

adaptec

AHA-1540A/1542A
User's Manual

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3.1 UNPACKING AND INSPECTION

The carrier is responsible for damage incurred during shipment. In case of damage, have the carrier note the damage on both the delivery receipt and the freight bill, then notify your freight company representative so that the necessary insurance claims can be initiated.

After opening the shipping container, use the packing slip to verify receipt of the individual items listed on the slip. Retain the shipping container and packing material for possible later reuse should return of the equipment to the factory necessary.

CAUTION: THE AHA-154XA IS CAREFULLY DESIGNED TO RESIST THE EFFECTS OF STATIC ELECTRICITY. HOWEVER, LIKE ALL ELECTRONIC EQUIPMENT, IT CAN BE DAMAGED OR ITS LIFE CAN BE SHORTENED BY UNUSUAL STATIC DISCHARGES. PLEASE TAKE THE PROPER PRECAUTIONS WHEN HANDLING THE BOARD. KEEP THE BOARD IN ITS CONDUCTIVE WRAPPING UNTIL IT IS READY TO BE INSTALLED IN YOUR SYSTEM. BE SURE THAT THE HOST COMPUTER AND THE PERSONNEL HANDLING THE BOARD ARE PROPERLY GROUNDED WHILE INSTALLING THE BOARD.

3.2 INSTALLATION

The following section details the installation procedure for the Adaptec AHA-1540A/1542A AT to SCSI host adapter. The installation of the board consists of setting the various on-board jumpers, preparing the SCSI devices, installing the correct terminations, inserting the board into a full-length AT compatible connector, and connecting a SCSI cable from the on-board connector to a SCSI target.

NOTE: The system must be turned off during the installation procedure.

3.2.1 System Configuration

The DOS operating system and the standard AT BIOS support two hard disk drives, drive C: and drive D:. If two standard hard disk drives are installed, they are the only hard disk drives accessible from the operating system. If one standard hard disk drive is installed, the AHA-154XA BIOS allows DOS to access the SCSI drive with the Target:LUN address of 0:0 as the second of the two supported drives (drive D:). If no standard hard disk drives are installed, the AHA-154XA BIOS allows DOS to access the SCSI drive with the address of 0:0 as the first of two supported drives (drive C:) and the SCSI drive with the address of 0:1 or 1:0 as the second of the drives (drive D:). System booting is performed from the floppy drive if a floppy diskette is installed. If no floppy is installed, system booting is attempted from the drive chosen as drive C: through the above process, whether the drive is a standard hard disk or a SCSI hard disk. The AHA-154XA BIOS fully supports the extended partitioning capabilities of DOS 3.3 for up to two drives. The AHA-154XA BIOS only supports the AHA-154XA if its I/O Port Address is set to 330h.

Adaptec provides a special DOS driver for the AHA-154XA that allows the support of up to 24 physical or logical devices under DOS. Many other operating systems, including SCO Xenix and Unix, do not have this limitation and will allow the access of any number of attached SCSI devices.

The term "standard hard disk" refers to the disks attached to the system by a standard ISA disk controller. These standard hard disks can be set to the "Installed" or "Not Installed" state by the SETUP program that is supplied with each ISA host computer. The SETUP program allows the user to select the number of standard hard disks that are recognized by the system regardless of whether or not they are physically installed.

3.2.2 Hardware Setup

Several preparatory steps must be taken to install the host adapter in the host computer. The initialization jumpers must be correctly placed in the AHA154XA. The SCSI Bus terminators must be installed in the correct SCSI devices. Finally, the correct SCSI addresses must be assigned to each peripheral device.

The Adaptec AHA-1540A/1542A 16-Bit AT bus to SCSI bus Host Adapter has been designed to operate as shipped in the majority of AT class computers. The host adapter's jumper settings should almost always remain in their original default positions. Refer to section 3.3 if conflicting memory or port assignments require that the host adapter jumpers be reconfigured. The AHA-1540A/1542A is shipped with the following default settings:

SCSI Address	7
SCSI Parity	Enabled
Terminators	Installed
Terminator Power	Supplying
Synchronous Negotiation	Disabled
DMA Channel	5
Interrupt Channel	11
AT Port Address	330H
AT BIOS Address	ODCOOOH
LA Enable Jumper	Installed

Termination

The SCSI bus must be terminated correctly to assure proper operation. The first and last physical SCSI devices on the SCSI cable must have terminators installed. All other SCSI devices must have terminators removed. The host adapter is shipped with terminators already installed at locations RN3, RN4, and RN5. The internal and external connectors connect to the same SCSI bus, so both internal and external cabling must be considered in determining where terminators are installed.

connected to the host adapter, the terminators must also be installed on the device at the far end of the cable. Terminators must be removed from all other

If only one cable (either internal or external) is connected to the host adapter, the terminators must remain installed in the host adapter. Terminators must be removed from the farthest end of the cable from the host adapter. Terminators must be installed on all attached SCSI devices.

