USER'S GUIDE

FAD 3500 SERIES

STREAMING 1/4 INCH TAPE CARTRIDGE DRIVE

(ɯ) wangtek

USER'S GUIDE NO. 63038-001   Rev B

FOREWORD

This manual provides operating and service information for the Streaming 1/4 Inch Tape Cartridge Drive, FAD 3500 Series, Manufactured by Wangtek Incorporated, 41 Moreland Road, Simi Valley, California. The content includes a detailed product description, specifications, installation and operation instructions.

TECHNICAL SUPPORT

If for any reason you require product technical support, please contact the OEM or Distributor where you first purchased your equipment. If they cannot help you or at their direction, Wangtek Technical Support can be reached at:

WANGTEK Incorporated	WANGTEK-Europe
41 Moreland Road	Unit 1A, Apollo House
Simi Valley, CA. 93065	Calleva Industrial Park
	Aldermaston, Reading
(805) 583-5255	RG7 4QW England
Telex 650450	44-7356-77746
TWX (910) 494-1925	Telex 851-848135
FAX (805) 522-1576	FAX 44-7356-6076

WARNING

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for Class B computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

PROPRIETARY NOTICE

This document contains information proprietary to Wangtek Incorporated. No reproduction, in whole or in part, or use of the information contained within is authorized except as Wangtek may agree to in writing.

COPYRIGHT NOTICE

This document and the information contained within is copyright by Wangtek Incorporated and may not be duplicated in full or in part by any person without prior written approval of Wangtek. While every effort has been made to keep the information contained within current and accurate as of the date of publication, no guarantee is given or implied that the document is error-free or that it is accurate with regard to any specification. Wangtek reserves the right to make changes, for the purpose of product improvement, at any time.

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

List of Illustrations

List of Tables

Section 1   GENERAL DESCRIPTION AND SPECIFICATIONS

1.1   Introduction

This section contains information about the purpose of the equipment, the physical and functional descriptions, and the mechanical and electrical specifications of the equipment.

1.1.1   Model Identification

The basic drive model designator is the FAD 3500 Series. This model number can be found on the drive identification label located on the right side of the drive. The complete model number breakdown is provided in Figure 1-1.

S FAD3500-X X X

Blank = Non-kit
K = Kit

3 = 3 1/2" form factor
5 = 5 1/4" form factor

C = Wangtek CCS interface
P = PS/2 Interface
F = Wangtek FAD interface

S = Subsystem
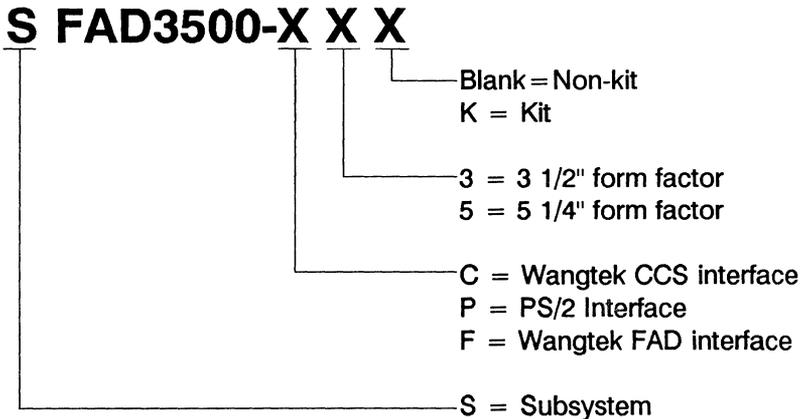
Figure 1-1
Model Number Breakdown

Also included on the identification label is the drive assembly number, also referred to as the drive part number. This number reflects the exact unit configuration and should be referred to in any communication with Wangtek.

1.2   Purpose of Equipment

The FAD 3500, manufactured by Wangtek Incorporated, is designed to write and recover data on DC 2000 type 1/4" tape data cartridges conforming to the ANSI standard X3B5/85-135. When used with the proper software, the drive supports the QIC-40 standard data format providing a formatted capacity of 40 Megabytes of data storage. The FAD 3500 is used primarily as a backup storage device to prevent the loss of valuable data due to accidental erasure or destruction caused by storage device failure. The removable data cartridge and QIC-40 standard format also allow the drive to be used for data interchange and distribution. When equipped with the Wangtek File Access Drive (FAD) or the Wangtek Common Command Set (CCS) interface, the drive is designed to be plug compatible with a standard floppy disk (SA400) controller, thereby eliminating the need for an additional controller board.

1.3   Physical Description of Equipment

The FAD 3500 is available in two industry standard physical configurations, the 5 1/4" half-height form factor and the 3 1/2" form factor. The physical drive outline and mounting dimensions for the 5 1/4" version drive can be found in Figure 1-2. A total of twelve (12) mounting holes are provided for mounting the drive, two (2) on each side and eight (8) on the bottom. This version is designed to fit the standard 5 1/4" half-height form factor mounting requirements. The physical drive outline and mounting dimensions for the 3 1/2" version drive can be found in Figure 1-3. A total of sixteen (16) mounting holes are provided for mounting the drive, four (4) on each side and eight (8) on the bottom. This version is designed to fit the standard 3 1/2" form factor mounting requirements. All holes are threaded to accommodate 6-32 by 0.25" length screws. All cable connections are made at the rear of the drive. For more information about drive mounting and cable connections, refer to Section 2 Installation.
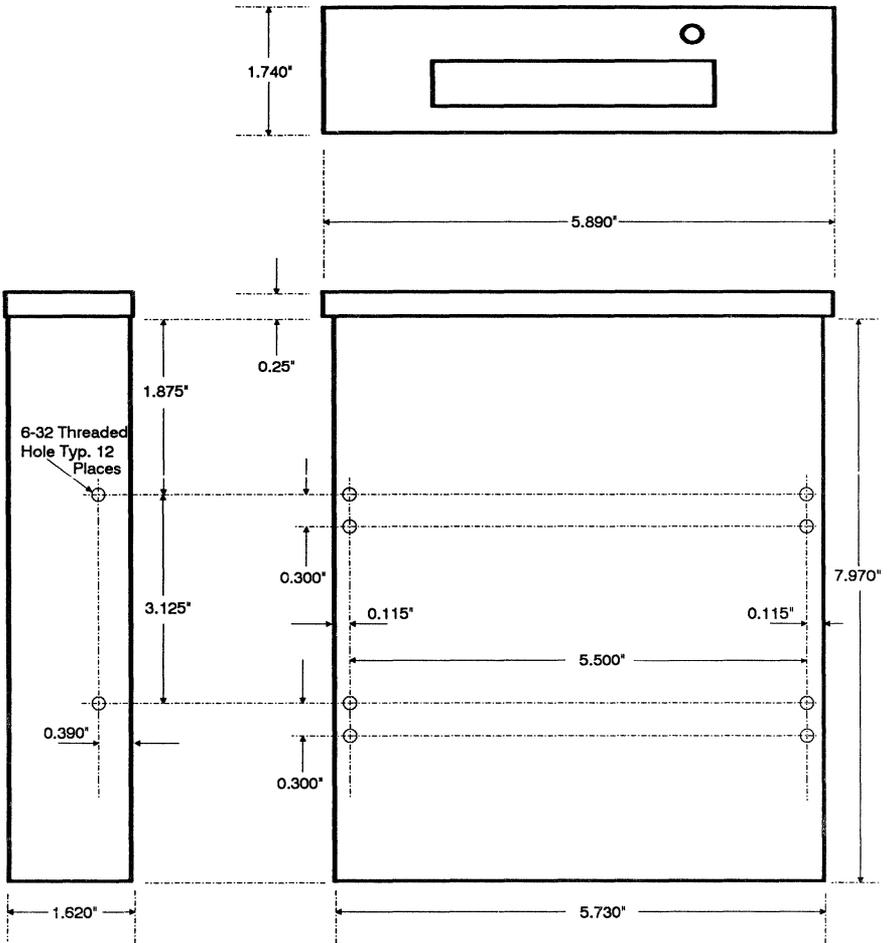
Figure 1-2
Drive Mounting, 5 1/4" Version

