



1/2" Magnetic Tape Drive System for the IBM PC/XT/AT

INSTALLATION GUIDE

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Installation of the PS/2 Tape Controller

(Because installation of this new PS/2 Tape Controller Card is not covered in the current edition of our Tape System Installation Guide, installation instructions are provided here. Please place this sheet in your copy of the Tape System Installation Guide.)

1. Copy the file @5FAA.ADF to your PS/2 Reference Diskette.
@5FAA.ADF is supplied on the enclosed TAP diskette. The PS/2 Reference Diskette came with your computer.
2. Turn off your PS/2 computer and remove the cover.
3. Insert the PS/2 Tape Controller Card in any empty slot in your computer.
4. Insert the PS/2 Reference Diskette in drive A: and turn on your computer.
"Adapter Configuration Error - 00165" should appear on the screen. (If you get error 00113, press <CTRL> + <ALT> + at the same time. If you get another error, turn off your computer, check that the PS/2 Tape Controller Card is properly plugged all the way in, then repeat step 4.) Press <PgDn>, then answer Yes when asked if you want to automatically configure the system. Reboot the system as directed following configuration.
5. Add the line DEVICE=MCATAPE.SYS to your CONFIG.SYS file.
6. Copy the file MCATAPE.SYS to the root directory of your hard disk.
MCATAPE.SYS is supplied on the enclosed TAP diskette.
7. Reboot by pressing <CTRL> + <ALT> + at the same time.
8. Install and connect the disk drive according to the instructions in the Tape System Installation Guide.

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Tape System Installation Manual

For Flagstaff Engineering 9-Track Magnetic Tape Systems

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Introduction

Before You Start ...

This manual contains complete instructions for installing and testing your Flagstaff Engineering 9-track tape controller card and system software. By following these instructions carefully, you should be able to have your tape system working in only a few hours, using a few simple hand tools. The installation procedure doesn't require any extensive technical knowledge, and should be quite painless.

This manual has several sections which have instructions for installing different types of tape controller cards (Flagstaff Engineering currently manufactures 3 types of cards). Please read through the section which describes your type of card **CAREFULLY**. If something doesn't make sense to you, re-read the section until it does. Please **DO NOT PROCEED WITH THE INSTALLATION UNTIL YOU HAVE READ AND UNDERSTOOD THE INSTRUCTIONS!** Remember that Flagstaff Engineering cannot be held liable for damage caused to your system or the controller card on account of faulty installation.

Help!

In case you encounter problems in installation which you can't solve, or if part of the procedure still is not clear (even after re-reading the text several times), please call Flagstaff Engineering for technical assistance. The phone number is (602) 779-3341; business hours are 8-5, Mountain Standard time. Technical support is provided without charge to registered purchasers for 90 days from the date of purchase.

The Packing List

You should have received all of the following parts with your tape system:

- **TAPE DRIVE:** the drive should be packed with its own power cord.
- **CONTROLLER CARD:** this will be one of the following types of cards (the "x" in the part number indicates a revision level for that type of card):
 - **V6.x:** no identifying # on card; has edge connectors at both ends;
 - **V8.x** ("FIFO" card);
 - **V1.2** (286 I/O card).
- **CONNECTOR CABLES:** depending on which card you have, you should receive either 1 or 2 cables--check the list below:
 - **V6.x:** 2 50-conductor ribbon (flat) cables; each has a 50-pin edge connector at each end.
 - **V8.x** and **V1.2:** 1 large round cable, with a 62-pin "D"-connector at one end, split with 2 50-pin edge connectors at the other ends.
- **SOFTWARE:** you should have 2 5-1/4" diskettes, containing the necessary system software (device drivers), application programs and a diagnostic (test) program; these diskettes should be labeled "8850-TAP." A third diskette (8850-TLI) contains additional software for programmers and system developers.
- **MANUALS:** in addition to this manual, you should have a larger manual, the "Tape Utility Software User's Manual," for use with the tape data transfer programs provided with this system.

Installation Overview

There are three main steps in getting your tape system running:

- **HARDWARE INSTALLATION.** This consists of installing the tape controller card in your computer, connecting the controller card to your tape drive, and making any needed adjustments to the tape drive. Hardware installation is covered in Chapter 2 of this manual. Notice that there are separate sections in this chapter, each of which covers one of the 3 types of tape controller card; make sure that you use the right procedure for your card.

NOTE: this manual does NOT cover any specific drive setup procedures. (This includes such things as selecting tape speed, density, and other physical tape parameters.) Refer to the manual for your tape drive for this information.

- **SOFTWARE INSTALLATION.** After you have installed the hardware, but before you run any programs which use the tape drive (including the test program provided with this package), you must install some "system software." This consists of a **DEVICE DRIVER**, as well as any necessary changes to your **CONFIG.SYS** configuration file. Software installation is covered in Chapter 3.
- **TESTING.** After you have finished installing both the hardware and software, you need to test the entire tape system before the installation is complete. A testing program is included in this package, and its use is covered in Chapter 3.

Tools Required For Installation

The following tools are needed to install the tape controller card in your computer:

- medium Phillips screwdriver;
- medium slotted screwdriver;
- small slotted screwdriver.