If both an internal and an external cable are connected to the host adapter, remove the terminators on the host adapter and install terminators on the devices at the farthest end of each cable. Terminators must be removed from all devices except the device at the end of each cable. The instruction manuals for each SCSI device will indicate how the terminators can be removed or replaced.

Addressing

The SCSI target address for each SCSI device to be attached must be selected by setting the proper jumpers or switches on the device. If the SCSI device is a hard disk that is to be used as the boot disk, it must have the Target Identifier (SCSI Address) set to zero and the Logical Unit Number set to zero. SCSI Addresses 0 and 1 should be reserved for SCSI hard disk drives. SCSI Address 2 is often used for tape devices. Each installed peripheral must have a different Target Identifier. The host adapter's default address is 7. Duplicate SCSI Addresses will cause errors that are extremely difficult to identify. Any jumpers that control operating modes must also be properly set. If there is a jumper that enables synchronous transfer negotiation, the jumper should be set to enable negotiation. Check the SCSI drive or controller to ensure that Parity Checking is enabled. If Parity checking on the device is disabled or not supported, the jumper at location J8 of the host adapter should be removed. Parity checking should only be enabled if all SCSI devices support it.

Installation Procedure

Now that the host adapter and the devices to be installed have been properly prepared, the devices should be installed in the following manner:

- 1) Turn OFF the power to the computer system.
- 2) Remove the system cover according to the directions of the computer manufacturer.
- 3) If only an external SCSI subsystem is to be used, no internal cabling is required. If an internal SCSI peripheral is to be used, install a 50 pin SCSI ribbon cable to the host adapter. This cable must be oriented correctly. Pin 1 of the SCSI cable is designated by a red stripe. Multi-color 50 pin ribbon cables signify pin 1 with a brown color. Pin 1 on the host adapter 50 pin SCSI header is located on the left hand side, farthest from the installation bracket and is designated by the words PIN 1 on the board adjacent to the header. After locating pin 1 on the host adapter and on the SCSI cable, carefully insert the connector located at the end of the long end of the cable into the host adapter connector. After ensuring that all pins are lined up and that the pin 1 orientation is correct, firmly seat the connector to the board. If it is ever necessary to remove the cable, gentle prying with a small thin-bladed screwdriver may be required.
- 4) After installing the SCSI cable, the host adapter can be installed in any one of the adapter slots in the host computer.
- 5) If an internal SCSI device is to be used, it should be installed in the drive bays in accordance with the directions on the peripheral. The proper power supply must be connected to the SCSI peripheral device.
- 6) The 50 pin SCSI ribbon cable can now be attached to each SCSI device. Refer to the device's installation instructions to ensure proper pin 1 orientation. Pin 1 orientation must be consistent throughout the system. Keep the ribbon cable neatly dressed away from the ventilation slots in the computer system. Keep the ribbon cable dressed away from possible electrical noise sources or noise sensitive components, particularly large microprocessors, memory boards, switching power supplies, and analog data acquisition boards. If the internal

configuration requires the cable to come near noise sensitive circuits, make sure that the cable crosses the boards at right angles and is near the noise sensitive circuits for the shortest distance possible.

7) Carefully reinstall the cover of the computer.

8) If an external SCSI subsystem is to be installed, it can now be cabled to the External SCSI Connector projecting from the shielding bracket on the back of the AHA-154XA Host Adapter. The proper shielded SCSI cable must be used for proper operation. The external connector on the AHA-1540A/1542A is a D shell connector that ensures correct pin 1 orientation on the host adapter. The subsystem, cables, and SCSI terminators must be installed in accordance with the directions provided with the external SCSI subsystem. The addresses selected for external SCSI devices must not overlap with the addresses of the host adapter or any other SCSI devices attached internally.