Figure 1-3
Drive Mounting, 3 1/2" Version
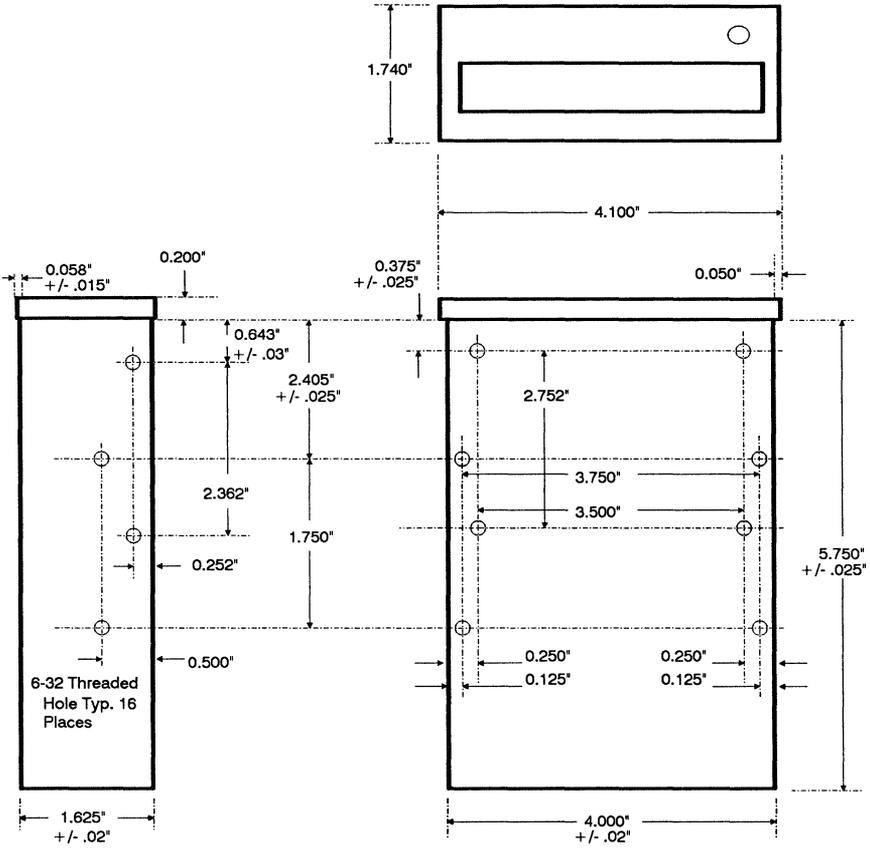
NOTE: All tolerances are +/- 0.010" unless otherwise noted.

6-32 Threaded Hole Typ. 16 Places

1.3.1 Types of Compatible Storage Media

Below is a list of the compatible storage media that have been tested by Wangtek. The data cartridge can greatly influence the data reliability of the storage device. Those tapes marked with an asterisk are specifically recommended by Wangtek to provide reliable operation.

- 3M DC 2000 Mini Data Cartridge *
- DEI Microtape Cartridge *

1.4 Functional Description of Equipment

The operation of the drive can be divided into five (5) major functional blocks as outlined in Figure 1-4. Each block is described in the paragraphs below.
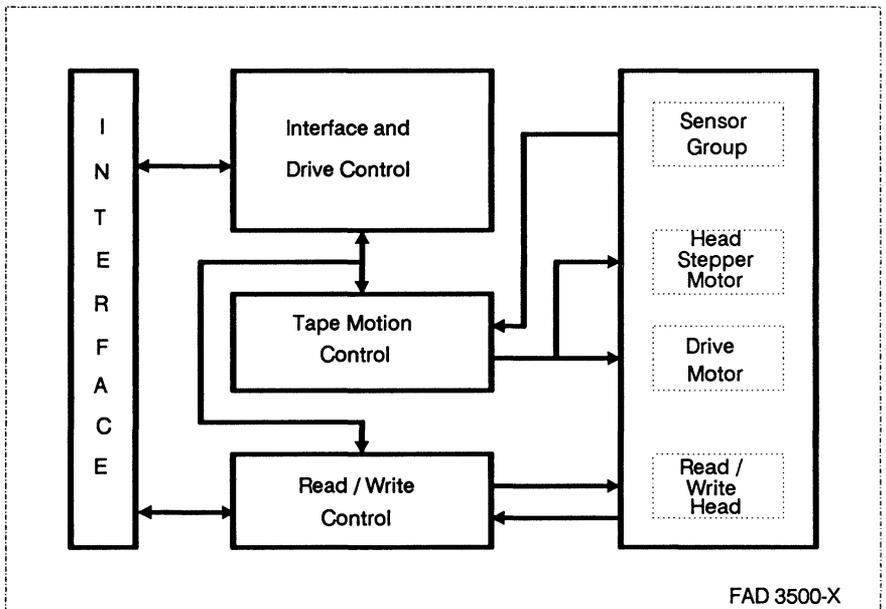
Figure 1-4
FAD 3500-XXX Functional Block Diagram

1.4.1   Interface And Drive Control

This block is responsible for control of all drive functions and provides the interface control for all non read/write signals. When a tape motion command is received by this block, the command is decoded and sent to the Tape Motion Control block to perform the tape movement.

1.4.2   Interface

This block provides the physical connection to the host controller. All tape motion, status, and read/write information pass through this block.

1.4.3   Tape Motion Control

When a tape motion command is received from the Interface and Drive Control block, this block will cause the tape to accelerate to the requested speed, the head to move to the requested track, and the read or write electronics to be enabled. Actual tape motion is achieved when the drive capstan engages the cartridge belt capstan providing drive to the cartridge reels. For more information regarding cartridge operation and care, refer to Section 3.4.3, Media Care and Handling.

1.4.4   Read / Write Control

This block performs all read and write functions on the tape, receiving and transmitting data directly to the interface. Data is recorded on the tape in a serial fashion on one of a possible twenty tracks, at a rate of 250 Kbytes per second (25 IPS) or 500 Kbytes per second (50 IPS), software or hardware selectable, dependant on system throughput capability. The first, track 0 or even track, will be recorded while the tape is moving from the beginning of tape (BOT) to the end of tape (EOT). Then the head will be positioned to the second, track 1 or odd track, and tape motion will reverse, recording data from EOT to BOT. The data cartridge can be record protected to prevent the loss of valuable data.

1.4.5   Drive Mechanics

This block contains all of the drive mechanics used to engage the data cartridge, provide tape motion, position the read/write head, and all the sensors required for safe operation.

1.5   Mechanical and Electrical Specifications

Refer to Table 1-1 for the mechanical and electrical specifications of the FAD 3500 tape drive.

Table 1-1
Mechanical and Electrical Specifications

Tape Cartridge Type	DC 2000 or equivalent
Formatted Capacity	40 megabytes with ECC
	44 megabytes without ECC
Recording Format Supported	QIC-40 Rev. C and above
Recording Code	MFM
Recording Density	10,000 FTPI
Number of Tracks	20 (serpentine)
Tape Speed	50 IPS at 500 Kbps
	25 IPS at 250 Kbps
Long Term Speed Variation	± 3%
Instantaneous Speed Variation	± 6.1%
Start/Stop Time	300 milliseconds
Voltage Requirements	+12 volts ± 5%
	+5 volts ± 5%
Current Requirements	
+12V Acceleration Surge nominal	1.9A for 115 miliseconds
+12V Acceleration Surge maximum	2.4A for 200 milliseconds
+12V @50ips	370 mA (nom.) 750 mA (max.)
+12V @90ips	600 mA (nom.) 1300 mA (max.)
+5V (3 1/2" board)	370mA (nom.) 500 mA (max.)
+5V (5 1/4" board)	720mA (nom.) 860 mA (max.)
Power Dissipation	
50 ips	10 watts (nom.) 14 watts (max.)
90 ips	12 watts (nom.) 20 watts (max.)
Standby	4 watts (5 watts 5 1/4" board)
Temperature	
Operating	5°C to 45°C (40°F to 115°F) on the base plate of the cartridge.
Storage and Shipping	-40°C to 71°C (-40°F to 160°F)
Wet bulb	26°C (78°F) maximum
Humidity	20% to 80% non-condensing

Table 1-1 (continued)
Mechanical and Electrical Specifications

Shock and Vibration
    Non-operational Shock   40 G's, 11mS pulse, 1/2 sine wave
                                  5 to 28 Hz-.05 in. displacement
                                  amplitude (peak to peak)

    Non-operational Vibration   28 to 500 Hz-2.0 G's
    Operational Shock   10 G's, 11 mS pulse, 1/2 sine wave
                                  5 to 20 Hz-.05 in. displacement
                                  amplitude (peak tp peak)

    Operational Vibration   20 to 500 Hz-1.0 G's
Acoustic Noise
    50 ips   48dB
    90 ips   52dB
Altitude
    Operational   -1,000 - 15,000 feet
    Non-operational   -1,000 - 50,000 feet
MTBF   12,000 power on hours at 15%
                                    tape motion
MTTR   30 minutes average
Soft Errors   1 in 10^8 bits without ECC
Hard Errors   1 in 10^{14} bits with ECC
Write Pre-compensation   125 nanoseconds (500Kbps)
                                    250 nanoseconds (250Kbps)

Dimensions (5 1/4" Version)
    Height   1.625 inches (146.05 mm)
    Width   5.750 inches (146.05 mm)
    Depth   8.000 inches (203.20 mm), including
                                    signal and power connectors. Add .25
                                    inches (6.35 mm) for the front bezel.