Hardware Installation

Identifying Your Controller Card

Since there are 3 different types of tape controller cards manufactured by Flagstaff Engineering, you must identify which type of card you have, and then refer to the appropriate section in this chapter for specific installation instructions. Not all cards have an identifying card number on them, but the cards are physically different enough to make identifying them easy.

The following section will help you identify your card, as well as giving you other specifications:

Series V6.x Card:

this is the only controller which has only edge connectors (an edge connector is just an extension of the printed-circuit board with parallel, metallic contact fingers on both sides). There is an edge connector at both the "front" and "back" of the card, plus the bottom bus connector. These cards bear no identifying version number.

- **Characteristics:**
 - will work in all computers (PC, XT, AT, 386 or compatibles).
 - uses DMA; DMA channel is selectable (channels 1, 2, or 3).
 - maximum throughput: 160 Kb/s for PC/XT, 72 Kb/s for AT.

Series V8.x Card:

this card uses a 1/2 Kb "FIFO" (first in-first out) memory buffer to increase throughput. There is one 62-pin "D"-shell connector at the back of the card. Series V8.x cards have their identifying number at the top of the card.

- **Characteristics:**
 - will work in all computers (PC, XT, AT, 386 or compatibles).
 - uses DMA; DMA channel is selectable (channels 1, 2, or 3).
 - maximum throughput: 320 Kb/s for PC/XT, 160 Kb/s for AT.

Series V1.2 Card:

this card uses the 16-bit I/O transfer capability of 286 and upward computers, as well as a 2 Kb FIFO buffer. These cards will NOT work in PC, XT or compatible computers; they will ONLY work in 80286- or 80386-based machines. These cards have one 62-pin "D"-shell connector at the back of the card. Series V1.2 cards have their identifying number at the top of the card.

- **Characteristics:**

- will only work in 80286- and 80386-based computers.
- uses 16-bit I/O transfer; does not use DMA.
- maximum throughput: 800 Kb/s.

All Flagstaff Engineering tape controller cards have jumper-selectable I/O port addresses. All boards occupy a block of 8 I/O addresses; the "base" (starting) address is selectable to be any address between 0 and 3F8 (hex). In practice, the range of usable base addresses is limited by other devices in the system which use I/O ports. The default address of all boards as they are shipped is 350 hex. For more information on selecting the I/O address, see Appendix A of this manual.

Setting Tape Card Jumpers

Before you start the installation, you need to make sure that the card is correctly configured for your system. Depending on which card you have, there will be one or several sets of jumpers on the board. (A jumper is a small removable block which is placed over two pins on the board to connect them together electrically.) Read through the next 3 sections below to determine whether you need to **change any jumpers**. Since all our cards are shipped preset to common "default" settings, they will operate correctly as set in most systems without any changes. Since there are so many add-ons available for the PC, though, it's possible that there may be hardware conflicts if other devices are installed in your system with the tape controller.

If you need to change any jumper settings, make a note of the new settings: you'll need this information when you set up the device driver (covered in Chapter 3).

Checking The DMA Setting

NOTE: if your card is a series V1.2, skip this section: these cards don't use DMA, and have no DMA jumpers on the board.

All of the other Flagstaff Engineering tape controllers use DMA (direct memory access) to accomplish high-speed data transfer. The card can use any one of 3 DMA "channels" (1, 2, or 3). The default DMA channel (1) has been selected to work with most computers (IBM and non-IBM "clones") and adapters. If you think that you have a conflict in your system and cannot use DMA channel 1, try channel 3 next, then channel 2. (Channel 2 is also used by the internal floppy and hard drives in the PC, XT and AT.)

Here's how to select the DMA channel on both the series V6.x and V8.x cards. There are 2 sets of DMA jumpers on the card: one set is labeled "DRQn", and the other set is labeled "DAKn" (where "n" is the DMA channel number--1, 2 or 3). Refer to the card illustrations (Figures 1 and 2) to locate these jumpers. To select a channel, put jumpers across BOTH the DRQ and DAK pins for the desired channel. For example, to select DMA channel 3, you would place a jumper on the 2 pins marked DRQ3, and one on the 2 pins marked DAK3. Be sure to **ONLY** put jumpers on **ONE SET** of DMA channel jumpers (DRQ & DAK).

IMPORTANT! If you change the DMA channel to anything besides the default (1), be sure to remember the setting. The channel selected must be given as a parameter on the device driver line in CONFIG.SYS. Refer to Chapter 3 for information on setting up the device driver.

Checking The Address Setting

The default I/O address (350 hex) used by all the Flagstaff Engineering tape controllers has been selected to be compatible with all types of PC (PC, XT, AT and 386 machines), and with MOST adapters available. In other words, the card will work the way it's shipped in 99% of all cases.

To confirm that you can use the default I/O address, answer the following question:

Does your system have any devices installed in it OTHER THAN:

- video monitor adapter (e.g., CGA, MGA, EGA, Hercules, etc.);
- disk drive controller (floppy or hard drive);
- serial port or modem (COM1:, 2:, or 3:);
- parallel printer board (LPT1:, 2:, 3:, or 4:);
- image scanner interface board;
- expanded (EMS) or extended memory board?