3.2.3 Checklist

Before applying power to your system, the following items should be completed and checked:

1. 50 pin SCSI ribbon cable is connected to the host adapter with proper pin 1 orientation.
2. The host adapter is firmly seated in the host computer's adapter slot.
3. The correct SCSI addresses are selected on all attached SCSI devices. Address 0 is reserved for the boot hard disk and address 1 is used for a second hard disk.
4. The correct operating modes are selected on all attached SCSI devices.
5. Terminators are installed or removed on the drives and host adapter as required.
6. External SCSI devices are properly installed and cabled.

3.2.4 Operation Using the BIOS Under DOS

To bring up the system for the first time with the host adapter installed, insert a bootable system diskette in drive A:, and close the door. After the system initialization and power-up diagnostics have completed, system error messages, such as "SYSTEM CONFIGURATION CHANGED, RUN SETUP" and prompts on how to continue, may be displayed. After following the instructions displayed on the screen, the system will boot from the flexible diskette drive.

Run your SETUP program to configure the system as required. **Remember that a SCSI drive can only be used as a boot device if both standard hard disks are mapped out.** When the SETUP parameters have been defined, follow the directions on the screen to re-initialize the system.

Most SCSI drives are shipped from the factory with a complete low-level format. A few SCSI drives and most bridge controllers, including the CCS compatible Adaptec ACB-4525Z, require a low-level SCSI format operation before they will operate. Section 7.4 describes how the low-level format utility that is available in the Adaptec BIOS Utilities should be used to format such SCSI devices.

Run the DOS FDISK program to partition the disk for the number of cylinders to be used by DOS. When using DOS 3.2 or under, it is generally a good idea to select 1 less cylinder than the maximum allowable per partition according to DOS. This eliminates the possibility of exceeding the 32 MB limit. Activate the first DOS partition before leaving the FDISK program if it is to be the boot partition. If you are not sure if a DOS partition exists, use the menu entry in FDISK to display partition data.

After the DOS partition has been created and activated, the drive is ready for a DOS FORMAT. Refer to the DOS manual for the format options that are available. If the system is going to boot from a SCSI disk, it is usually easiest to transfer the hidden system files to that disk during the FORMAT.

CAUTION: IF THE DRIVE YOU ARE USING WAS PREVIOUSLY FORMATTED OR PARTITIONED WITH A DIFFERENT HOST ADAPTER OR DISK CONTROLLER, A DOS PARTITION MAY ALREADY EXIST. IF SUCH A PARTITION DOES EXIST IT SHOULD BE DELETED AND RE-CREATED USING THIS HOST ADAPTER. IF THIS PRECAUTION IS NOT FOLLOWED, ERRATIC SYSTEM OPERATION MAY RESULT.

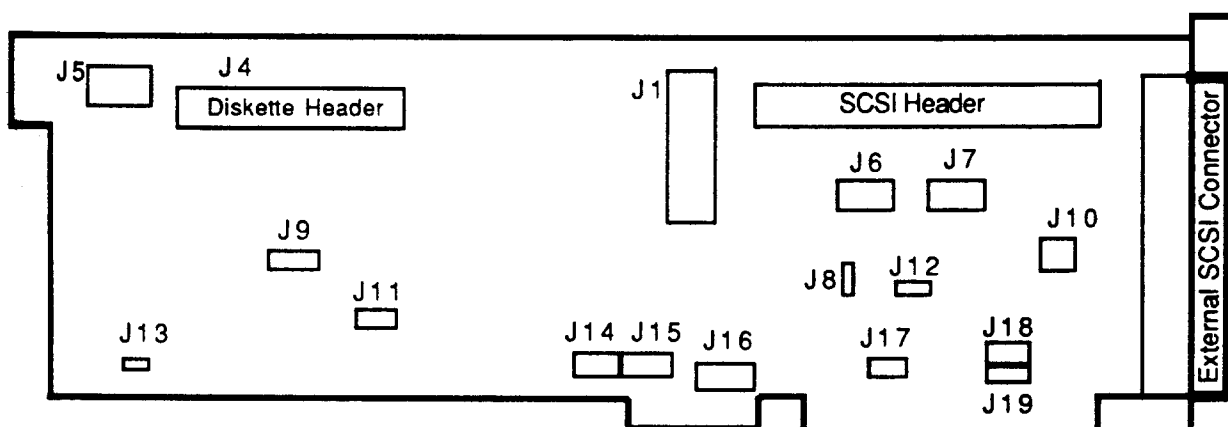
The host adapter and SCSI disks are now ready for normal operation. The host adapter's BIOS performs the necessary initialization procedures during the boot operation. This procedure is described in section 6.1.1

3.3 Jumper Configuration

All of the jumpers have been preset at the factory to ensure proper system operation with the majority of AT bus systems. This information is provided to help the OEM or system integrator to configure the system properly if other option boards present conflicts.