    Weight (unit)   2 pounds
    Weight (shipping)   3 pounds
    Mounting   Standard bottom or side mount for
                                    1/2 height 5 1/4" form factor

Dimensions (3 1/2" Version)
    Height   1.625 inches (146.05 mm)
    Width   4.00 inches (101.50 mm)
    Depth   5.75 inches (146.05 mm) including
                                    signal and power connectors. Add .25
                                    inches (6.35 mm) for the front bezel.

    Weight (unit)   2 pounds
    Weight (shipping)   3 pounds
    Mounting   Standard bottom or side mount for
                                    3 1/2" form factor.

Section 2 INSTALLATION

2.1 Introduction

This section contains information on unpacking the drive, a parts check list, hardware and software installation.

2.2 Unpacking the Drive

The drive is shipped in a carton and an electrostatic discharge (ESD) protective bag. Only after taking the proper precautions to prevent ESD damage may the drive be removed from the protective bag.

> **WARNING   The discharge of electrostatic energy that acclimates on the surface of the human body or other surfaces will damage or destroy the electronic components used in this device.**

2.2.1 Electrostatic Discharge (ESD) Protection

Before removing the drive from its protective bag, prepare a static safe working area. The surface on which the drive will be placed should be conductive. Conductive mats are available at most electronics supply dealers. A grounded conductive wrist strap should be worn at all times when handling the drive. If a wrist strap is not available, insure that some part of your body remains in contact with a ground source (ie. the computer chassis if the line cord is connected) at all times while handling the drive. To reduce the possibility of ESD damage, handle the drive by the metal sides of the drive chassis. Even after the drive is mounted in the computer chassis and properly grounded, ESD will still cause serious damage. Avoid touching any components or connectors on the circuit board. Save the ESD bag and desiccant pack in case the unit needs to be repackaged.

2.2.2   Environmental and Shock Protection

The drive can be easily damaged by subjecting it to adverse temperature and humidity conditions as well as by mishandling. When packaged for shipment, a desiccant pack is enclosed in the ESD bag to absorb any unusually high amounts of moisture that may enter the bag. When the unit has been stored in a cool, dry location and is moved to a warmer, more humid location for unpacking, the drive should be allowed the temperature stabilize for at least 30 minutes before opening the ESD bag. If a cool unit is exposed to warm. humid air, moisture will condense on the surface on the drive. Some components can be severely damaged by this moisture.

The way that the unit is handled can also affect the reliability of the drive. Even a small drop of 1 inch onto a hard surface can cause the drive to become misaligned, resulting in data interchange problems. When handling the drive on a work bench, a conductive rubber mat should be used. This will reduce the possibility of damage or misalignment if the unit is dropped.

2.3   Parts Check List

In addition to this user's guide, your FAD 3500 package should contain:
- FAD 3500 tape drive
- DC 2000 tape cartridge (if applicable)
- Side Rails (AT version)
- Power Adapter (XT version)
- User's Guide
- Software (if applicable)

2.4   Hardware Installation

The following paragraphs contain a step-by-step installation procedure for installing the FAD 3500 into the IBM PC/XT/AT. Additional information on installing options into your particular computer system can usually be found in the information supplied with your computer. You must have at least one half-height accessible installation bay available in your computer. The following tools are required to install the drive:
- Medium size flat blade screwdriver

- #1 Phillips screwdriver

Turn off power to your computer and remove the power cord from the rear of the unit. On AT models, assure that the key lock switch is in the unlocked position and remove the key. Disconnect all other cables from the rear of the system unit and position it on a static safe work area.

2.4.1 Treminator Pack Configuration

An interface signal termination pack is installed in the drive at location U5 for the 5 1/4" version board (Z10 for 3 1/2" the version board). Normally this pack must be removed from in the tape drive, and the termination pack in the floppy disk drive, also installed in the computer, must be installed. The rules for determining which terminator pack to remove are as follows:

- At least one drive must have a terminator pack installed.
- Only one drive, in a multiple drive configuration, may have a terminator pack installed.
- The last drive, the drive attached to the cable connector furthest from the controller, must have a terminator pack installed.

These configurations are outlined in Figure 2-1. The terminator pack used by floppy disk manufacturers may be blue, gray, or black in color and usually is located near the interface connector in a socket. Refer to the installation or operation guide supplied with your computer for more information.

2.5 Drive Preparation (5 1/4" Version Board)

The drive contains several option jumpers that must be configured for proper operation before installation in the system unit. The locations of these jumpers for the 5 1/4" version can be found in Figure 2-2.

The default jumper settings can be found in Table 2-1. The default configuration is for installation in the IBM AT using the Wangtek FAD interface. The jumper blocks consist of two rows of wire pins protruding up from the board approximately 3/8". Jumper connections are made by installing or moving one of the blue or black plastic jumper blocks be-

Terminator Pack U5

To
Floppy
Controller

Terminator
Pack
Removed

B: Tape Drive   A: Diskette Drive
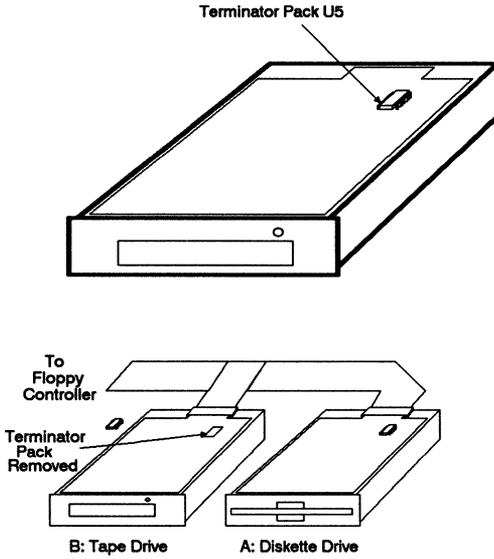
Figure 2-1
Terminator Pack Configuration

E1

1 HDR2
1 HDR1   1 HDR3
U5

HDR4
1

J1
Interface

J2   HDR5
Power   1
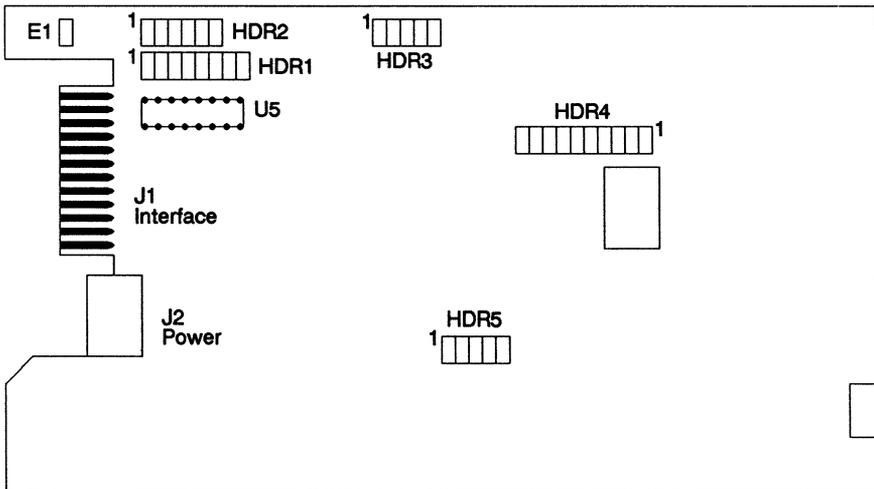
Figure 2-2
5 1/4" Version Logic Board Jumper Loactions