If the answer is "no," use the default address setting and go to the next step. If you have any unusual expansion boards in your system, you may want to check them to see what I/O addresses they use. If nothing uses address 350 - 357 (hex), then there is no problem. Otherwise, turn to Appendix A of this manual to select an alternate I/O address.

The IRQ Jumpers

All of the tape controller cards have 2 IRQ (interrupt request) jumpers on them, to select IRQ 3 or IRQ 5. These jumpers are for future software expansion use: **DO NOT USE THEM!** The current software does not recognize these jumpers.

Time To Install Your Card

Now that you're done checking the jumpers on your card (and making any needed changes to the jumper settings), you're ready to install the

card. Locate your card in one of the 3 following sections, then read that section and follow the instructions given for installing your card. When you're done with the hardware installation, turn to Chapter 3 for instructions on system software installation and testing.

Installation Procedure: V6.x Controller Cards

1. Switch off the computer and any attachments connected to it (monitor, disk drives, printer, etc.). Remove the power cord to the computer to eliminate any shock hazard.
2. Remove the computer's cover. This procedure varies, depending on whether the cover slides off or flips open. If in doubt, refer to the computer's installation and operation manual.
3. Select a vacant expansion slot on the computer's motherboard. This can be any available slot (you can use either a short 8-bit slot or a long 16-bit slot if you have an AT or a '386 computer, although you may want to reserve the 16-bit slots for other expansion cards). If there is a slot cover at the rear of the computer behind this slot, remove the cover. Save the retaining screw from the cover, or obtain a screw, to fasten the tape controller card.
4. Take the two flat ribbon cables, and see that they are marked: one should be marked "P1" or "1", the other "P2" or "2". If the cables aren't marked, then mark them: the longer of the two cables is P2.
5. Snake the two cables through the open slot in the computer's back panel directly behind the selected motherboard slot. Make sure that the red stripe on the edge of each cable is facing DOWN. Viewing from the front of the computer, cable P1 should be at the left, P2 at the right.
6. Attach cable P1 (the cable to the left) to the rear edge connector on the controller card marked P1. Attach cable P2 (the cable to the right) to the front edge connector marked P2. (See the diagram of the card on page 2-8). Make sure that both of these cable connectors are firmly attached to the card.
7. Hold the controller card by the top and press it FIRMLY (don't force it) into the open motherboard slot. Remove the card from the slot, then reinsert it, making sure it is firmly seated in the bus slot. Inserting it twice will ensure a good, clean connection.

CAUTION! If you are installing this card in an older IBM AT, check the bus connectors. Some of these machines were made with 16-bit connectors without dividers; all other machines should have a plastic divider molded into the connector so that an 8-bit card placed in one of these slots cannot slide back and forth in the slot. If you have a motherboard with one of these divider-less slots, **DO NOT USE THESE SLOTS!!!** You can cause severe damage to your computer if a card is misaligned in such a slot. Short of replacing the motherboard (the best solution), the other alternative is to simply not use any of these 16-bit slots with any short (8-bit) card connectors.

8. Screw the card's rear bracket to the rear ledge of the computer. Check that the card and cables are well secured. At this point, the card's installation in your computer is complete. From now on, don't yank on the cables. Do **NOT** change any of the switch settings inside the computer; the tape controller card doesn't require any special settings. If you have an AT or 386, you do **NOT** need to run your computer's "SETUP" program.

9. With the tape drive turned **OFF** and unplugged, attach the two ribbon cables to the drive. Be sure to attach cable P1 to the drive connector marked "P1" or "J1", and cable P2 to the connector marked "P2" or "J2". The red stripe on one edge of the cable must line up with pin 1 of the connector: on some drives, this pin will be marked with a red line.

10. Replace the cover on the computer. Reattach the power cords to the computer and the tape drive.

11. Now you can turn both the computer and tape drive on. Let the computer go through its normal boot sequence; this should complete with no error messages. **IF YOU GET AN ERROR MESSAGE DURING BOOTUP**, turn the computer off, go back and check the installation. The most likely causes of an error during bootup are:

- the controller card isn't seated firmly in the motherboard slot;
- the controller card's selected I/O address conflicts with another device in the system. If you suspect this problem, refer to Appendix A of this manual for information on selecting alternate I/O addresses.
- improper switch settings on the motherboard. Remember-- **DON'T** change any of the current switch settings when installing the tape card! If you suspect this problem, refer to the

Hardware Installation

installation or operation manual which came with your computer.

If the error persists during bootup and you cannot locate the problem yourself, call Flagstaff Engineering for technical assistance. The phone number is (602) 779-3341; business hours are 8-5, Mountain Standard time.

When The Card Is Successfully Installed,

Go to Chapter 3, "Software Installation."