The following diagram shows the approximate location of the various customer configurable items on the AHA-1540A/1542A. Listed after the diagram are the functions, defaults, and set-up options for each jumper.

Jumper locations:



3.3.1 Jumper Block J1

Jumper block J1 is shown below:

J1		
Pin 1	0 0	Synchronous Transfer
	0 0	Diagnostics
	0 0	SCSI Parity
	0 0	SCSI Address
	0 0	SCSI Address
	0 0	SCSI Address
	0 0	DMA Channel
	0 0	DMA Channel
	0 0	Interrupt Channel
	0 0	Interrupt Channel
	0 0	Interrupt Channel
	0 0	DMA Transfer Speed
	0 0	DMA Transfer Speed

J14 and J15 must also be set.

J16 must also be set.

Jumper block J1 is the large vertically oriented block of jumpers located near the center of the host adapter. Pin pair 1 is the topmost pair of pins.

3.3.1.1 SCSI Synchronous Negotiation

Pin-pair 1 of jumper block J1 is the synchronous negotiation enable jumper. The AHA-1540A/1542A will initiate SCSI synchronous negotiation during initialization, or after a SCSI reset if this jumper is installed. If the jumper is not installed, the AHA-1540A/1542A will still support synchronous SCSI transfers, but a different SCSI device must initiate the negotiation. **Default is jumper removed, synchronous negotiation initiation disabled.** If any attached SCSI devices support synchronous transfer, the initiation of negotiation should be enabled by both the AHA-154XA and the attached devices to fully implement the SCSI synchronous negotiation protocol.

3.3.1.2 Diagnostic Jumper

Pin-pair 2 of jumper block J1 is a factory diagnostic jumper. This jumper is reserved for Adaptec use and must not have a jumper shunt installed. If this jumper is installed, the firmware will loop through the power on diagnostics, preventing normal operation. **Default is jumper removed.**

3.3.1.3 SCSI Parity

Pin-pair 3 of jumper block J1 is the parity enable/disable jumper. The SCSI parity checking is disabled if this jumper is installed. **The default is parity checking enabled.**

3.3.2 SCSI Address

Pin-pairs 4, 5, and 6 of jumper block J1 define the SCSI address. The SCSI address is selected according to the following table. The default address is 7.

J1				
Pin 1	0	0		
	0	0		
	0	0		
Pin-pair 4	0	0	SCSI 0	
Pin-pair 5	0	0	SCSI 1	
Pin-pair 6	0	0	SCSI 2	
	0	0		
	0	0		
	0	0		
	0	0		
	0	0		
	0	0		
	0	0		
	0	0		
	0	0		

Pin-pair			SCSI	Default
4	5	6	Address	
0	0	0	7	
X	0	0	6	
0	X	0	5	
X	X	0	4	
0	0	X	3	
X	0	X	2	
0	X	X	1	
X	X	X	0	

X = Jumper Installed

3.3.3 DMA Channel

There are three jumper blocks involved in selecting the DMA channel. These are J1, J14, and J15. The DMA channel selection jumpers consist of pin pairs 7 and 8 located in the large block of jumper pins J1. The DMA channel reported to the AT during the Return Configuration command is set by these jumpers according to the following table. **Default is DMA channel 5.**

Jumper set J14 selects the DMA REQ signal to be used by the AHA-1540A/1542A according to the following table. This jumper set is located near the bottom center of the host adapter. Pin pair 1 is the right most pair of pins.