Table 2-1
5 1/4" Version Board Default Jumper Settings

Header	Pin	Name	Configuration			
			AT FAD *	PC/XT FAD	AT CCS	PC/XT CCS
1	1	DS3	-	-	-	-
	2	DS0	-	-	-	-
	3	MOT0	-	-	-	-
	4	MOT1	X	X	-	-
	5	DS1	-	-	X	X
	6	DS2	-	-	-	-
	7	MOTDS	X	X	-	-
	8	MOT	-	-	-	-
2	1	HI/LO	-	-	-	-
	2	SPD	X	-	X	-
	3	CARCHG	-	-	-	-
	4	CARTIN	X	X	-	-
	5	SELD	X	X	-	-
	6	RDY	-	-	X	-
3	1	MODEB	-	-	X	X
	2	TSPD	-	-	-	-
	3	MODEA	X	X	-	-
	4	RTN	-	-	-	-
	5	T90	-	-	-	-
		E1	X	X	X	X
Note: X = Use jumper - = Remove jumper * = Factory Default						

tween the proper pin pairs. Refer to Figure 2-3 for proper jumper installation. Extra jumpers may be removed from the drive or installed in a "not connected" position, as shown in Figure 2-3, for future use.

Header Block

Not
Installed   Installed
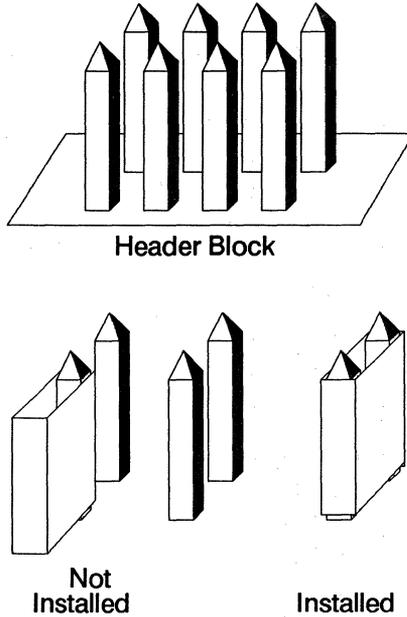
Figure 2-3
Option Jumper Installation

2.5.1   HDR 1 Pins 2,5,6,1,3,4 - DS0, DS1, DS2, DS3, MOT0, MOT1

These jumpers are used to configure the DS0, DS1, DS2, and DS3 inter-
face signals to provide drive select address (DS0, DS1, DS2, or DS3) or
motor enable address (MOT0 or MOT1).   Only one jumper may be in-
stalled. The default configuration is HDR 1 pin 4 - MOT1 installed. The
MOT0 and MOT1 jumpers should not be used for the CCS interface
configuration.

2.5.2   HDR 1 Pin 7,8 - MOTDS, MOT

These jumpers are used to configure the MOT interface signal to provide
drive selection (MOTDS) or motor enable (MOT). Only one jumper may
be installed. The default configuration is HDR 1 pin 7 - MOTDS installed.

The drive will be selected when the MOT interface signal goes active. These jumpers should not be used for the CCS interface configuration.

2.5.3   HDR 2 Pin 1,2 - HI/LO, SPD

These jumpers are used to configure the HI/LO interface signal for exter-nal speed select (HI/LO) or high speed only (SPD) operation. Only one jumper may be installed. The default configuration is HDR 2 pin 2 - SPD installed. When the HI/LO jumper is installed, the tape speed can be selected using J1 pin 2 - HI/LO on the interface connector. When the HI/LO signal is active, the 50 IPS tape speed will be selected. When the HI/LO signal is not active, the 25 IPS tape speed will be selected. The HI/LO jumper should not be used for the CCS interface configuration.

2.5.4   HDR 2 Pin 5,6,3,4 - SELD, RDY, CARCHG, CARTIN

These jumpers are used to configure the meaning of the cartridge status CRT STS interface signal on J1 pin 34 of the interface connector. The SELD and RDY jumpers determine if the drive needs only to be selected (SELD) for the CRT STS signal to go active or if the drive must be selected and ready (RDY) to enable the signal. The default is HDR 2 pin 5 - SELD installed. Only one of these two jumpers may be used and at least one must be used for the signal to be enabled. The CARCHG and CARTIN signals determine the active state of the CRT STS signal when it is enabled. The signal will be active when the cartridge has been changed (CARCHG) or when the cartridge is in the drive (CARTIN). The default is HDR 2 pin 4 - CARTIN installed. Only one of these two jumpers may be used and at least one must be used for the signal to be enabled. All of these jumpers should not be used for the CCS interface configuration.

2.5.5   HDR 3 Pin 3,1 - MODEA, MODEB

These jumpers are used to configure the drive interface for Wangtek FAD (MODEA) interface or CCS (MODEB) interface. The default for

FAD3500-FX models is HDR 3 pin 3 - MODEA installed. The default for FAD3500-CX models is HDR 3 pin 1 (MODEB) installed. Only one jumper may be installed.

2.5.6 HDR 3 pin 4 - RTN

This jumper is used to enable the auto re-tension feature each time a new cartridge is inserted in the drive. The default is no jumper installed.

2.5.7 HDR 3 Pin 2,5 - TSPD, T90

These jumpers are used to enable the test speed (TSPD) mode or the test at 90 IPS (T90) mode and are used for factory testing only. When the TSPD jumper is installed, the drive will repeatedly shuttle tape between BOT and EOT, stepping the head to the next higher track each time BOT is encountered. When the T90 jumper is installed, the drive will perform the tape shuttle at 90 IPS. The default is no jumpers installed.

2.5.8 HDR 4 Pins 1-10

These jumpers are used to establish the correct head stepper motor phasing during factory testing and should not be moved.

> **Warning - The HDR 4 jumpers affect the drive head alignment and should not be moved.**

2.5.9 HDR 5 Pins 1-5

These jumpers are used for automated testing at the factory and should not be used at any other time. The default is no jumpers installed.

2.5.10   E1

This jumper is used to connect the main board logic ground to chassis ground when installed. When not installed, the main board logic ground is bypassed from the chassis ground via a 0.47 microfarad capacitor.

2.6   Drive Preparation (3 1/2" Version Board)

The drive contains several option jumpers that must be configured for proper operation before installation in the system unit. The locations of these jumpers for the 3 1/2" version can be found in Figure 2-4.

The default jumper settings can be found in Table 2-2. The default configuration is for installation in the IBM AT using the Wangtek FAD interface. The jumper blocks consist of two rows of wire pins protruding up
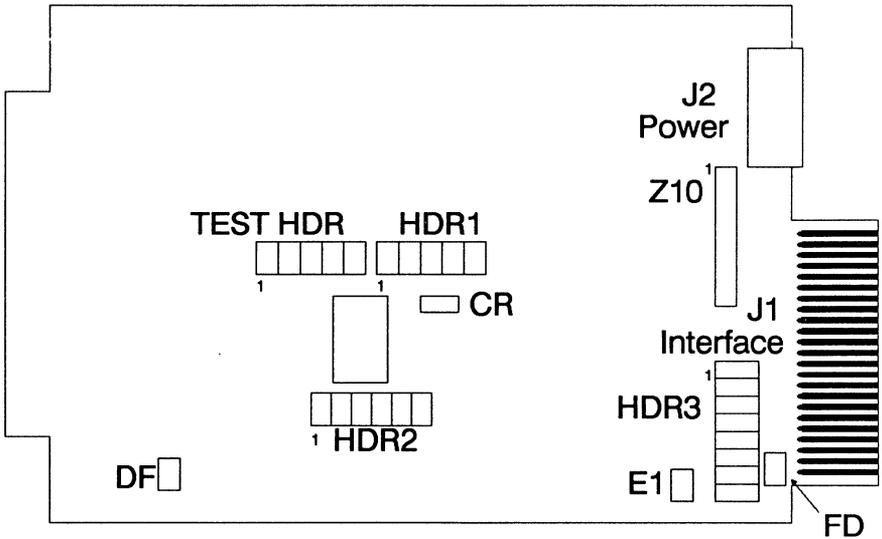