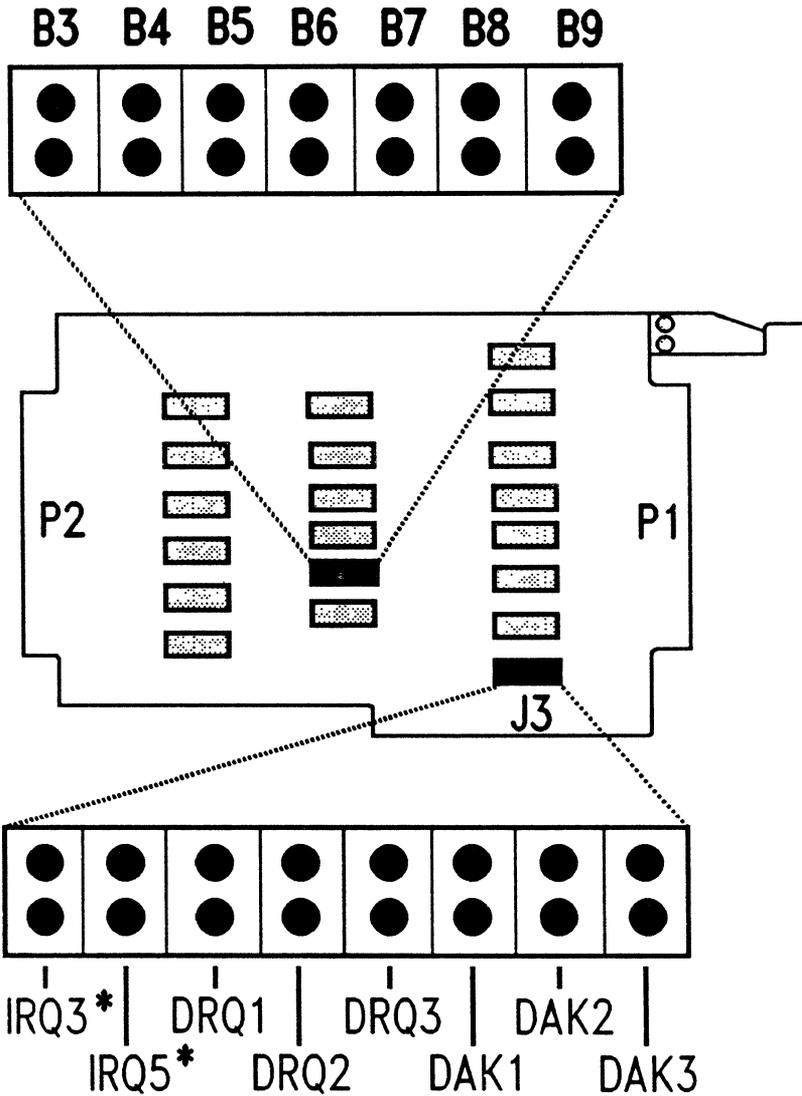


Fig. 1. V6.x tape card showing jumper locations.

*** NOTE:** Do NOT use these jumpers. The IRQ jumpers are for future software expansion and are not currently supported by our software.

Installation Procedure: V8.x and V1.2 Controller Cards

1. Switch off the computer and any attachments connected to it (monitor, disk drives, printer, etc.). Remove the power cord to the computer to eliminate any shock hazard.
2. Remove the computer's cover. This procedure varies, depending on whether the cover slides off or flips open. If in doubt, refer to the computer's installation and operation manual.
3. Select a vacant expansion slot on the computer's motherboard. This can be any available slot (you can use either a short 8-bit slot or a long 16-bit slot if you have an AT or a '386 computer, although you may want to reserve the 16-bit slots for other expansion cards). If there is a slot cover at the rear of the computer behind this slot, remove the cover. Save the retaining screw from the cover, or obtain a screw, to fasten the tape controller card.
4. Hold the controller card by the top and press it **FIRMLY** (don't force it) into the open motherboard slot. Remove the card from the slot, then reinsert it, making sure it is firmly seated in the bus slot. Inserting it twice will ensure a good, clean connection.

CAUTION! If you are installing this card in an older IBM AT, check the bus connectors. Some of these machines were made with 16-bit connectors without dividers; all other machines should have a plastic divider molded into the connector so that an 8-bit card placed in one of these slots cannot slide back and forth in the slot. If you have a motherboard with one of these divider-less slots, **DO NOT USE THESE SLOTS!!!** You can cause severe damage to your computer if a card is misaligned in such a slot. Short of replacing the motherboard (the best solution), the other alternative is to simply not use any of these 16-bit slots with any short (8-bit) card connectors.

5. Screw the card's rear bracket to the rear ledge of the computer. Take the end of the large connecting cable which has the 62-pin "D" shell connector, and attach this connector to the matching connector on the back of the card. Secure this connector to the card, using the two screws on the cable connector.

At this point, the card's installation in your computer is complete. From now on, don't yank on the cables. Do NOT change any of the switch settings inside the computer; the tape controller card doesn't require any special settings. If you have an AT or 386, you do NOT need to run your computer's "SETUP" program.

6. With the tape drive turned OFF and unplugged, attach the two edge connectors at the split end of the connector cable to the drive. Be sure to attach the connector marked "P1" or "J1" to the drive connector marked "P1" or "J1", and the connector marked "P2" or "J2" to the drive connector marked "P2" or "J2". The red arrow on each of the connectors must line up with pin 1 on the drive connector: on some drives, this pin will be marked with a red line.