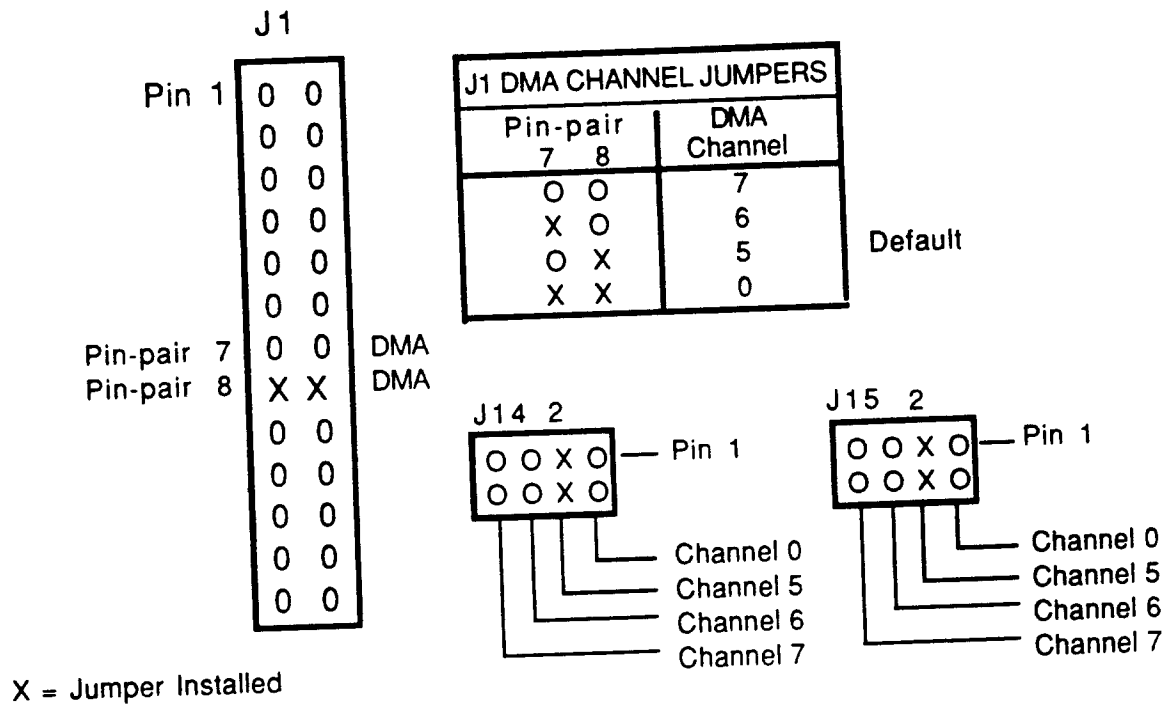
The default is DMA Request 5.

Jumper set J15 selects the DMA ACK signal to be used by the AHA-1540A/1542A according to the following table. This jumper set is located near the bottom center of the host adapter. Pin pair 1 is the right most set of pins. **The default is DMA Acknowledge 5.**

Section Three

Installation

There are four DMA channels that may be chosen for use by the AHA-1540A/AHA-1542A, channels 0, 5, 6, and 7. The DMA channel is set up by using the three jumper blocks and pin-pairs previously described. The jumper settings for each channel are shown below:



3.3.4 AT Interrupt Channel

There are two jumper blocks involved in selecting the AT interrupt channel. These are J1 and J16. The AT interrupt channel jumpers consist of pin pairs 9, 10, and 11 in the large block of jumper pin pairs J1. The interrupt channel reported to the AT during the Return Configuration Command is set by these jumpers according to the following table. The default is interrupt channel 11.

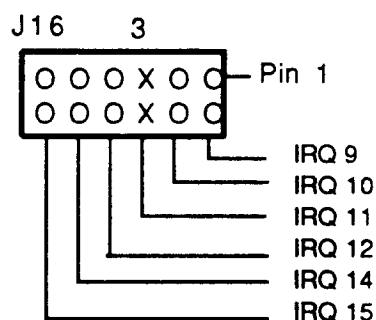
Jumper set J16 selects the AT interrupt channel to be used by the AHA-1540A/1542A. This jumper set is located near the bottom center of the host adapter. Pin pair 1 is the right most pair of pins. The interrupt channel used is set according to the following table. The default interrupt channel is 11.

J1	
Pin 1	0 0
	0 0
	0 0
	0 0
	0 0
	0 0
	0 0
	0 0
Pin-pair 9	0 0
Pin-pair 10	X X
Pin-pair 11	0 0
	0 0
	0 0

