USER'S GUIDE

5099EK / 5125EK /5150EK SERIES

STREAMING 1/4 INCH TAPE BACKUP SYSTEM

(ᵚ) wangtek

USER'S GUIDE NO. 63009-001   Rev. C

FOREWORD

This manual provides operating and service information for the 5099EK/5125EK Series Streaming 1/4 Inch Tape Backup System, 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:

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41 Moreland Road	Unit 1A, Apollo House
Simi Valley, CA. 93065	Calleva Industrial Park
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(805) 583-5255	RG7 4QW England
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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 communications. 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 commercial or residential environment.

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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 kit model designator is the 5XXXEK Series. This model number can be found on the carton end flap. The complete model number breakdown is provided in Figure 1-1 including a parts list for each kit type.

5XXX-EK

```
      ┌─────────────── 099 = 60 MByte
      │                   5099EN Drive
      │                   PC-36 Controller
      │                   SY-TOS Software
      │                   Cable & Mounting Kit
      ├─────────────── 125 = 125 MByte
      │                   5125EN Drive
      │                   PC-36 Controller
      │                   SY-TOS Software
      │                   Cable & Mounting Kit
      └─────────────── 150 = 150 MByte
                          5150EN Drive
                          PC-36 Controller
                          SY-TOS Software
                          Cable & Mounting Kit
```
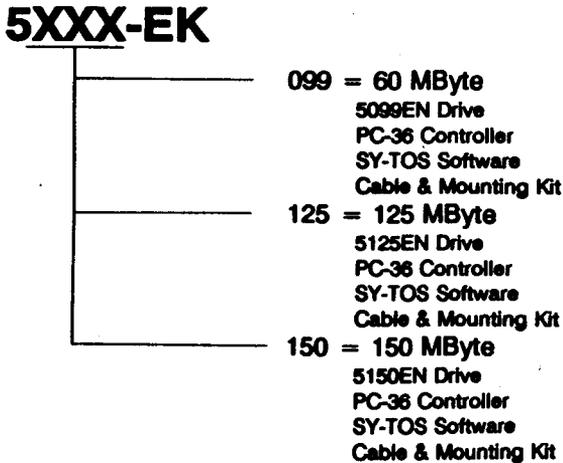
Figure 1-1
Model Number Breakdown

Included on the drive identification label is the drive assembly number, also referred to as the drive part number. The controller board is also identified with it's assembly number along the top edge of the component side of the board. These numbers reflect the exact assembly configuration and should be referred to in any communication with Wangtek.

1.2   Purpose of Equipment

The 5XXXEK, manufactured by Wangtek Incorporated, is designed to write and recover data on DC 600 type 1/4" tape data cartridges conforming to ANSI standard X3B5/85-138. The data format recorded on tape conforms to the QIC-24, QIC-120 or QIC-150 standards, depending on model selected, to provide a formatted capacity of 60, 125 or 150 MBytes, respectively, of data storage. The 5XXXEK 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 removable data cartridge and the QIC standard data formats also allow the system to be used for data distribution. The system consists of a tape drive, IBM PC/XT/AT controller board, cables and software to operate the system in an IBM computer using the PC-DOS or MS-DOS operating systems. The 5XXXEK is also compatible with the Novell Netware network operation system. The 5XXXEK is also compatible with the SCO-Xenix operating system V2.2 using the device drivers supplied by SCO. The 5XXXEK is also compatible with the PICK operating system using the device drivers supplied by PICK.

1.3   Physical Description of Equipment

The 5XXXEK tape drive conforms to the industry standard 5 1/4" half-height form factor. The physical drive outline and mounting dimensions 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. All holes are threaded to accommodate 6-32 by 0.25" length screws. The controller board requires a full length IBM PC/XT (8 bit) expansion slot in the computer. The controller board outline, mounting dimensions and interface connections are provided in Figure 1-3.
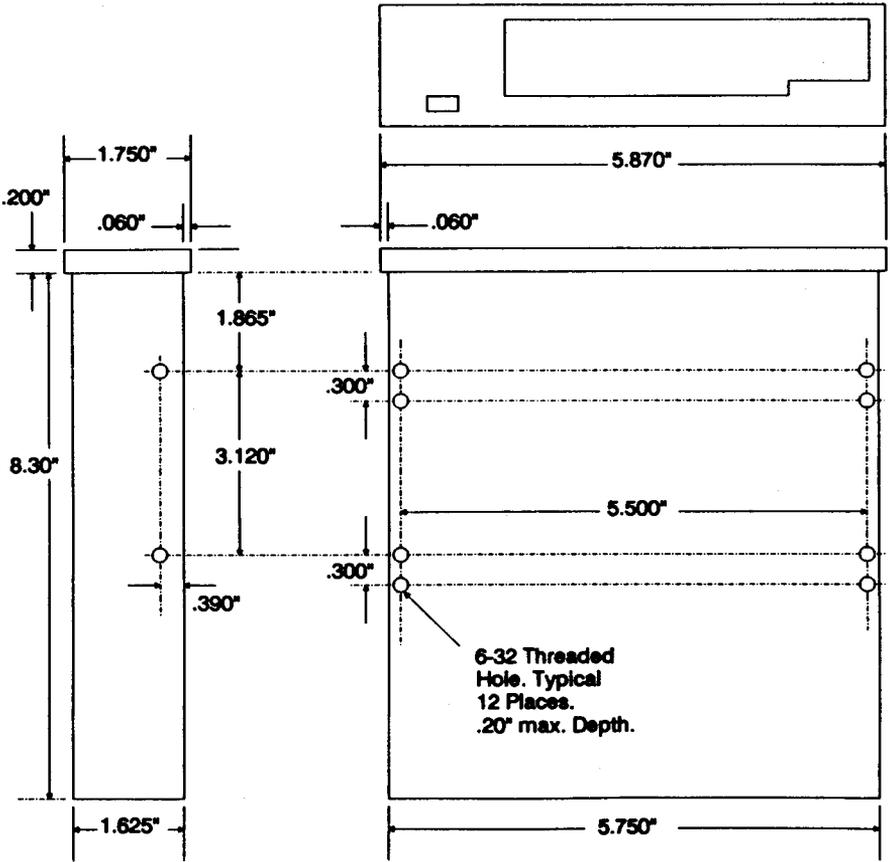
Figure 1-2
Drive Mounting
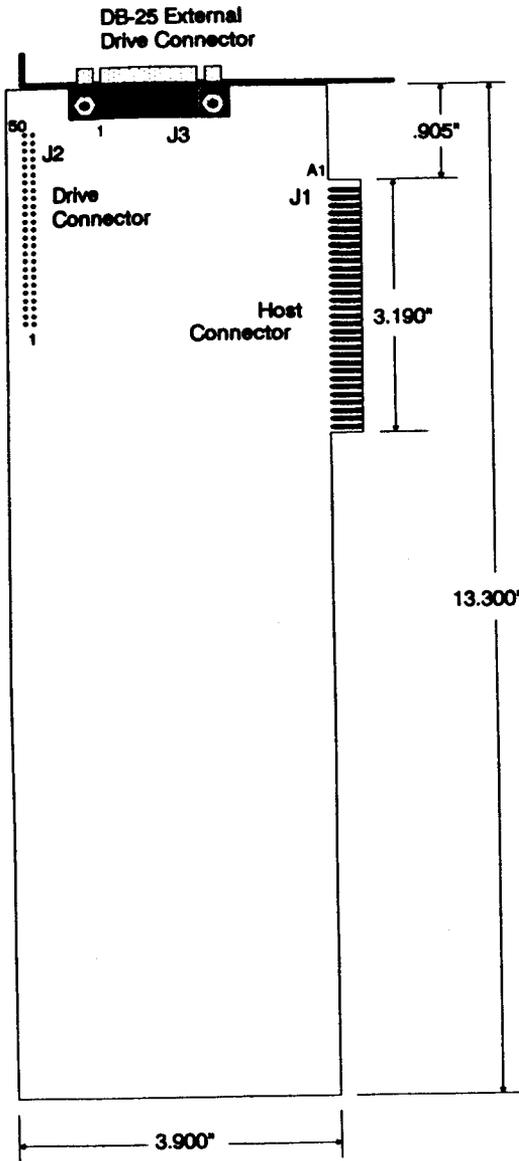
Figure 1-3
PC-36 III (Assy. 30850-XXX) Controller Mounting And Connections