7. Replace the cover on the computer. Reattach the power cords to the computer and the tape drive.

8. Now you can turn both the computer and tape drive on. Let the computer go through its normal boot sequence; this should complete with no error messages. IF YOU GET AN ERROR MESSAGE DURING BOOTUP, turn the computer off, go back and check the installation. The most likely causes of an error during bootup are:

- the controller card isn't seated firmly in the motherboard slot;
- the controller card's selected I/O address conflicts with another device in the system. If you suspect this problem, refer to Appendix A of this manual for information on selecting alternate I/O addresses.
- improper switch settings on the motherboard. Remember-- DON'T change any of the current switch settings when installing the tape card! If you suspect this problem, refer to the installation or operation manual which came with your computer.

If the error persists during bootup and you cannot locate the problem yourself, call Flagstaff Engineering for technical assistance. The phone number is (602) 779-3341; business hours are 8-5, Mountain Standard time.

When The Card Is Successfully Installed,

Go to Chapter 3, "Software Installation."

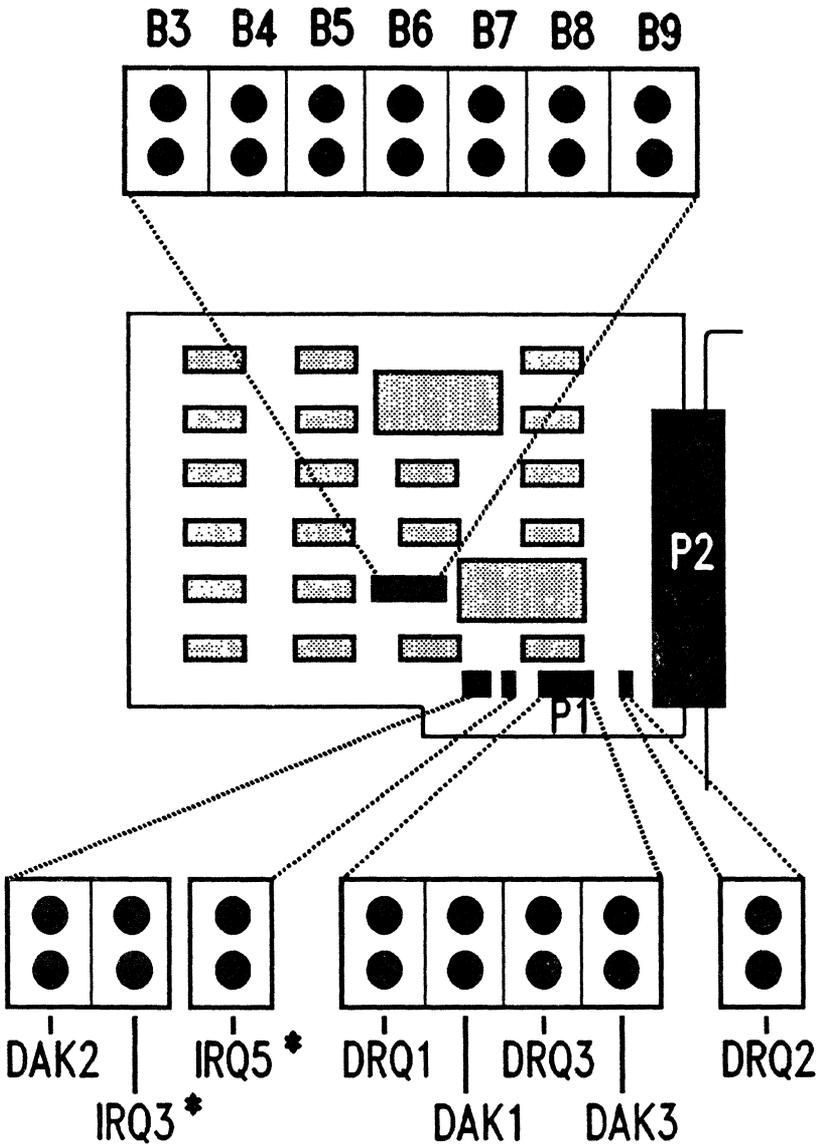


Fig. 2. V8.x tape card showing jumper locations.

* NOTE: Do NOT use these jumpers. The IRQ jumpers are for future software expansion and are not currently supported by our software.