Interrupt
Interrupt
Interrupt

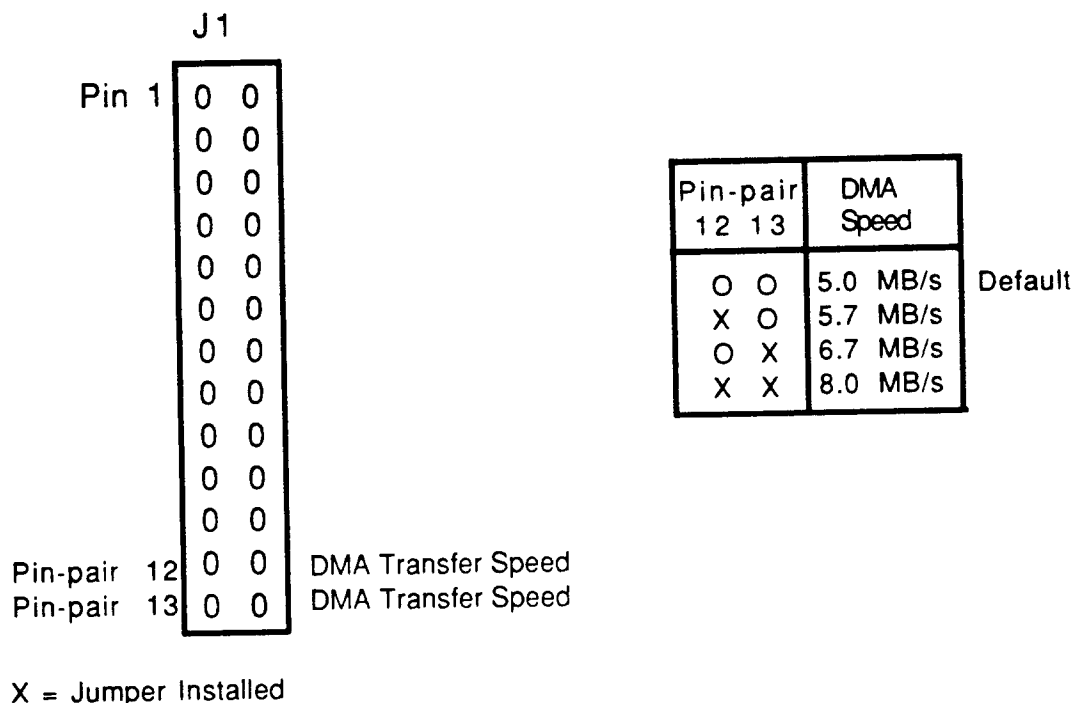
X = Jumper Installed

J1 INTERRUPT CHANNELS				
Pin-pair			Interrupt	
9	10	11	Channel	
0	0	0	9	
X	0	0	10	
0	X	0	11	
X	X	0	12	
0	0	X	14	
X	0	X	15	



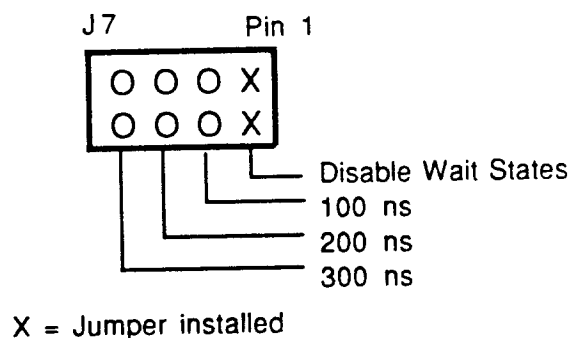
3.3.5 DMA Transfer Speed Default

Pin-pairs 12 and 13 of jumper block J1 set the default DMA transfer speed. Installing jumper shunts as shown below will set any of 4 default DMA transfer speeds. (See Appendix A for system timing requirements.) The default speed is selected after power on or after a hard reset occurs. This speed may also be tuned to allow for the fastest possible transfer (minimum bus on time) for any particular system by using the Host Adapter command Set Transfer Speed. The Host Adapter Command overrides the jumper settings. This command is detailed in section 5. **The default is no jumper installed.**



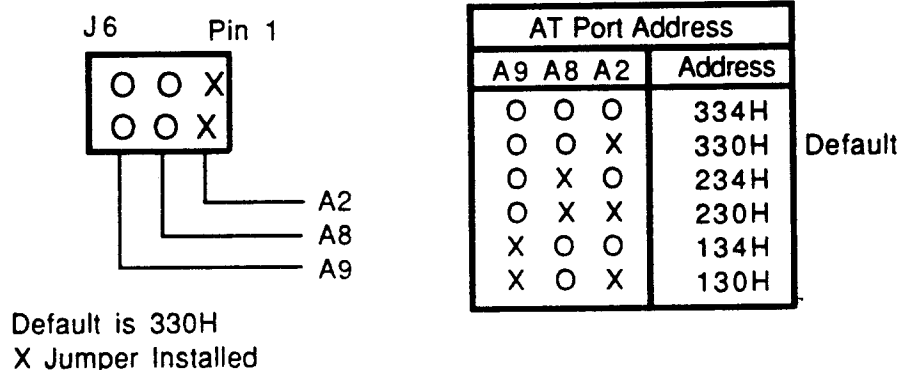
3.3.6 AT BIOS Wait State

Jumper block J7 allows IOCHRDY on the AT bus to be driven not active during BIOS reads. The time may be set to 100ns, 200ns, 300ns, or the function may be disabled. **The default is Wait State Disabled.**