Figure 2-4
3 1/2" Version Logic Board Jumper Loactions

Table 2-2
3 1/2" Version Board Default Jumper Settings

Header	Pin	Name	Configuration			
			AT FAD	PC/XT FAD	AT CCS *	PC/XT CCS
1	1	QIC	X	X	X	X
	2	SPD	X	-	X	-
	3	TST	-	-	-	-
	4	FAD	X	X	-	-
	5	HI/LO	-	-	-	-
2	1	CARCHG	X	X	X	X
	2	CARTIN	-	-	-	-
	3	DCS	-	-	-	-
	4	SEL	-	-	-	-
	5	RDY	-	-	X	X
	6	SGATE	-	-	X	X
3	1	DS2	-	-	-	-
	2	MOT1	X	X	-	-
	3	DS1	-	-	X	X
	4	DS0	-	-	-	-
	5	MOT0	-	-	-	-
	6	DS3	-	-	-	-
	7	MOTDS	X	X	-	-
	8	MOT	-	-	-	-
		E1	X	X	X	X
		FD	-	-	-	-
		CR	X	X	-	-
		DF	-	-	-	-
Note: X = Use jumper - = Remove jumper * = Factory Default						

from the board approximately 3/8". Jumper connections are made by installing or moving one of the blue or black plastic jumper blocks between the proper pin pairs. Refer to Figure 2-3 for proper jumper installa-

tion. Extra jumpers may be removed from the drive or installed in a "not connected" position, as shown in Figure 2-3, for future use.

2.6.1 HDR 1 Pin 1 - QIC

This jumper is used for automated testing at the factory and must always be installed for proper operation.

2.6.2 HDR 1 Pins 2,5 - SPD, HI/LO

These jumpers are used to configure the HI/LO interface signal for external speed select (HI/LO) or high speed only (SPD) operation. Only one jumper may be installed. The default configuration is HDR 1 pin 2 - SPD installed. When the HI/LO jumper is installed, the tape speed can be selected using J1 pin 2 - HI/LO on the interface connector. When the HI/LO signal is active, the 50 IPS tape speed will be selected. When the HI/LO signal is not active, the 25 IPS tape speed will be selected. The HI/LO jumper should not be used for the CCS interface configuration.

2.6.3 HDR 1 Pin 3 - TST

This jumper is used to enable the test mode (TST In) and is used for factory testing only. When the TST jumper is installed, the drive will repeatedly shuttle tape between BOT and EOT, stepping the head to the next higher track each time BOT is encountered. The default configuration is not installed.

2.6.4 HDR 1 Pin 4 - FAD

This jumper is used to configure the drive interface for Wangtek FAD (FAD In) interface or CCS (FAD Out) interface. The default for FAD3500-FX models is HDR 1 pin 4 - FAD installed. The default for FAD3500-CX models is HDR 1 pin 4 - FAD not installed.

2.6.5 HDR 2 Pins 1,2,3,4,5 - CARCHG, CARTIN, DCS, SEL, RDY

These jumpers are used to configure the meaning of the cartridge status CRTSTS interface signal on J1 pin 34 of the interface connector. The DCS, SEL and RDY jumpers determine if the drive needs only to be selected (SEL) for the CRTSTS signal to go active, if the drive must be selected and ready (RDY) to enable the signal, or if the signal is disabled (DCS). The default is HDR 2 pin 5 - RDY installed. Only one of these jumpers may be used and at least one must be used for the signal to be gated. If all three jumpers are removed the CRTSTS signal is always enabled. The CARCHG and CARTIN signals determine the active state of the CRTSTS signal when it is enabled. The signal will be active when the cartridge has been changed (CARCHG) or when the cartridge is in the drive (CARTIN). The default is header 2 pin 1 - CARCHG installed. Only one of these jumpers may be used and at least one must be used for the signal to be enabled.

2.6.6 HDR 2 Pin 6 - SGATE

This jumper determins if the drive status signals INDEX, TRK 0, WPROT, and RDATA on J1 pins 8, 26, 28, & 30 are enabled if the drive is selected and ready (SGATE In) or enabled at all times (SGATE Out). The default is installed.

2.6.7 HDR 3 Pins 4,3,1,6,5,2 - DS0, DS1, DS2, DS3, MOT0, MOT1

These jumpers are used to configure the DS0, DS1, DS2, and DS3 interface signals to provide drive select address (DS0, DS1, DS2, or DS3) or motor enable address (MOT0 or MOT1). Only one jumper may be installed. The default configuration is HDR 3 pin 3 - DS1 installed. The MOT0 and MOT1 jumpers should not be used for the CCS interface configuration.

2.6.8 HDR 3 Pin 7,8 - MOTDS, MOT

These jumpers are used to configure the MOT interface signal to provide drive selection (MOTDS) or motor enable (MOT). Only one jumper may be installed. The default configuration is no jumpers installed. These jumpers should not be used for the CCS interface configuration.

2.6.9 TEST HDR

These jumpers are used for automated testing at the factory and should not be used at any other time. The default is no jumpers installed.

2.6.10 DF

This jumper is used for automated testing at the factory and should not be used at any other time. The default is not installed.

2.6.11 FD

This jumper is used to connect the CRTSTS signal on J1 pin 34 to J1 pin 4 for special configurations only. The default is not installed.

2.6.12 CR

This jumper is used to configure the drive electronics to be reset each time a new cartridge is installed into the drive (CR In) or only at power up (CR Out). The default configuration is not installed.

2.6.13 E1

This jumper is used to connect the main board logic ground to chassis ground when installed. When not installed, the main board logic ground

is bypassed from the chassis ground via a 0.47 microfarad capacitor. The default configuration is installed.

2.7   Drive Installation

The following paragraphs contain a step-by-step procedure for installing the FAD 3500 in the IBM PC/XT or AT computer systems. Additional information may be found in the Installation and Setup or Guide To Operations manuals included with your computer.

2.7.1   IBM PC/XT Drive Installation

1. After removing the power connector and all option slot connectors from the rear of the system unit, remove the five (5) screws securing the system unit cover. Refer to Figure 2-5.
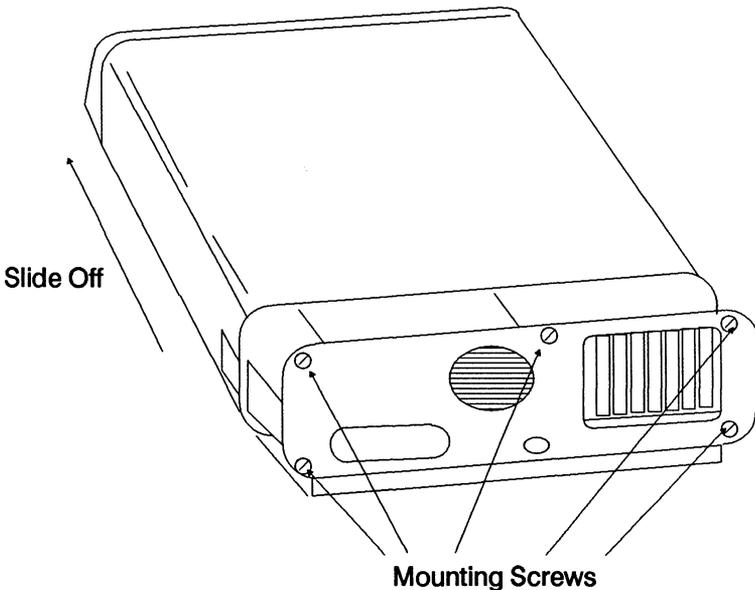
Figure 2-5
IBM PC/XT Cover Removal

2. Remove the system unit cover by sliding it off the front of the system chassis, taking care not to disconnect any internal cables.

3. Prepare an installation bay for the drive by removing the front panel diskette block off or an unused drive.

4. Remove the interface signal termination pack from the diskette drive A. Slide the tape drive into the open bay from the front of the system unit.

5. Locate the ribbon cable connector labeled B behind the diskette drive. Align the locating key on connector B with the locating slot on J1 of the tape drive interface connector and press the connector firmly into place.

