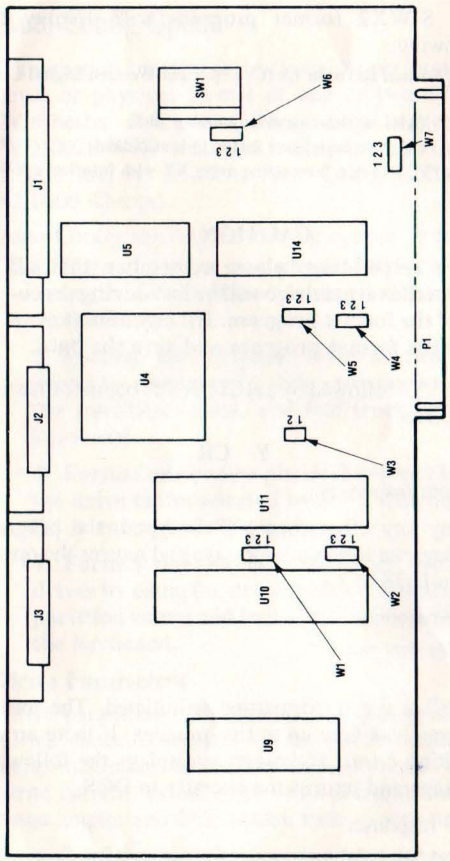


CLOSED — Jumper is installed by connecting identified pin with pin located immediately opposite of same as shown.

OPEN — No jumper is installed.

Example of Jumper Installation

Jumper = Berg P/N 76438 – 101



JUMPER LOCATIONS

Jumper	Pin Connects	Status
W1	2–1	NORMAL*
	2–3	Factory Test Only
W2	2–1	NORMAL*
	2–3	Factory Test Only
W3	CLOSED	BIOS ROM enabled*
	OPEN	BIOS ROM disabled
W4	2–3	Device Address 320H*
	2–1	Device Address 324H
W5	2–1	BIOS ROM SIZE 32K or 64K**
	2–3	BIOS ROM SIZE 16K
W6	2–3	REDUCED WRITE CURRENT (8 heads)*
	2–1	HEAD SEL 3 (16 heads)
W7	2–1	INTRQ to INTRQ 5 on host connector**
	2–3	INTRQ to INTRQ 2 on host connector

W1 – W7 Jumper Positions
Staked Jumpers
CLOSED – Jumper is installed
OPEN – Jumper is not installed
* – As shipped – Jumper is installed
** – As shipped – Instead of jumper, pins 1 and 2 are joined via an etch on the PCB. To change, the etch must be carefully cut and a jumper installed.

CAUTION
Modify jumpers W1-W7 only under the direction of a qualified individual, i.e. your dealer.

If you require further information or other technical support, please contact your authorized dealer:

F.C.C. CERTIFICATION

THIS WESTERN DIGITAL PRODUCT HAS BEEN CERTIFIED TO COMPLY WITH THE LIMITS FOR A CLASS B COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF FCC RULES. THIS DOES NOT GUARANTEE THAT INTERFERENCE WILL NOT OCCUR IN INDIVIDUAL INSTALLATIONS. WESTERN DIGITAL IS NOT RESPONSIBLE FOR ANY TELEVISION, RADIO, OR OTHER INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS OF THIS PRODUCT.

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WD1002S-WX2 Winchester Disk Controller USER'S GUIDE

Making the leading edge work for you.

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