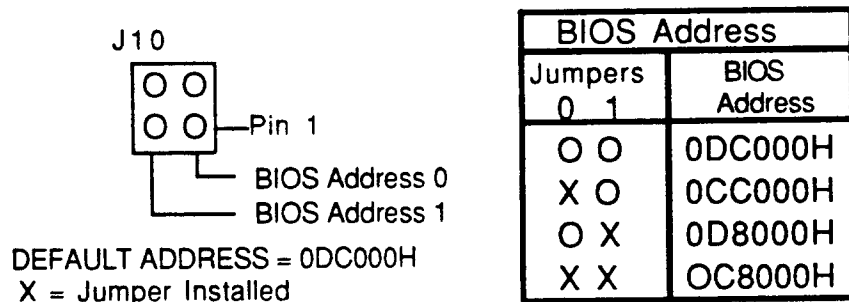
3.3.7 AT Port Address

The starting address of the block of four I/O ports required by the AHA-1540A/1542A is selected by the jumpers in jumper block J6. Pin pair 1 is the right most pair of pins. The default address is 0330H. That port address is required by the BIOS. Other valid port addresses are 334H, 330H, 234H, 230H, 134H, and 130. These port addresses may be used by device drivers and operating systems that support multiple host adapters. **The default address is 330H.**



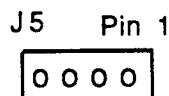
3.3.8 AT BIOS Address

The starting address of the block of address space reserved for the Adaptec BIOS is selected by the jumper pins located in J10. **The default address is 0DC000H.** This address must not conflict with any other BIOS or decoded address space in the system.



3.3.9 Front Panel LED Connector

J5 is the front panel LED header. Pins 1 and 4 are connected to the same 220 ohm pull up resistor and pins 2 and 3 are pulled low by the same LED driver whenever the on board LED is on. This allows the Front Panel LED cable to be plugged in with either orientation. The driver is specified to pull 24 milliamps through the LED. J5 is located near the top left of the host adapter.



3.3.10 LA Enable Jumper (AHA-W1542A Only)

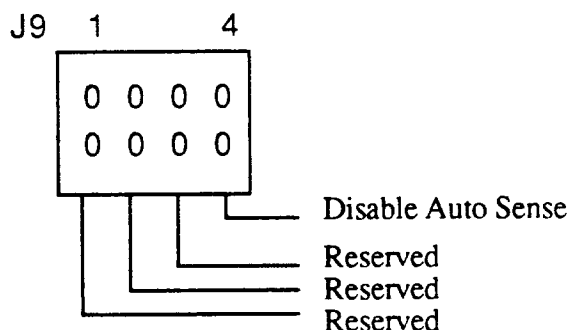
Note: This jumper exists only on the early production units. These are easily identified by a label on the board that has a model number of AHA-W1542A. Standard production AHA-1540A and AHA-1542A boards do not have this jumper.

When J8 is installed, address drivers LA17 - LA19 are enabled. When not installed these address lines are not driven. Some computers, especially 80386 based machines, short address lines LA17 and SA17, LA18 and SA18, and LA19 and SA19 together. If your computer system shorts these lines then remove jumper J8. Default is jumper installed.

CAUTION: *INCORRECT INSTALLATION OF THIS JUMPER MAY NOT RESULT IN IMMEDIATE SYSTEM PROBLEMS. IF IT IS NECESSARY TO CHANGE THE STATE OF THIS JUMPER AFTER THE SYSTEM HAS BEEN CONFIGURED, THE SCSI HARD DISK MUST ALSO BE RE-FORMATTED. CONTACT THE COMPUTER SYSTEM MANUFACTURER IF THERE IS ANY DOUBT ON HOW THE SYSTEM IMPLEMENTS THESE ADDRESS LINES.*

3.3.11 Auxiliary Jumpers

Installation of a jumper shunt on pin pair 4 of jumper block J9 will disable the automatic request sense function on the AHA-1540A/1542A. If the automatic Request Sense function is enabled, it may additionally be disabled on a command by command basis using the Request Sense Allocation Length Field of the CCB (see Section 5.3). All other pins-pairs on jumper block J9 are reserved for future use.