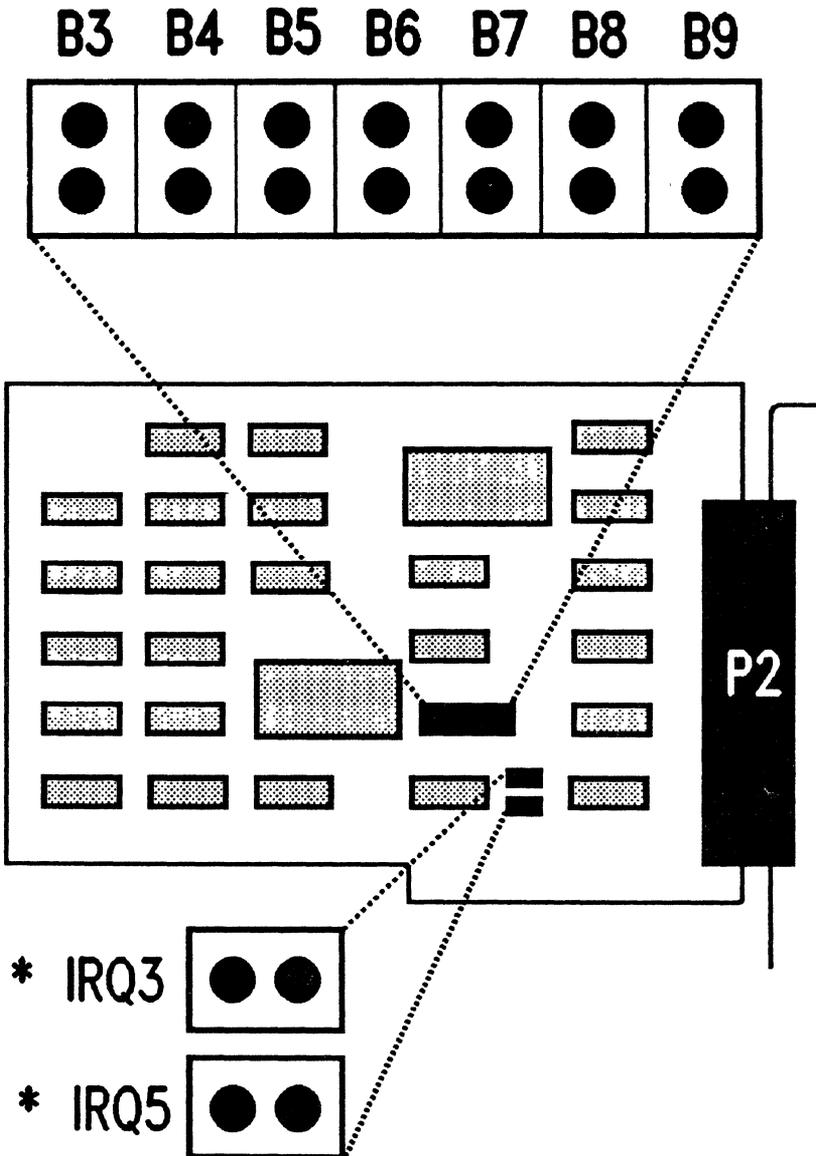


Fig. 3. V1.2 tape card showing jumper locations.

*** NOTE:** Do NOT use these jumpers. The IRQ jumpers are for future software expansion and are not currently supported by our software.

Software Installation

Installing the Tape System Software

After you have completed the hardware installation of your tape controller card, there remains the task of installing the system software to operate the tape drive. This consists of installing a device driver which will be loaded by DOS (the computer's operating system) each time you start your computer up. The device driver is the software link between the tape hardware (the tape drive and controller card) and any application program which uses tape operations.

There are several device drivers included with the tape package; the drivers are on the first diskette of the 2 labeled "8850-TAP." Before you install a driver, you should select the appropriate driver from the table below, depending on which computer type (PC, XT, AT or '386) and other factors explained below. After you've selected the right driver, read the next section for instructions on installing the driver on your system.

The last part of the installation process is testing the entire tape system, using the diagnostic program provided. When everything checks out correctly, the tape system is ready for use.

Which Device Driver Should I Use?

CARD	All (PC, XT, AT, 386)	286/386 only
V6.x	FLAGIO50SYS FLAGAUT.SYS *	FLAGIO50.SYS FLAGAUT.SYS *
V8.x	FLAGIO62.SYS FLAGAUT.SYS *	FLAGIO62.SYS FLAGAUT.SYS *
V1.2	- doesn't work in PC or XT	FLAGIO88.SYS FLAGAUT.SYS *

* NOTE: this device driver will NOT work in systems which have a Flagstaff Engineering disk controller card installed.

To find the right device driver, use the chart above. Select the column which corresponds to the type of computer system you have. Then select the row corresponding to the type of tape controller card you have. The intersection of this row and column contains the usable device drives(s) for that combination. Notice that the driver **FLAGAUT.SYS** can be used with ANY valid combination of computer and controller. This device driver is "auto-configuring," which means that you do not need to tell it anything about how the tape system except (possibly) the port address of the card. **FLAGAUT.SYS** cannot be used, however, in a system which also has a Flagstaff Engineering diskette controller card installed. If you have our diskette controller installed, use the other device driver from the chart entry.

Before proceeding, you should make backup copies of all of the diskettes you got in this package, and put the originals in a safe place. During the following software installation procedure, **USE THE COPIES--NOT THE ORIGINAL DISKETTES.**

Having selected the correct device driver above, you can now install it. There are two steps:

- copying the device driver file onto the disk from which you will be booting your system;
- creating a **CONFIG.SYS** file on this same boot disk, or modifying the existing **CONFIG.SYS** file, to cause DOS to load the tape device driver when you boot the system.

If you have a hard drive in your system, this will normally be the disk from which you boot: otherwise, you will be creating a "boot" diskette.

Copying The Device Driver

If you're familiar with using DOS commands already, just **COPY** the correct device driver (**.SYS**) file from the work copy you made onto your hard drive or boot diskette. You can safely ignore the following explanation of how to copy files.