6. Find the four wire power connector, align the connector with the J2 power jack at the rear of the tape drive and press the connector firmly into place. Refer to Figure 2-2 or Figure 2-4. If a four wire power con- nector is not available in your system unit, a power splitter Y adapter should be used. Power splitter Y adapters are available at most electronic supply dealers.

7. Attach a chassis ground strap to the drive ground wire lug at the top rear of the drive.

8. Slide the drive back into position in the mounting bay. Install two (2) 6-32 by 0.25" screws through the mounting bay side and into the drive chassis. 9. Lift the front of the system unit until it is resting on the rear panel. Install one (1) 6-32 by 0.25" screw through the access hole provided in the bottom of the system unit into the drive chassis. Refer to Figure 2-6.

10. Lower the system unit. Locate the system board configuration switches. The number of 5 1/4" drives is defined by switch bank 1 switches 7 and 8. Refer to Table 2-3 for the switch settings for your computer configuration.
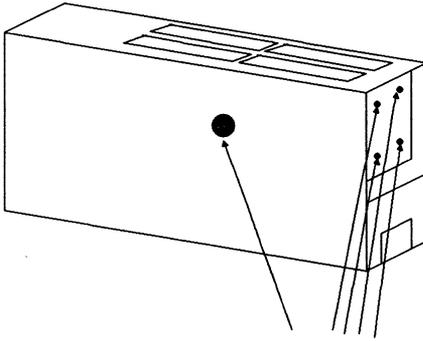
Mounting Screw Locations

Figure 2-6
IBM PC/XT Mounting Screw Locations

Table 2-3
IBM PC/XT Switch Bank 1 Settings

Computer	Switch Bank 1 Switch #		
	1	7	8
PC	Off	Off	On
XT	Off	Off	On

11. Reinstall the system cover. Reconnect all option slot connectors previously removed. Reconnect the system power cord.

12. Apply power to the system unit. After a power on self test, the computer should boot from the hard disk. If this does not occur or a error message is displayed, refer to section 3.5 If You Have A Problem.

13. Perform the tape drive software installation as outlined in the manual provided with your software package.

This completes the drive installation procedure for the IBM PC/XT.

2.7.2 IBM AT Drive Installation

1. After removing the power connector and all option slot connectors, assure that the front panel key lock is in the **Unlocked** position, and remove the black plastic cover panel from the rear of the system unit. Refer to Figure 2-7.


Slide Off

Mounting Screws

Back Panel
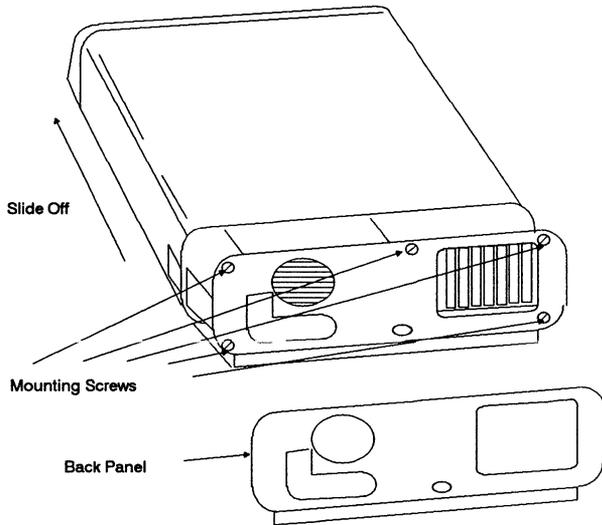
Figure 2-7
IBM AT Cover Removal

2. Remove the five (5) screws securing the system unit cover.

3. Remove the system unit cover by sliding it off the front of the system chassis, taking care not to disconnect any internal cables.

4. Prepare an installation bay by first removing the two (2) screws securing the cover plate over the lower right bay, refer to Figure 2-8.

5. Remove the four mounting screws and three mounting clips from the lower right bay as shown in Figure 2-9.
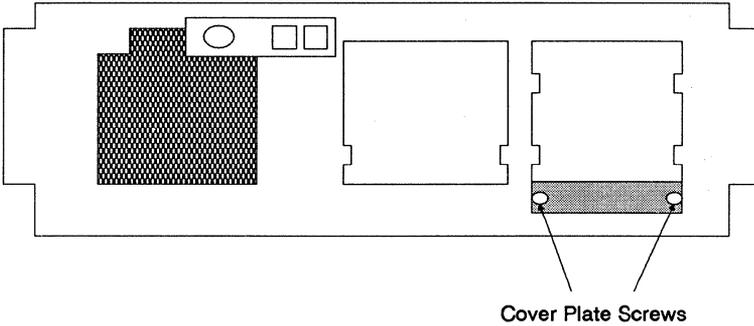
Cover Plate Screws

Figure 2-8
Cover Plate Removal


4 Mounting Screws
and 3 Clips

Two
Mounting Clips
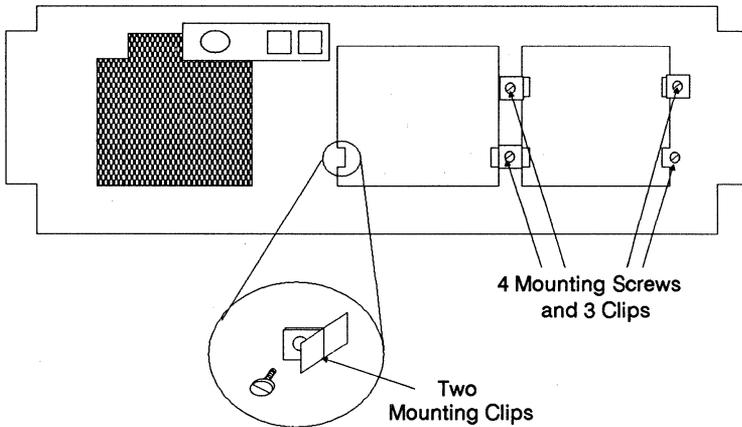
Figure 2-9
Mounting Clip Removal

6. Remove the mounting screw and two (2) mounting clips from the left bay. Reinstall one of the clips and the mounting screw to the left bay, the other mounting clip will be used to install the drive in the lower right bay.

7. Slide diskette drive A out approximately 2-3 inches form the top right bay, but do not disconnect the cables at the rear of the drive.

2-18

8. Remove the interface signal termination pack from the diskette drive A. Attach the AT mounting rails, with the narrow ends toward the rear, to the sides of the tape drive using four (4) 6-32 by 0.25" screws.

9. Slide the tape drive into the right center mounting bay until it is even with drive A.

10. Locate the ribbon cable connector labeled B behind the diskette drive. Align the locating key on connector B with the locating slot on J1 of the tape drive interface connector and press the connector firmly into place. Refer to Figure 2-2 or Figure 2-4.

11. Find the four wire power connector labeled P12. Align the P12 connector body key with the J2 power jack on the drive and press the connector firmly into place.

12. Locate an unused ground wire, located near the rear of the diskette drive A, and attach to the ground lug at the rear of the tape drive.

13. Slide the diskette drive and tape drive into the mounting bay and install the four (4) mounting clips and screws.

14. Position the cables so they are no higher than the power supply.

15. Locate the cover plate that was removed earlier. Remove the two (2) screws securing the diskette face plate block off and remove the plate, they are no longer needed.

16. Reinstall the cover plate below the tape drive using the two (2) screws removed earlier. Reinstall the system cover. Reconnect all option slot connectors previously removed. Reconnect the system power cord.

17. Insert the Diagnostics diskette into diskette drive A and apply power to the system. After a power on self test, the system will boot from the diskette and the diagnostics menu will be displayed. If this does not occur or an error message is displayed, refer to section 3.5 If You Have A Problem.

18. Press 4 to run the setup program. After setting the system time and date, a configuration summary will be displayed. If the configuration for the diskette drive B is not set to **Not Installed**, answer no to the question "Is this correct?".

19. Follow the directions to set the diskette drive B to not installed and save the new configuration.

20. After the system reboots, perform the tape drive software installation as outlined in the manual provided with your software package.

This completes the drive installation procedure for the IBM AT.