1.3.1   Types of Compatible Storage Media

Table 1-1 lists the compatible storage media for each configuration of the 5XXXEK that have been tested by Wangtek. The data cartridge can greatly influence the data reliability of the storage device.

Table 1-1
Compatible Storage Media

Media Type	5099EK	5125EK	5150EK
3M DC 300XL/P	X		
3M DC 600A	X	X	
3M DC 600XTD	X	X	X
3M DC 615A	X	X	
3M DC 615XTD	X	X	X
DEI Series II Silver	X		
DEI Series II Gold	X	X	
DEI Series II Gold Plus	X	X	X
Sony QD 300XL/P	X		
Sony QD 600A	X	X	

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. The operation of the controller board can be divided into five (5) major functional blocks as outlined in Figure 1-5. Each block is described in the paragraphs below.

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.
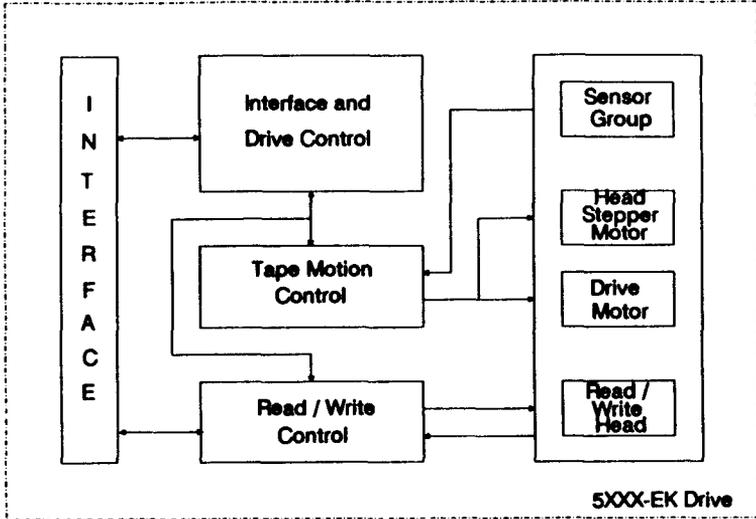
Figure 1-4
Drive Functional Block Diagram
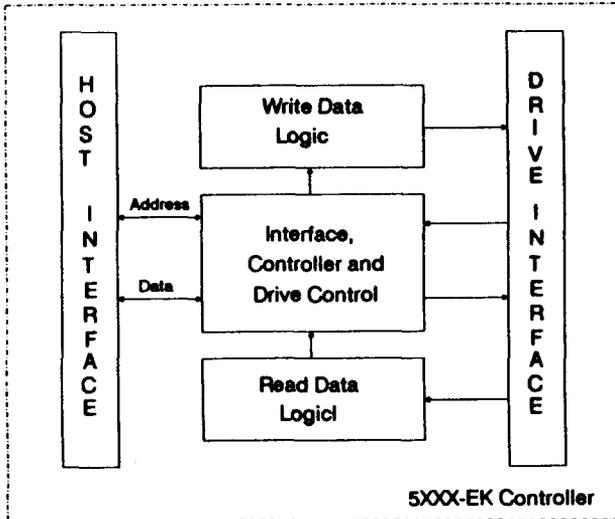
Figure 1-5
PC-36 Controller Functional Block Diagram

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 3.4.1, 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 nine, fifteen or eighteen tracks, depending on the model configuration. The data is transferred form the controller to the drive at a rate of 90 Kbytes per second. The first, or odd 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, or even 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.

1.4.6   Host Interface

This block provides the physical interface to the host computer bus. It contains the necessary logic for I/O port address selection, interrupt selection and DMA channel selection.

1.4.7   Interface, Controller & Drive Control

This block is responsible for the flow of data between the host and the Read Data and Write Data logic blocks. All drive commands are generated by this block while the drive status is monitored for proper operation.

1.4.8   Write Data Control

This block is responsible for converting the data, organized as eight (8) bit bytes, from the host into a serial Group Coded Recording (GCR) data stream. This block also generates the Cyclic Redundancy Check characters that are stored with the data on tape and used by the Read Data Control block to assure reliable read operation.

1.4.9   Read Data Control

This block is responsible for converting the serial GCR encoded data stream coming from the drive to the parallel eight (8) bit bytes to be sent to the host. The block also monitors the read data and performs error checking using the CRC characters stored on tape when the data was generated.

1.4.10   Tape Drive Interface

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

1.5 Mechanical and Electrical Specifications

Refer to Table 1-2 for the mechanical and electrical specifications of the 5XXXEK tape backup systems.

Table 1-2
Mechanical and Electrical Specifications

Tape Cartridge Type	DC 300XL/P, DC 600A, DC 600XTD or equivalent depending on model.
Formatted Capacity	
5099EK	60 megabytes with DC 600A
5125EK	125 megabytes with DC 600A or DC 600XTD
5150EK	150 megabytes with DC 600XTD
Recording Format	
5099EK	QIC-11 or QIC-24
5125EK	QIC-120
5150EK	QIC-150
Recording Code	GCR (4,5) / RLL (0,2)
Recording Density	
5099EK	8,000 BPI
5125EK, 5150EK	10,000 BPI
Number of Tracks	
5099EK	9 (serpentine)
5125EK	15 (serpentine)
5150EK	18 (serpentine)
Tape Speed	72 IPS Read/Write
	90 IPS search or rewind
Long Term Speed Variation	± 7%
Instantaneous Speed Variation	± 3%
Start/Stop Time	≤ 300 milliseconds
Voltage Requirements	+12 volts ± 5%, 500mVp-p max. ripple
	+5 volts ± 5%, 100mVp-p max. ripple
Current Requirements	
+12V Acceleration Surge max.	
5099EK	4.3 Amps (max.) 1.9 Amps (nom.)
5125EK, 5150EK	2.5 Amps (max.) 1.0 Amp (nom.)
+5V	1.0 Amp (max.)
Acoustic Noise	
90 ips	50dBA with cartridge
Power Dissipation (drive & controller)	
Standby (all models)	19.4 watts (nom.)
Opperational	
5099EK	40.3 watts (nom.)
5125EK, 5150EK	25.9 watts (nom.)