If you're a little unfamiliar with DOS commands, follow this procedure: (Note that the actual drive letters you use--**C:**, **A:**, etc., may be different depending on what drives you have in your computer.)

Software Installation

1. Boot up your machine in the normal way (just turn it on if you boot from your hard drive, or insert your boot diskette into drive A: if you don't have a hard drive.)
2. Make sure that you're on the drive from which you booted (this will be A: if you booted from diskette, or probably C: if you booted from the hard drive.) Usually the DOS prompt will say what drive you're currently on--for example, if you're on the hard drive (C:), the normal prompt is

C >

If you're not sure what drive you are actually on, you can explicitly change to a drive by typing the drive letter followed by a colon--for example,

C:

will put you on drive C:

Now that you're sure you're on the right drive, make sure you're "logged into" the right directory on that drive. (Don't worry if you don't know what a **directory** is--just follow instructions and take our word for it!) You want to be in the **root** directory; to make sure that you are actually there, type the following command:

**CD **

Notice that the last character is a **backslash**, NOT a forward slash.

Now you can copy the device driver onto the boot disk. If you're on your hard drive, put the work diskette (the copy you made of the original diskette) into drive A:, and type the following command:

COPY A:device driver

--except that instead of typing the words "device driver," you will substitute the actual name of the device driver on the diskette; this is the same name you found in the table above. For example, if the driver you selected is FLAGAUT.SYS, you'll type the following command:

COPY A:FLAGAUT.SYS

If you're using a floppy-drive based system, you will be on drive A:, which means you'll need to copy the device driver from drive B:. (Even a system with only 1 diskette drive always has 2 "logical" drives, A: and B:--you use the one drive as two by swapping diskettes in and out.) Put the work diskette in the second drive if you have two drives (if you only

have one drive, DOS will prompt you to insert the disk "for drive B:" automatically). Then type in the copy command:

COPY B:device driver

where you replace "device driver" with the actual name of the device driver file as explained above.

If the copy is successful, you'll see this message:

1 file(s) copied

Setting Up Your CONFIG.SYS File

You must tell DOS that you want the tape device driver loaded at bootup time by placing a statement in your CONFIG.SYS file; this statement gives DOS the name of the device driver file, and communicates certain information to the device driver about how the controller card is configured. If you don't already have a CONFIG.SYS file, you'll need to create one: if this file exists on your system, you'll need to modify it.

Here is the GENERAL FORM of the statement you need to add to CONFIG.SYS if you are using any device driver EXCEPT **FLAGAUT.SYS**:

DEVICE = devicedriver [(T=DMA channel, 3, address)] [(800)]

(NOTE: there must be NO SPACES inside the parentheses. Be sure to include the commas.)

If you are using **FLAGAUT.SYS**, then the GENERAL FORM of the statement is:

DEVICE = FLAGAUT.SYS [P=address] [(800)]

First of all, let's explain what all these things mean! You do NOT type in the actual statement above--it's simply a guide to show all the parts of the statement. Specifically,

- The square brackets (" []") are NEVER typed: they mean that what's inside them is OPTIONAL, meaning that it can be omitted from the statement. If you use all of the default card settings given below, then you don't need the first optional part.

- **"devicedriver"** must be replaced by the actual name of the device driver file which you copied above, as given in the table above, including the **.SYS**--for example, **FLAGIO62.SYS**.
- **"DMA channel"** gets replaced by the DMA channel number set by the DMA (DRQ & DAK) jumpers on the controller card--1, 2 or 3. The default setting is for channel 1.
- **"address"** gets replaced by the I/O port address (in hexadecimal) set by the address jumpers on the controller card. The default setting is 350.

To avoid conflicts with other device drivers, the **DEVICE** statement for the tape driver should be the first **DEVICE** statement in the **CONFIG.SYS** file.

Notice the last optional part of the statement ("**800**"). This parameter should only be included if you are using a Kennedy 9650 or 9660 tape drive which is set to run at 800 BPI (bits per inch). This is because data written and read at this density is in a different format than data transferred at other densities. If the "**800**" parameter is given, the tape system can **ONLY** be used at 800 BPI.

IMPORTANT: all of the jumper settings on the controller card (I/O address and DMA channel) must correspond **exactly** to the parameters given on the device driver statement.

Some Examples:

1. A V6.x card, using **FLAGIO50.SYS**, with the DMA channel jumpered to select channel 2:

```
DEVICE = FLAGIO50.SYS (T = 2, 3, 350)
```

2. Any card, using **FLAGAUT.SYS**, where the I/O address was changed on the card to 340 hex:

```
DEVICE = FLAGAUT.SYS P = 340
```

3. A V1.2 card (using a 286 AT machine), all settings on the card at their default values, but using a Kennedy 9650 tape drive set to operate at 800 BPI. The system also has a Flagstaff Engineering disk controller card installed, so **FLAGAUT.SYS** cannot be used:

```
DEVICE = FLAGIO88.SYS (800)
```

Use the space below as a work area to write down YOUR device driver statement:

DEVICE = _____ .SYS _____

Now that you have the correct device driver statement, you're ready to put it into your **CONFIG.SYS** file. If you're familiar with editing files on the PC, just add this statement to your new or existing file, and skip the explanation below. If you need a little help with changing **CONFIG.SYS**, read on.