2.8 Software Availability

The FAD 3500 tape drive is compatible with the Q-TOS tape backup software manufactured by Wangtek. It is also compatable with the QIC-Save tape backup software manufactured by Wangtek. It is also compatable with the SY-TOS tape backup software manufactured by Sytron Corporation. All provide a user friendly, menu driven user interface to provide easy disk backup and restore operations. For more information regarding the Q-TOS, QIC-Save or SY-TOS tape backup software and operation, refer to the Q-TOS, QIC-Save or SY-TOS Software Installation and Operation Manual provided with the software. For pricing and availability of the QTOS, QIC-Save or SY-TOS software, contact your local Wangtek distributor or Wangtek.

Section 3   OPERATION

3.1 Introduction

This section contains information regarding drive operation, backup strategy, drive care and cleaning, and problem solving information.

3.2 Drive Operation

In normal operation, a tape cartridge would be inserted into the drive to perform a backup, verify, or restore operation. After the operation, the cartridge should be removed from the drive and stored in a safe place.

3.2.1 Cartridge Installation

Before installing the cartridge into the drive, it must be properly con-figured for read/write or write protected operation. The DC2000 mini data cartridge provides for write protection with a record slide lock lo-cated in the left front corner of the cartridge. Refer to Figure 3-1. To allow writing on the cartridge, the record slide lock must be positioned towards the left side of the cartridge. Refer to Figure 3-2. This will be the normal position and seldom need to be changed. If it is desired to protect a pre-recorded data cartridge from being altered, slide the record lock towards the right of the cartridge to write protect it. In this position, the tape drive can not write on or erase the data cartridge.

To install the data cartridge into the tape drive, push the cartridge front through the cartridge access door, into the drive. Continue pushing until the cartridge will push no further, a distinct click will be felt and herd. The cartridge is now properly installed for operation. The drive will automatically position it's head to track 0, perform a reference burst seek, and move the tape to BOT. If this does not occur, remove the cartridge and insert it again.

Record Lock   Tape Access Door
              Tape Cartridge Capstan
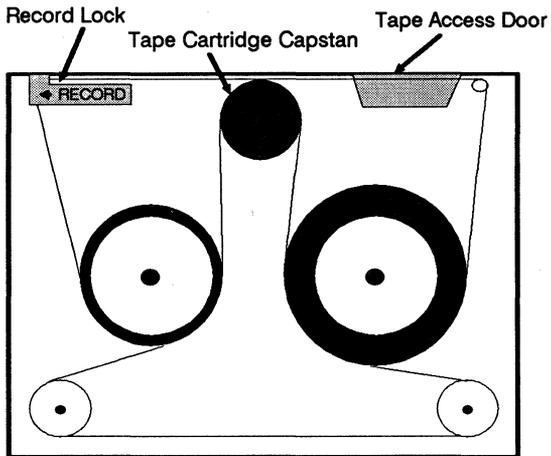
Figure 3-1
DC 2000 Data Cartridge

Unprotected   Protected
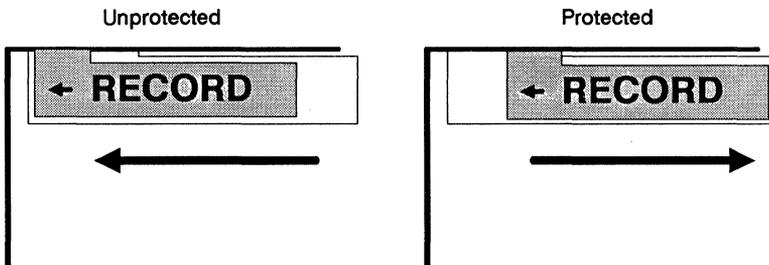
Figure 3-2
Data Cartridge Write Protection

3.2.2 Cartridge Removal

When operations on a data cartridge are completed, the cartridge can be removed from the drive.

> **Caution - Do not remove the data cartridge if the "Selected" indicator is on or if the drive is running, moving the tape. The cartridge or drive may be damaged and data lost.**

To remove the cartridge, press the cartridge eject button in fully until the cartridge pops out. The cartridge can now be pulled out of the cartridge access door, placed in it's protective case, and stored in a safe place.

3.3 Recommended Backup Strategy

The FAD 3500 is used primarily as a backup storage device to prevent the loss of valuable data due to accidental erasure or destruction due to storage device failure. The need to backup your data as well as the frequency of backup is best determined by the data's "value". If the data cannot be recreated but access to the data is still desired, then the data has a high value. If the data can be recreated at a high cost of man hours, the data value is high to medium. If the data can be easily recreated and is seldom used, the data value is medium to low. The frequency of backup should be determined by the frequency of access or change to the highest value data. For example, if the computer system was used the process income tax returns, requiring 0.75 man hours per return processed, the data value would be high to medium. The recommended frequency of backup would be every 8 hours for medium value data and every 4 hours for high value data. At no time should the frequency of backup require more time to be spent performing the backup then it took to create the data being backed up.

A second need to perform data backups is for archive reasons. If a particular piece of data mush be retained, unchanged, for history reasons, an archive copy is made and stored in a safe place. For example, if a version of a document (ie. a manual) needs to be kept unchanged so that it may be referred to at some future date. After the archive tape is made, it should be write protected to prevent loss by erasure or rewriting.

Another item that must be considered as part of a backup strategy is the location of the backup tape storage. If the data being backed up is medium to high, an off site backup strategy should be used to prevent the loss of data due to fire or theft. The off site backup should be stored at a location other than where the computer and on site backups are located, for example a data storage facility or an employees home, and would only be brought in to the computer site for update.

3.3.1 Daily Backups

The daily backup tape should be made at the end of each work day just before turning the computer system off. A tape with the name of the day (ie Monday, Tuesday...) on the label should be prepared in advance. Each day of the week, a complete backup of the hard disk would be performed. The following week, each tape would be reused. With this method, the maximum loss of data is limited to one day's work within the past week. If the capacity of the tape is much greater than the capacity of the hard disk, 40 megabytes per tape and 10 megabytes for the hard disk, several backup sessions can be stored on one tape to minimize the number of tapes required.

Another method used to provide the same protection with a minimum of tapes is to perform backups of only the files that change. For example, on Monday a complete backup of the entire disk is performed. On Tuesday, a backup of only the files that have changed is performed and so on through the end of the week. Depending on your actual computer usage, one whole week of daily backups may fit on one tape. This process can be carried out for weekly, monthly, quarterly, and annual backups.

One last consideration is unscheduled backups. An unscheduled backup is one made in addition to the normal, scheduled backups. For example, a complete backup should be made before any work is performed on the computer hardware or before the computer is sent to the repair shop to correct a problem, even if the problem doesn't involve the hard disk.

3.3.2 Backup Strategy - High Value Data

Outlined below is one possible backup strategy to be used with high value data. A graphic representation of the backup procedure is shown in Figure 3-3. A complete disk backup is made daily on a separate tape for each day. On the last day of the week, a weekly backup tape is made. Each daily tape is then reused the following week with the weekly backup tape being made on a 2nd weekly tape. This pattern will con-

tinue for each week of the month. On the last day of the last week of the month, a complete monthly backup tape is produced. The weekly tapes are then reused when needed. At the end of the next month, a 2nd monthly backup is made. This pattern will continue for the year. At the end of the last week of the last month of the year, an annual backup tape is made. This method would provide the following protection while using 25 tape cartridges for the year:

- A maximum of one day lost within the past week.
- A maximum of one week lost within the past month.
- A maximum of one month lost within the past year.

More elaborate backup strategies can be used to provide better protection with the only limiting factor being the number of tapes used.