Table 1-1 (continued)
Mechanical and Electrical Specifications

Temperature
    Operating   5°C to 45°C (40°F to 115°F) on the
                                       base plate of the cartridge.
    Storage and Shipping   -30°C to 60°C (-22°F to 140°F)
    Wet bulb   26°C (78°F) maximum
    Humidity   20% to 80% non-condensing
Shock and Vibration
    Non-operational Shock   30 G's, 11mS pulse, 1/2 sine wave
    Non-operational Vibration   0 to 17 Hz- .1 inch displacement
                                       amplitude (peak to peak)
                                       17 to 500 Hz - 1.5 G's
    Operational Shock   2.5 G's, 11 mS pulse, 1/2 sine wave
    Operational Vibration   0 to 63 Hz- .05 in. displacement
                                       amplitude (peak to peak)
                                       63 to 500 Hz - 1.0 G's

Altitude
    Operational   -1,000 - 15,000 feet (-.304 - 4.572Km)
    Non-operational   -1,000 - 50,000 feet (-.304 - 15.240Km)
MTBF (Power On Hours at 15% tape motion)
    5099EK   > 8,000 POH
    5125EK, 5150EK   > 15,000 POH
MTTR   30 minutes average
Soft Errors (read mode) $\leq$ 1 in 10^8 bits
Hard Errors (read mode) $\leq$ 1 in 10^{11} bits ($\leq$ 1 in 10^{10} bits for 5099EK)
Dimensions (drive)
    Height   1.625 inches (41.275 mm)
    Width   5.750 inches (146.05 mm)
    Depth   8.500 inches (210.82 mm), including
                                       signal and power connectors, and the
                                     front bezel.
    Weight (drive)   2.4 pounds (1.1Kgrams)
Dimensions (controller)
    Height   3.900 inches (99.06mm)
    Lenght   13.300 inches (337.82mm)
    Thickness   0.50 inches (12.7mm) board
    Weight (controller)   0.6 pound (0.27Kgrams)
Weight (shipping)   8 pounds (3.62Kgrams)
Mounting (drive)   Standard bottom or side mount for
                                     1/2 height 5 1/4" form factor
Mounting (controller)   One IBM PC AT compatible full length
                                     expansion slot
Safety Compliance   UL, CSA, VDE, TUV, FCC Class B

Section 2   INSTALLATION

2.1 Introduction

This section contains information on unpacking the drive, a parts check list, hardware installation, 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 5XXX-EK package should contain:
- 5099EN, 5125EN or 5150EN Tape Drive
- PC-36 III Controller Board
- Interface Ribbon Cable
- Side Rails (AT Version)
- SY-TOS Tape Operating Software (if applicable)
- User's Guide

2.4 Hardware Installation

The following paragraphs contain a step-by-step installation procedure for installing the 5XXX-EK into the IBM 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.

2.5   Quick Start Configuration

This paragraph outlines the basic information needed to quickly configure your tape backup system for use in most systems. For more detailed jumper configuration information, refer to sections 2.6, 2.7 & 2.8.

The tape drive excluded in your kit comes from the factory with the jumpers pre-set, no changes should be required. On the controller board, the DMA channel, Interrupt, and I/O Address must be checked to avoid conflicts with other hardware options. If you experience problems with the operation of the backup system using these quick start configurations, refer to sections 2.6, 2.7 & 2.8. Refer to Figure 2-1 for controller board jumper and switch locations.

2.5.1   Quick Start Configuration - IBM AT Running PC-DOS/MS-DOS

The I/O address comes preset from the factory to 300H. The DMA will be set to DRQ = 1 and DACK = 1. The interrupt will be set to IRQ = 3. These settings will work for most basic AT configurations.

2.5.2   Quick Start Configuration - IBM AT Running SCO Xenix

The I/O address for operation with SCO Xenix must be set to 338H. Set switches 1, 2, 6 & 7 to the ON or Closed position and all other switches to the OFF or open position. The DMA must be set to DRQ = 1 and DACK = 1. The interrupt must be set to IRQ = 5.

Figure 2-1
PC-36 III Controller Jumper And Switch Locations

I/O Address Switch Settings

Address Bit	A1	A2	A3	A4	A5	A6	A7	A8	A9
SW Position	1	2	3	4	5	6	7	8	9	10
Desired Address									
000H	On	On	On	On	On	On	On	On	On	On
2ACH	On	Off	On	Off	On	On	Off	On	On	On
288H	On	Off	On	Off	Off	On	On	On	On	On
300H*	On	Off	Off	On	On	On	On	On	On	Off
338H	On	Off	Off	On	On	Off	On	Off	On	Off

*Default Setting

Default Jumper Settings

Jumper	In	Out
W1	x	
W2	x	
W3		x
W4		x
W5	x	
W6		x
W7	x	
W8		x
W9		x
W10		x
IRQ7	x	
IRQ6		x
IRQ5		x
IRQ4		x
IRQ3		x
IRQ2		x
DRQ1	x	
DRQ2		x
DRQ3		x
DACK1	x	
DACK2		x
DACK3		x

IRQ = 7
DRQ = 1
Mem = 338H

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2.5.3 Quick Start Configuration - IBM AT Running The PICK Operating System

The I/O address for operation with PICK must be set to 338H. Set switches 1, 2, 6 & 7 to the ON or Closed position and all other switches to the OFF or open position. The DMA must be set to DRQ = 3 and DACK = 3. The interrupt must be set to IRQ = 5.

2.5.4 Quick Start Configuration - Novell Netware Operating System

The I/O address for operation with Novell Netware must be set to 338H. Set switches 1, 2, 6 & 7 to the ON or Closed position and all other switches to the OFF or open position. The DMA must be set to DRQ = 2 and DACK = 2. The interrupt must be set to IRQ = 6.

2.5.5 Quick Start Configuration - AT&T 6300 Running MS-DOS

The I/O address for operation in the AT&T 6300 must be set to 288H. Set switches 1, 2, 4, 5, 6 & 8 to the ON or Closed position and all other switches to the OFF or open position. The DMA must be set to DRQ = 1 and DACK = 1. The interrupt must be set to IRQ = 2.