3.3.12 BIOS Enable/Disable

Only one host adapter BIOS should be enabled in any host system. That BIOS allows DOS to access up to two SCSI drives on the host adapter having a port address of 330H. Any other host adapters installed in the system must have their BIOS disabled. In addition, certain operating systems may require that the BIOS be disabled. The enabling of the BIOS is controlled by jumper J11, near the bottom left of the host adapter. When the jumper is installed on J11 the BIOS is enabled. When the jumper is removed, the BIOS is disabled and will not respond to host reads. The default is jumper installed.

3.3.13 SCSI Terminators

RN3, RN4, and RN5 are the SCSI terminators. If the AHA-1540A/1542A is not the first or the last SCSI device in a string of SCSI devices, or if in-line terminators are used, then all of these resistor networks must be removed. More information is provided in section 3.2.2 about the proper use of the SCSI terminators. **The default is terminators installed.**

3.3.14 SCSI Terminator Power

Fuse F1 controls the terminator power. If another SCSI device is supplying terminator power, then F1 may optionally be removed. No more than 5 SCSI devices should be configured to supply terminator power to a single SCSI bus. **The default is F1 installed with the AHA-1540A/1542A supplying terminator power.** The terminator power is protected with a 1.5 amp fuse to prevent short circuits from burning SCSI cables. The terminator power is additionally protected from terminator power back-flow with a low voltage-drop diode so that the SCSI bus will continue to operate even if one or more SCSI host adapters is powered down.

3.4 FLEXIBLE DISKETTE CONTROLLER CONFIGURATION JUMPERS (AHA-1542A ONLY)

3.4.1 Flexible Diskette Controller Secondary Address

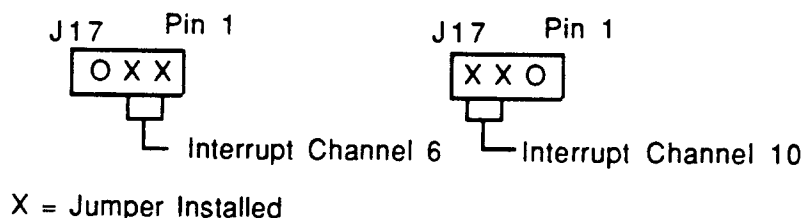
Jumper J12, located near the center right of the host adapter, controls the selection of the flexible diskette controller secondary address. When J12 is installed, the flexible diskette controller will respond to I/O addresses 370-377. When not installed, the flexible diskette controller will respond to I/O addresses 3F0-3F7. **The default is no jumper installed.**

3.4.2 Flexible Diskette Controller Enable

Jumper J13, located near the bottom left of the host adapter, enables or disables the flexible diskette controller. When this jumper is installed, the flexible diskette controller will respond to host reads and writes. When not installed, the flexible diskette controller will not respond to any signal. **The default is jumper installed.**

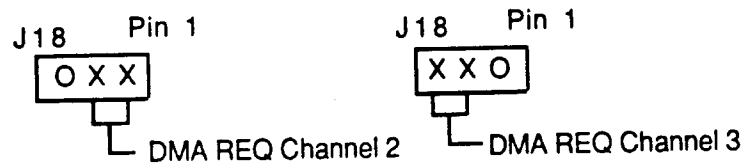
3.4.3 Flexible Diskette Controller Interrupt Channel

Jumper block J17, located near the bottom right of the host adapter, sets the interrupt channel for the flexible diskette controller. **The default is interrupt channel 6.**



3.4.4 Flexible Diskette Controller DMA Request Channel

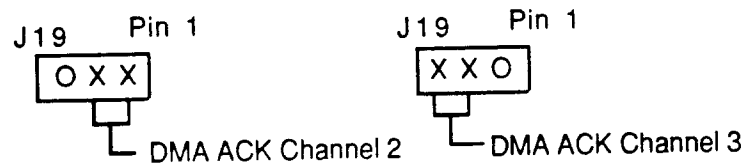
Jumper J18, located near the bottom right of the host adapter, selects the DMA Request channel for the flexible diskette controller. Jumper J19, the DMA Acknowledge jumper, must be set to the same position. Default is DMA channel 2.



X = Jumper Installed

3.4.5 Flexible Diskette Controller DMA Acknowledge Channel

Jumper J19, located near the bottom right of the host adapter, selects the DMA acknowledge channel for the flexible diskette controller. Jumper J18, the DMA Request jumper, must be set to the same position. Default is DMA channel 2.



X = Jumper Installed