3.3.3 Backup Strategy - Medium Value Data

Outlined below is one possible back strategy to be used with medium value data. A graphic representation of the of the backup procedure is shown in Figure 3-4. A complete disk backup is made Monday on a tape marked "Daily". On Tuesday, a backup of only the files that have

Daily Backups

Weekly Backups

Annual Backup

Monthly Backups
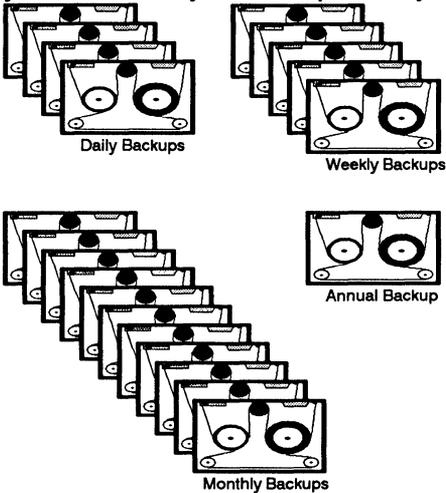
Figure 3-3
High Value Data Backup Method

changed is added to the "Daily 1" tape. On Friday, a complete backup of the disk is made on a tape marked "Weekly 1". The next week, a tape marked "Daily 2" is used for the daily backups and "Weekly 2" for the weekly backup. During the following week, the Daily 1 tape is reused for the daily backups and the Weekly 1 tape for the weekly backup. This method would provide the following protection while using 4 tape cartridges:

- A maximum of one day lost within the last two weeks.
- A maximum of one week lost within the last two weeks.

3.4 Drive Care and Cleaning

The tape drive is designed to operate with a minimum of maintenance care. The recommended preventive maintenance schedule is provided in Table 3-1.
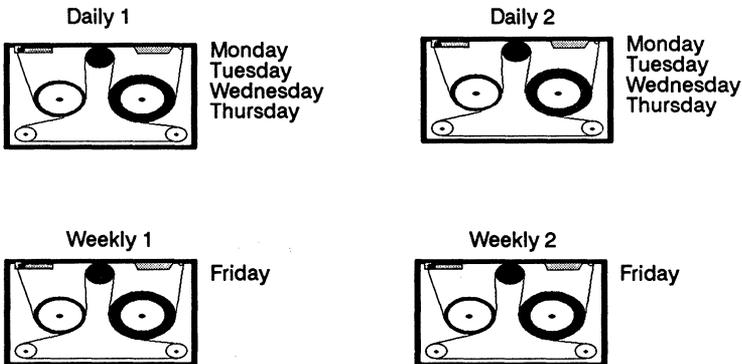

Figure 3-4
Medium Value Data Backup Method

The number of hours refers to "Actual Use Time", the time that a cartridge is installed in the drive and the drive is moving the tape. In a typical backup session, the tape may actually be moving for 20 minutes. At this usage rate, it would take approximately 60 days of use to accumulate the number of hours of use to require the drive to be cleaned. The definition of "As Required" is as follows: "In addition to scheduled cleaning, if the drive software reports an error, cleaning is required". This means that drive cleaning should be performed if the software

Table 3-1
Recommended Preventive Maintenance Schedule

Item	Interval (hours)
Head Cleaning Capstan Cleaning	20 (or as required) 20 (or as required)

reports a "Tape Write Error, Tape Read Error, or Tape Verify Error". If the problem still persists after cleaning the drive, try a different data cartridge.

3.4.1   Head Cleaning

The tape head can be accessed for cleaning from the front of the drive by opening the tape access door with a finger. Refer to Figure 3-5. To properly position the head for cleaning, install a data cartridge in the drive with the power on, and allow the drive to perform the track 0/reference burst search. The head should only be cleaned using Freon TF and polyurethane swabs, commonly available at video stores in VCR head cleaning kits. Wet the swab with the Freon TF solution, and wipe the head using a side to side motion. Use a dry swab to dry any remaining residue from the head.

3.4.2   Drive Capstan Cleaning

The drive capstan can be accessed for cleaning from the front of the drive by opening the tape access door with a finger. Refer to Figure 3-5. The drive capstan should only be cleaned using water and polyurethane swabs.

> **WARNING - The drive capstan should not be cleaned with Freon TF. Permanent damage to the capstan could result.**

Capstan

Push Tape Access Door
Open With Finger

Read/Write Head
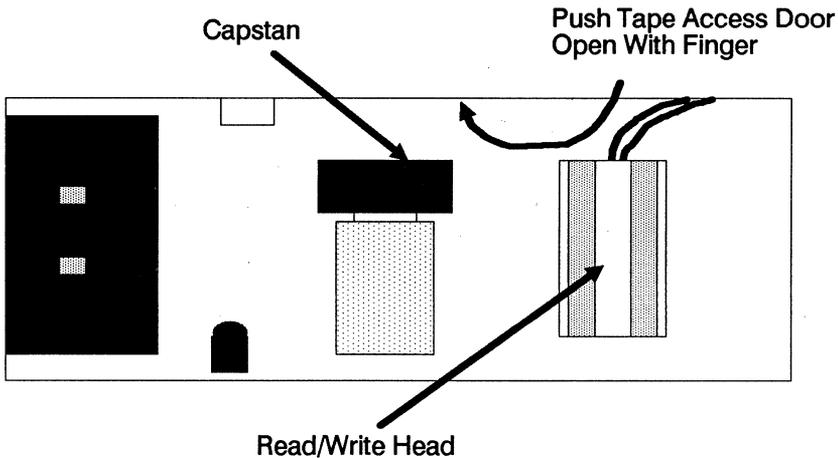
Figure 3-5
Head and Capstan Cleaning Access

Wet the swab with water, and wipe the capstan using a up and down motion. Use a dry swab to dry any remaining residue from the capstan. After insuring that the capstan is completely dry, install a data cartridge into the drive with power on, and allow the drive to perform the track 0/reference burst search. This will rotate the capstan for cleaning the opposite side. Repeat the cleaning and drying procedure to completely clean to capstan.

3.4.3   Media Care and Handling

The data cartridge should be handled with care to protect the valuable data stored on it. The cartridge can be easily damaged by dropping it onto a hard surface such as a desk or the floor. Contamination by dust and dirt can also degrade the data reliability as well as possibly causing permanent damage to the tape drive. Temperature extremes can also cause permanent damage to the data cartridge. The data stored on a data cartridge represents many man hours of labor to create, and the data backup is your insurance policy to protect that time investment. The real catastrophe would not be the crash of a hard disk drive, but the inability to restore the data because the data cartridge has been

damaged by misuse. The following is a list of data cartridge Do's and Don'ts that should be practiced by anyone that handles data cartridges.

Data Cartridge Do's

- Do store the cartridge in it's protective case.
- Do store the cartridge at temperatures between 5°C to 45°C (40°F to 115°F)
- Do allow the cartridge to stabilize after moving from one temperature extreme to another before using.
- Do keep magnetic sources (ie. magnets, motors...) away from the cartridge.

Data Cartridge Don'ts

- Don't drop the cartridge.
- Don't expose the cartridge to moisture or high humidity.
- Don't place the cartridge in direct sunlight.
- Don't touch the tape at the head access hole or cartridge capstan.
- Don't use excessive force while inserting or removing the cartridge from the drive.

3.5   If You Have A Problem During Installation

If the drive does not perform as described after installation, the following items should be checked before calling for assistance:

- Are all cable connectors seated properly?
- Is the data cartridge installed properly?
- Is the data cartridge write enabled?
- Is the software installed properly?
- Is the software configured properly?
- Are the computer option switches configured properly?
- Is there only one terminator pack installed for the floppy disk and tape drive.
- Is the tape head clean?

If the problem persists, try to isolate the problem to the drive, computer, or software. Use the fault symptom guides that follow. If you need assistance isolating the fault, contact the dealer or distributor where you purchased the equipment. Do not return the drive to the dealer, distributor, or Wangtek without first contacting them to receive a return

authorization. Drives returned to Wangtek without a Return Materials Authorization (RMA) number will be refused and returned to the sender at the sender's expense.

3.5.1 Dive Fault Symptoms

The following are symptoms of drive induced faults:
- If the tape drive select light flashes a repeating sequence of 2 or 3 short pulses followed by a 2-3 second pause.
- If the flexible disk drive will not work with the tape drive installed but works fine when the tape drive is removed. Check for the proper installation of the terminator pack in the floppy and tape drives.
- If the tape drive does not perform the track 0/reference burst seek when a cartridge is installed.

3.5.2 Computer Fault Symptoms

The following are symptoms of computer induced faults:
- If the computer will not boot from the hard disk when the tape drive is removed.
- If the flexible disk drive will not work when the tape drive removed. Check for the proper installation of the terminator pack in the floppy and tape drives.

3.5.3 Software Fault Symptoms

The following are symptoms of software induced faults:
- If, when the software is run, the system hangs or locks up. Check the software configuration.
- If the software performs properly when first installed, but stops working sometime later. Reinstall the software from the original diskettes only.