2.6 Drive Preparation - Model 5099EN

The drive contains several option jumpers that must be configured for proper operation before installation in the system unit. The locations of these jumpers 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. 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 between 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.
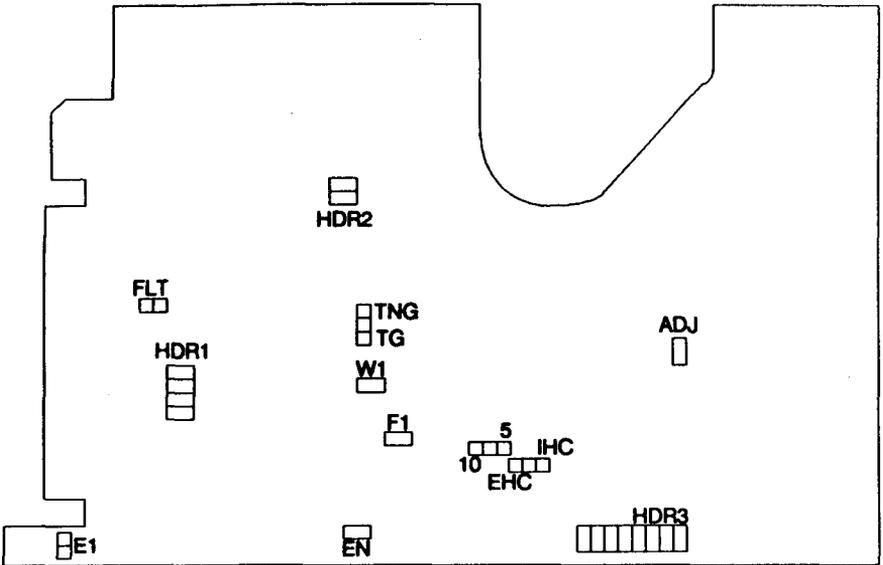
Figure 2-2
5099EN Jumper Locations

Table 2-1
5099EN Default Jumper Setings

Jumper	In	Out		Jumper	In	Out
HDR1-1		X		W1		X
HDR1-2	X			F1		X
HDR1-3		X		HC		X
HDR1-4		X		MDS IN/EX		X
HDR2-1	Etch			EN		X
HDR2-2		X		5		X
HDR3	As	Req.		12TK		X
TNG	X			ADJ		X
IHC	X			TG		X
E1	X			FLT		X
10	X					
9TK	Etch					

2-6

Header Block

Not
Installed   Installed

Figure 2-3
Option Jumper Installition

2.6.1 HDR 1 Pins 1,2,3 & 4 - Unit Address Select

These jumpers are used to configure the drive select address. Refer to
Table 2-2. The default is pin 2 installed.

Table 2-2
Address Jumper Settings

Desired Address (HDR1)	1-8	2-7	3-6	4-5
Sel. 0 Non-Daisy Chain		X		
Sel. 1 Non-Daisy Chain			X	
Sel. 0 Daisy Chain	X	X		
Sel. 1 Daisy Chain	X		X	
Always Selected				X

2.6.2 HDR 2 Pins 1 & 2 - Read Threshold Select

These are special option jumpers for specific applications requiring external read threshold control. In the 5XXX-EK configuration, pin 1 will be connected by an etch on the circuit board and pin 2 will not be installed.

2.6.3 HDR 3 Pins 1-8 - Head Alignment

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

> **Warning - The header 3 jumpers affect the drive head alignment and should not be moved.**

2.6.4 10/5 - Clock Speed

These jumpers select the microprocessor clock speed of 10 Mhz or 5 Mhz respectively. The "10" jumper is hard wired on the board and is the default for this configuration.

2.6.5 E1 - Ground Isolation

When this jumper is installed, the main board logic ground is connected to the chassis ground. When not installed, the main board logic ground is isolated from the chassis ground by a 0.47 microfarad capacitor. The default for this configuration is installed.

2.6.6 EN - Disable Track 0 Search

This jumper is used to disable the track 0 search function after a Reset command is received when installed. If this jumper is not installed, the track 0 search and tape type (300/600) functions will be performed

automatically when a Reset command is received. The default for this configuration is not installed.

2.6.7 MDS IN/EX

These jumpers are reserved for future use and are not installed.

2.6.8 9/12 - 9 Track Select

These jumpers select the number of tracks and their spacing. When installed, the drive will write and read 9 tracks using the QIC-24 specified locations. The 12 jumper is not supported. This jumper is hard wired on the board and is the default for this configuration.

2.6.9 HC/IHC - Write Current

These jumpers determine the source of write current selection. When the IHC jumper is installed, write current is selected by the drive microprocessor as a function of the tape type determined by the microprocessor. When the HC jumper is installed, write current is selected by the HC interface signal from the controller. Only one jumper may be installed and the default for this configuration is the IHC jumper installed.

2.6.10 F1 - Test Mode

When installed, this jumper will cause the drive to repetitiously perform a test shuttle of the drive, moving tape from BOT to EOT and moving the head between the tracks. This mode is for Wangtek internal use only and is not installed.

2.6.11   W1 - Reserved

This jumper is not used and is reserved for future use.

2.6.12   ADJ - Amplifier Adjust

This jumper is used during the testing of the read amplifier and should not be installed at any time. This mode is for Wangtek internal use only.

2.6.13   TNG & TG - Tach Gating Option

When the TNG jumper is installed, the capstan tachometer output to the controller is enabled during the QIC-24 Reference Burst search operation. When the TG jumper is installed, The tachometer output is disabled during the QIC-24 Reference Burst search operation. The default for this configuration is the TNG jumper installed.

2.6.14   FLT - Drive Fault Status

When this jumper is installed, the internal drive fault status signal is sent to the controller. When not installed, the fault status is not sent to the controller. The default for this configuration is not installed.

2.7   Drive Preparation - Model 5125EN/5150EN

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

The default jumper settings can be found in Table 2-3. The default configuration is for installation in the IBM AT. 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 between the proper pin pairs. Refer to Figure 2-3 for proper jumper installation. Extra jumpers may be
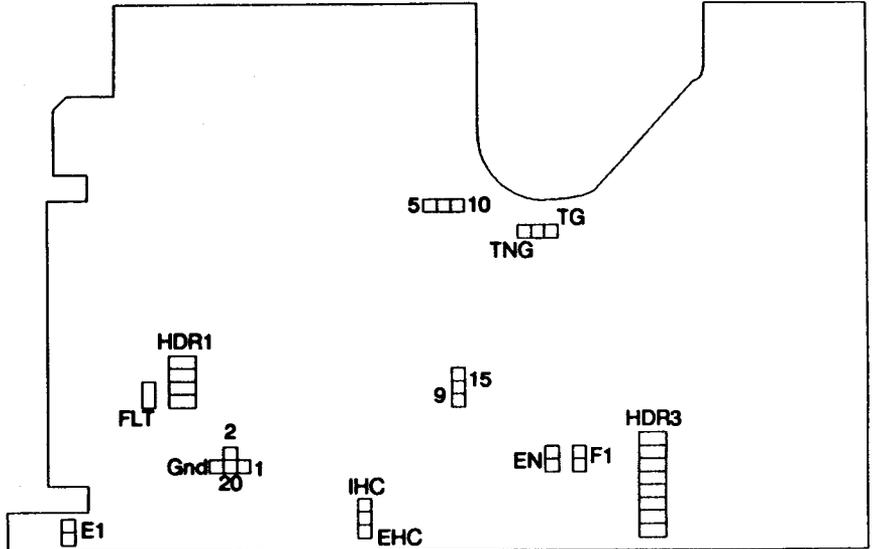
Figure 2-4
5125EN/5150EN Jumper Locations

Table 2-3
5125EN/5150EN Default Jumper Settings

Jumper	In	Out		Jumper	In	Out
HDR1-1		X		W1		X
HDR1-2	X			F1		X
HDR1-3		X		HC		X
HDR1-4		X		MDS IN/EX		X
HDR2-GND to 20	X			EN		X
HDR2-20 to 1		X		5		X
HDR2-20 to 2		X		9TK		X
HDR3	As	Req.		TG		X
TNG	X			FLT		X
IHC	X					
E1	X					
10	X					

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

2.7.1   HDR 1 Pins 1,2,3 & 4 - Unit Address Select

These jumpers are used to configure the drive select address. Refer to Table 2-2. The default is pin 2 installed.

2.7.2   HDR 2 Pins GND to 20, 20 to 1, & 20 to 2 - Read Threshold Select

These are special option jumpers for specific applications requiring external read threshold control. In the 5XXX-EK configuration, pins GND to 20 will be connected. The 20 to 1 and 20 to 2 jumpers will not be installed.

2.7.3   HDR 3 Pins 1-8 - Head Alignment

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

```
Warning - The header 3 jumpers affect the drive
     head alignment and should not be moved.
```

2.7.4   10/5 - Clock Speed

These jumpers select the microprocessor clock speed of 10 Mhz or 5 Mhz respectively. In the 5XXX-EK configuration, the "5" jumper is installed and is the default for this configuration.

2.7.5 E1 - Ground Isolation

When this jumper is installed, the main board logic ground is connected to the chassis ground. When not installed, the main board logic ground is isolated from the chassis ground by a 0.47 microfarad capacitor. The default for this configuration is installed.

2.7.6 EN - Disable Track 0 Search

This jumper is used to disable the track 0 search function after a Reset command is received when installed. If this jumper is not installed, the track 0 search and tape type (300/600) functions will be performed automatically when a Reset command is received. The default for this configuration is not installed.

2.7.7 MDS IN/EX

These jumpers are reserved for future use and are not installed.

2.7.8 9/15 - 9 Track Select

These jumpers select the number of tracks and their spacing. When the "9" jumper is installed, the drive will write and read 9 tracks using the QIC-24 specified locations. When the "15" jumper is installed, the drive will write and read 15 tracks using the QIC-120 specified locations. When both the 9 and 15 jumpers are removed, the drive will write and read 18 tracks using the QIC-150 specified locations. The default for the 5099EK is the 9 jumper installed. The default for the 5125EK is the 15 jumper installed. The default for the 5150EK is no jumpers installed.

2.7.9 HC/IHC - Write Current

These jumpers determine the source of write current selection. When the IHC jumper is installed, write current is selected by the drive

microprocessor as a function of the tape type determined by the microprocessor. When the HC jumper is installed, write current is selected by the HC interface signal from the controller. Only one jumper may be installed and the default for this configuration is the IHC jumper installed.

2.7.10   F1 - Test Mode

When installed, this jumper will cause the drive to repetitiously perform a test shuttle of the drive, moving tape from BOT to EOT and moving the head between the tracks. This mode is for Wangtek internal use only and is not installed.

2.7.11   W1 - Reserved

This jumper is not used and is reserved for future use.

2.7.12   TNG & TG - Tach Gating Option

When the TNG jumper is installed, the capstan tachometer output to the controller is enabled during the QIC-24 Reference Burst search operation. When the TG jumper is installed, The tachometer output is disabled during the QIC-24 Reference Burst search operation. The default for this configuration is the TNG jumper installed.

2.7.13   FLT - Drive Fault Status

When this jumper is installed, the internal drive fault status signal is sent to the controller. When not installed, the fault status is not sent to the controller. The default for this configuration is not installed.

2.8 Controller Preparation

The controller contains several option jumpers that must be configured for proper operation before installation in the system unit. The locations of these jumpers can be found in Figure 2-1. The default jumper settings can also be found in Figure 2-1. The default configuration is for installation in the IBM AT. 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 between 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.

2.8.1 DRQ 1-3 & DACK 1-3 - DMA Channel Select

These jumpers select the desired DMA channel for the controller. The DRQ and DACK jumpers must be configured for the same channel (ie. if the DRQ1 jumper is installed, the DACK1 jumper must be installed). The default for this configuration is DRQ1 & DACK1 installed and all others not installed.

2.8.2 IRQ 2-7 - Interrupt Select

These jumpers configure the controllers hardware interrupt priority, IRQ 2 has the highest priority and IRQ 7 the lowest. The selection of an interrupt must be chosen to avoid conflicts with other hardware options in your computer application. Refer to Table 2-4 for a list of commonly used interrupts. The default for this configuration is IRQ 3 installed and all others not installed.

2.8.3 I/O Address Select

These switches configure the input/output address for the controller. The selection of an input/output address must be chosen to avoid con-

flicts with other hardware options in your computer. Refer to Figure 2-5 for proper switch setting. Refer to Figure 2-1 for the default and common address switch settings.
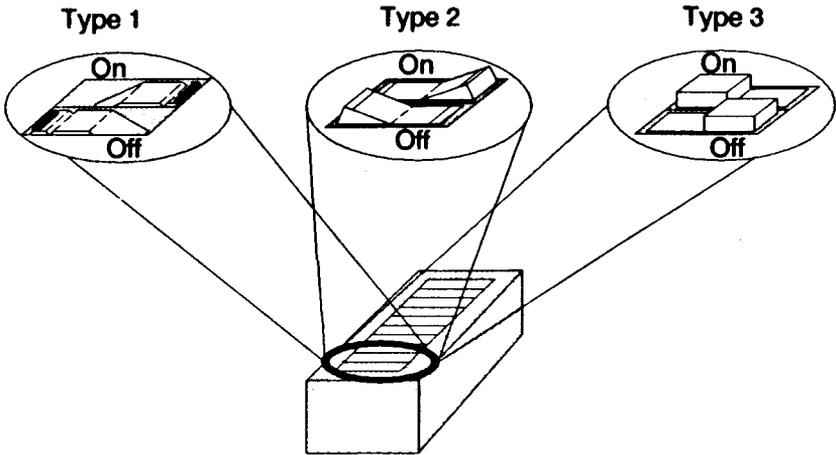
Figure 2-5
On/Off Switch Settings

2.8.4 W1, W6 & W7 - Test Mode

These jumpers are used by Wangtek during the testing of the controller and should not be changed. The W1 & W6 jumpers should be installed and the W7 jumper not installed.

2.8.5 W2 & W3 - RAM Size Select

These jumpers are used to configure the RAM buffer size to match the RAM I.C. installed on the board. When jumper W2 is installed and W3 not installed, the controller is configured for a 2K byte RAM. When W2 is not installed and W3 is installed, the controller is configured for a 8K byte RAM. The default for the 5099EK is W2 installed, W3 not installed. The default for the 5125EK & 5150EK is W3 installed and W2 not installed.

2.8.6 W4 - Read Threshold Select

This jumper is used the controller for external read threshold selection when installed. The default for this configuration is not installed.

2.8.7 W5 & W9- Reserved

These jumpers are reserved for future use and are not installed.

2.8.8 W8 - Power Status

This jumper provides a status signal indicating if the controller has power applied to it. The default for this configuration is not installed.

2.8.9 W10 - Ground Isolation

When this jumper is installed, the main board logic ground is connected to the chassis ground. When not installed, the main board logic ground is isolated from the chassis ground by a 0.1 microfarad capacitor. The default for this configuration is installed.

2.9 Drive And Controller Installation

The following paragraphs contain a step-by-step procedure for installing the 5XXX-EK in the IBM AT computer system. Additional information may be found in the Installation and Setup or Guide To Operations manuals included with your computer.

2.9.1 IBM AT 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 2-6.
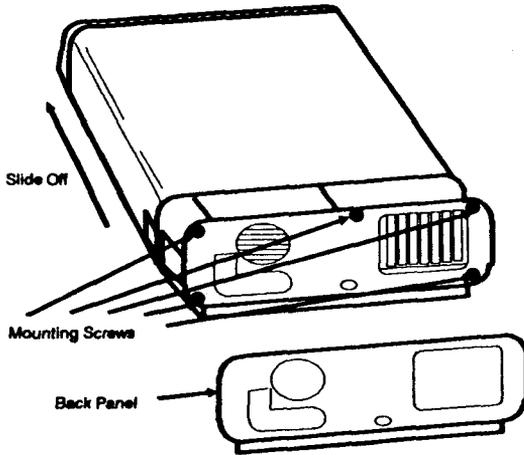
Figure 2-6
IBM AT Cover Removal

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 2-7.

5. Remove the four mounting screws and three mounting clips from the lower right bay as shown in Figure 2-8.

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.

8. 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.

Cover Plate Screws

**Figure 2-7
Cover Plate Removal**

4 Mounting Screws
and 3 Clips

Two
Mounting Clips

**Figure 2-8
Mounting Clip Removal**

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

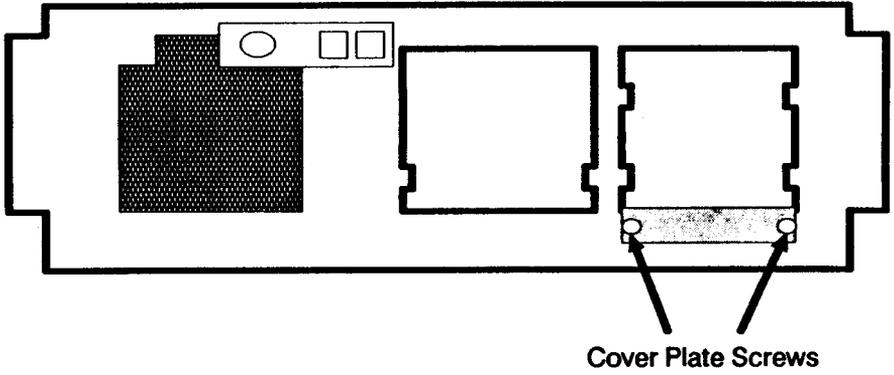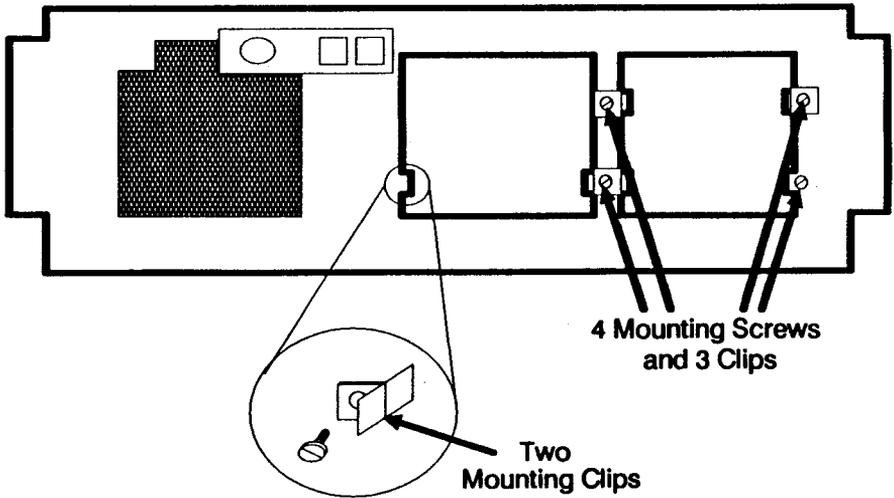10. Remove one of the option slot cover plates located at the rear of the computer chassis.

11. Install the controller board by aligning the circuit board with the card guides at the front and rear of the computer. Slide the board down until the board edge connector aligns with the mother board edge connecter. Push firmly down on the board until the edge connector seats firmly into the motherboard connector.

11. Locate the ribbon cable connector J1 on the rear of the tape drive. Align the locating key on the ribbon cable connector with the locating slot on J1 of the tape drive interface connector and press the connector firmly into place.

12. Locate the ribbon cable connector J2 on the top edge on the controller board. Align the ribbon cable connector pin 1 (blue stripe) with the pin 1 marking on the board. Press the connector onto the pins on the board until it is fully seated.

13. Route the ribbon cable from the tape drive to the controller so that it does not interfere with any other cables and to allow the cover to be re-installed.

14. Find the four wire power connector labeled P12. Align the P12 connector body key with the J2 power jack on the tape 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. The hardware installation is now complete. The software must now be configured to match the hardware configuration. Refer to the software user's guide provided with your software for configuration information.

2.10   Software Availability

The 5XXX-EK tape backup system is compatible with the SY-TOS tape backup software manufactured by Sytron Corporation. It provides a user friendly, menu driven user interface to provide easy disk backup and restore operations. For more information regarding the SY-TOS tape backup software and operation, refer to the SY-TOS Software Installation and Operation Manual provided with the software. For pricing and availability of the SY-TOS software, contact your local Wangtek distributor, Wangtek or Sytron Corporation.

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 configured for read/write or write protected operation. The data cartridge provides for write protection with a record lock located in the right front corner of the cartridge. Refer to Figure 3-1. To allow writing on the cartridge, the record lock must be positioned so that the arrow points away from the word "SAFE", or towards the right 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, rotate the record lock so that the arrow points towards the word "SAFE" 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 end of the cartridge with the tape access door into the drive, refer to Figure 3-3. Continue pushing until the cartridge will push no further, a distinct click will be felt and heard. Release the cartridge and it will slide out partially to the head docking position and the cartridge retainer will be visible at the lower left corner of the cartridge. The cartridge is now properly installed for operation. The drive will automatically position it's head to track 0. If this does not occur, remove the cartridge and insert it again.

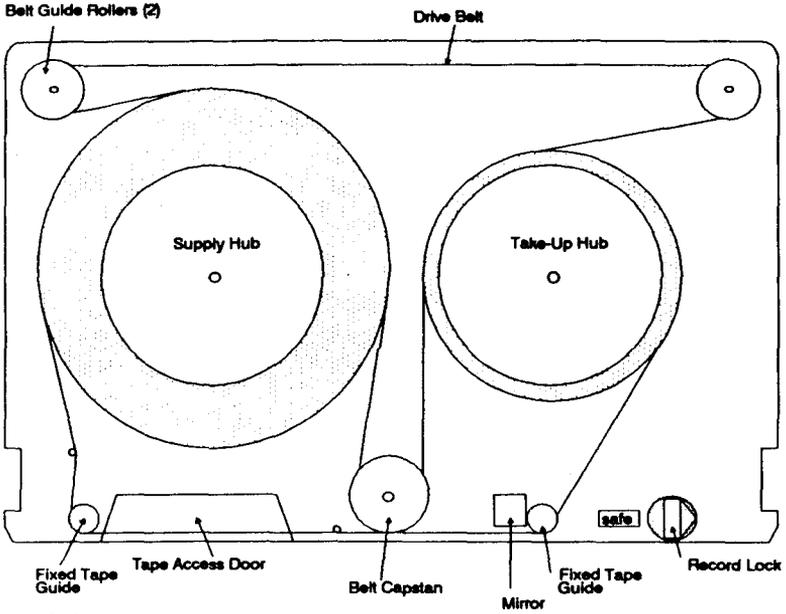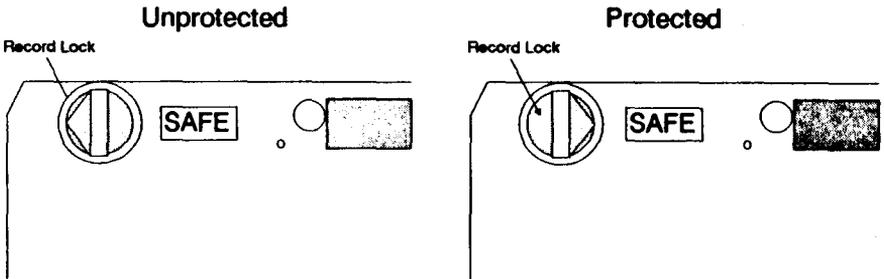**Figure 3-1
Data Cartridge**

Unprotected   Protected

**Figure 3-2
Data Cartridge Write Protection**

3-2

Cartridge Loading
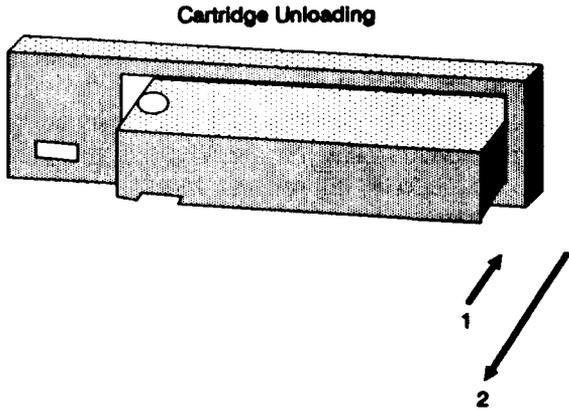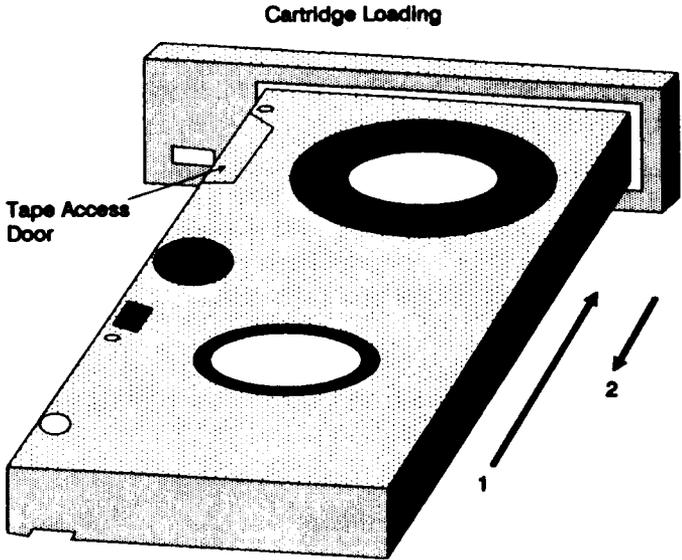
Tape Access
Door

2

1

Cartridge Unloading

1

2

**Figure 3-3
Cartridge Loading & Unloading**

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 inward on the cartridge until it move no further, a distinct click will be felt and herd. The cartridge can now be pulled out of the cartridge access slot, placed in it's protective case, and stored in a safe place.

3.3 Recommended Backup Strategy

The 5XXX-EK 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 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 must 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, 60 megabytes per tape and 20 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 per-

3-5

formed 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 3-4. 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 continue 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.
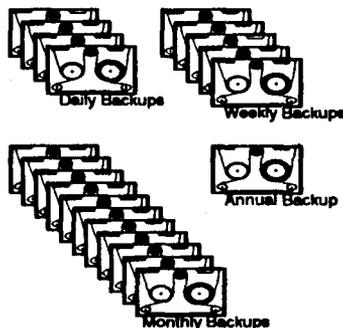
Figure 3-4
High Value Data Backup Method

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 3-5. A complete disk backup is made Monday on a tape marked "Daily". On Tuesday, a backup of only the files that have 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 three weeks.

Daily 1

Monday
Tuesday
Wednesday
Thursday

Daily 2

Monday
Tuesday
Wednesday
Thursday

Weekly 1

Friday

Weekly 2

Friday

Figure 3-5
Medium Value Data Backup Method

3-7

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.

Table 3-1
Recommended Preventive Maintenance Schedule

Item	Interval (or as required)
Head Cleaning	8 hours or 30 days
Head Cleaning (new tape)	2 hours or 7 days
Capstan Cleaning	8 hours or 30 days

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 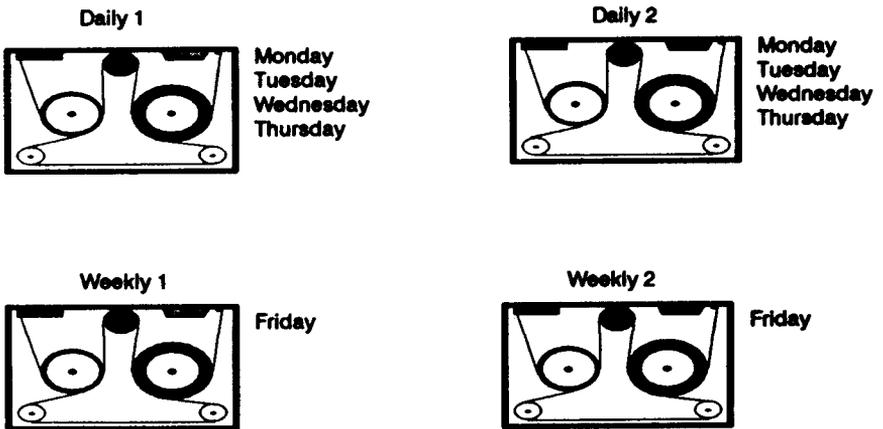would take approximately 21 days of use to ac-cumulate the number of hours to require the drive to be cleaned. The definition of "As Required" is as follows: "In addition to scheduled clean-ing, if the drive software reports an error, cleaning is required". This means that drive cleaning should be performed if the software 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 the cartridge access slot. Refer to Figure 3-6. To properly position the head for cleaning, it must be moved out to the "docked" position. This is accomplished by pushing inward on the cartridge baseplate using finger pressure only. The plate will slide inward until resistance is felt, a distinct click will be felt and heard. Release the plate and it will slide outward, moving the head to the docked position.

The head should only be cleaned using Freon TF and polyurethane swabs, commonly available at video stores in VCR head cleaning kits.
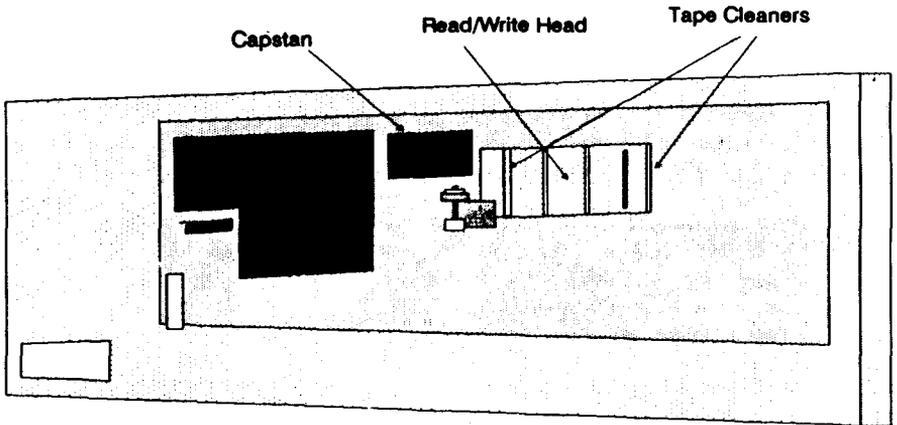
Figure 3-6
Head and Capstan Cleaning Access

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. After the head has been cleaned, it must be moved back to the "undocked" position. This can be done by pressing inward on the cartridge baseplate until resistance is felt, a distinct click will be felt and heard. Release the plate and it will latch the head in the undocked position, ready for data cartridge insertion.

An easier method of cleaning the head is to use the Perfect Data QIC II Drive Head Cleaning Kit (Perfect Data part# 102791-21). The kit consists of a cleaning cartridge with a cleaning pad located such that it will contact the head when inserted into the drive. The cleaning pad can be moved for cleaning the head by the use of a lever located at the end of the cartridge. Before the cartridge is inserted into the drive, the pad must be wetted with a few drops of the cleaning solution provided in the

3-9

kit. After cleaning, the cartridge is removed and the drive is ready for use.

3.4.2   Drive Capstan Cleaning

The drive capstan can be accessed for cleaning from the front of the drive through the tape access slot. 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.**

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 perform a "retention" of the cartridge. This will rotate the capstan for cleaning the opposite side. Repeat the cleaning and drying procedure to completely clean the 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 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 tape drive select light remains on at all times.
- If the tape drive does not perform the track 0 seek when a cartridge is installed.

3.5.2   Controller Fault Symptoms

The following are symptoms of controller board induced faults:
- If the computer system will not boot with the controller installed but boots correctly when removed.

3.5.3   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 and controller are removed.

3.5.4   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.

Appendix A

A.1 PC-36 I (Assy. #30006-XXX)

I/O Address Switch Settings

Address Bit	A1	A2	A3	A4	A5	A6	A7	A8	A9	
SW Position	1	2	3	4	5	6	7	8	9	10
Desired Address										
000H	On	On	On	On	On	On	On	On	On	Off
268H	On	On	Off	On	On	On	Off	On	On	Off
2ACH	On	Off	Off	On	Off	On	Off	On	On	Off
300H*	On	On	On	On	On	On	On	Off	Off	Off
338H	On	On	Off	Off	Off	On	On	Off	Off	Off

* Default Setting

Default Jumper Settings

Jumper	In	Out
E1-E6		X
E2-E5		X
E3-E4	X	
E7-E10		X
E8-E9		X
E11-E12	X	
E13-E14		X
E15-E16		X
E17-E18	X	
W1	X	
IRQ2		X
IRQ3	X	
IRQ4		X
IRQ5		X
IRQ6		X
IRQ7		X
DRQ1	X	
DRQ2		X
DRQ3		X
DACK1	X	
DACK2		X
DACK3		X
DRQ3EN	X	
DACK3EN	X	

Figure A-1
PC-36 I Controller Jumper And Switch Locations

A.2 PC-36 II (Assy. #30422-XXX)

I/O Address Switch Settings

Address Bit	A1	A2	A3	A4	A5	A6	A7	A8	A9
SW Position	1	2	3	4	5	6	7	8	9	10
Desired Address									
000H	On	On	On	On	On	On	On	On	On	Off
288H	On	On	Off	On	On	On	Off	On	On	Off
2ACH	On	Off	Off	On	Off	On	Off	On	On	Off
300H*	On	On	On	On	On	On	Off	Off	Off	Off
338H	On	On	Off	Off	Off	On	On	Off	Off	Off

* Default Setting

Default Jumper Settings

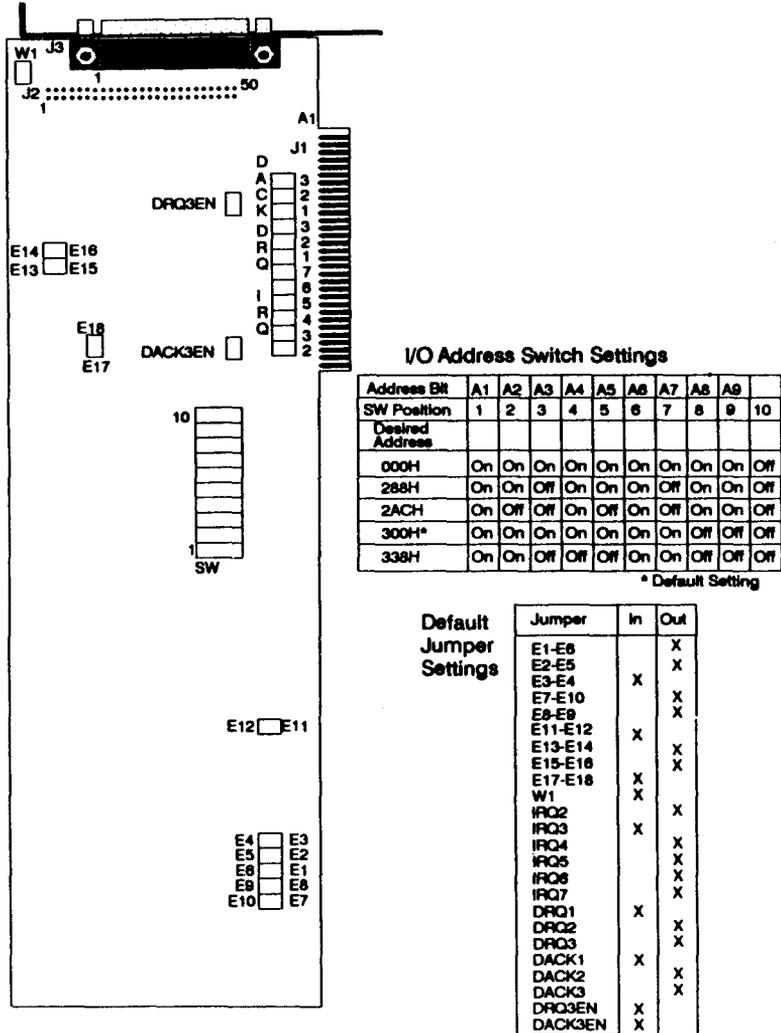| Jumper	In	Out
E1-E6		X
E2-E5		X
E3-E4	X	
E7-E10		X
E8-E9		X
E11-E12	X	
E13-E14		X
E15-E16		X
E17-E18	X	
W1	X	
IRQ2		X
IRQ3	X	
IRQ4		X
IRQ5		X
IRQ6		X
IRQ7		X
DRQ1	X	
DRQ2		X
DRQ3		X
DACK1	X	
DACK2		X
DACK3		X
DRQ3EN	X	
DACK3EN	X	

Figure A-2
PC-36 II Controller Jumper And Switch Locations

A-2