If You Do Not Have An Existing CONFIG.SYS File

You need to create this file. There are several ways to do this. One way is to use a text editor or word processor to create this file. If you have such a program that you're familiar with, you can use it to create a file called **CONFIG.SYS** with the device driver statement in it. This file must be an ASCII file--it must NOT be saved in the word processor's special format. If you don't know how to create an ASCII file with your editor or word processor, use the method given next.

You can create a file by typing it directly from the keyboard, using the DOS **COPY** command. The command is

COPY CON CONFIG.SYS

(CAUTION!! This command will DESTROY any existing file called **CONFIG.SYS**, so be sure either that the file doesn't exist, or that it's OK to replace it.)

The cursor will appear on the left side of the screen without any prompt before it: DOS is waiting for you to type in the file. Keep in mind that you can correct mistakes BEFORE you press the <ENTER> key, but once you hit <ENTER>, whatever you typed is on its way toward the file, so take care in typing.

Type in the entire device driver statement; don't hit <ENTER> yet, but check the statement carefully. When you're sure that it's correct, hit <ENTER>. Before you close the file, you may want to enter the following two statements in the same way:

FILES = 10
BUFFERS = 10

When you're finished entering all the lines for the file (after you've pressed <ENTER> at the end of the line), enter a <CTRL> <Z> to end your input and close the file: this means "hold down the <CTRL> key and type the 'Z' key". The following message should appear:

1 file(s) copied

When You're Done Changing CONFIG.SYS:

Before you use the tape system, you must REBOOT the computer in order for the device driver to actually be loaded. You can use the 3-key boot sequence (<CTRL>-<ALT>-), or turn the computer off, then back on again. When the device driver loads, it will display a short message on the screen. If it doesn't, then it probably didn't get loaded, and you should check your **CONFIG.SYS** file, and make sure that the device driver file is also in the ROOT DIRECTORY OF THE DISK FROM WHICH YOU ARE BOOTING. If the device driver statement is in **CONFIG.SYS** but the device driver is not present on the disk (or if you misspelled the name in the device driver statement), you may get this message on bootup:

Bad or missing xxxxxxxx.SYS

where "xxxxxxx" is the name given in the device driver statement.

Testing The Tape System

After the tape card and software installation is complete, the system should be tested to make sure that everything is working properly. There is a program called **TAPETEST** provided with the tape system software; this program will exercise the tape drive and controller card, and tell you whether there are any problems with the system.

If you have just completed the software installation procedure (above), but haven't yet rebooted your computer, you need to reboot it before you run the tape test program so that the tape device driver will be loaded by DOS.

To use the test program, you'll also need a reel of tape which can be used as a "scratch" tape, since the test program will overwrite any existing data on the tape. Choose a good, clean reel, preferably a brand new one. You'll need to put a write-protect ring on the tape to enable the tape to be written to. Mount the reel on the tape drive and load the tape: make sure the tape is at the load point and that the drive is ready.

NOTE: if you are testing a drive which has the density set at 6250 BPI, be sure to use a tape which is certified for this high density (some tape is only rated for use up to 1600 or 3200 BPI).

Software Installation

Run the tape test program from the COPY of the diskette you made above, not the original disk. Insert the disk in one of your disk drives (say drive A: for this example), then run the program from that disk by typing

A:TAPETEST

(you don't need the A: if you're already on drive A:).

The program will display its ID message and its main menu of commands:

Flagstaff Engineering Tape Test Program Copyright Flagstaff Engineering 02/02/88

Tape controller card found

Tape unit on line at address 0

Tape utility commands:

TST	Test tape installation
EXE	Exercise tape read/write functions
AUT	Automatic continuous test
STS	Display tape drive status
PARM	View additional command list
<RET>	Exit back to DOS
?	Redisplay menu

Main Command: _

TAPETEST is now waiting for you to tell it what to do. The TST function is generally the only test needed to determine if the system is working properly: if this test completes without any read or write errors, then you can safely assume that all is well. If this test fails, or if you experience any problems with a tape application program, then you can use the other test commands for a more extensive checkout of the system.

To end the TAPETEST program and return to DOS, simply hit <ENTER> and no other keys.

A brief description of the available TAPETEST commands follows.

The TST Command

TST performs 2 read-write tests on the tape (first 50 blocks of 10,000 bytes each, then 75 blocks of 64K bytes each). This test is sufficient to test the tape system initially.

The EXE Command

EXE allows you to select the size of block and how many blocks will be written to and read from tape; if you have any problems with the tape system, you can use this command to exercise the system to locate problems with certain block sizes.

The AUT Command

If you want to run a much more extensive test, use the AUTomatic test. This command will run a continuous test on the tape, automatically increasing both the block size and the number of blocks written to tape to test a variety of read-write conditions. This test will run until the EOT marker at the end of the tape is hit, then will rewind the tape and start the test again. To stop the test, hold down both <Shift> keys simultaneously until you see this message:

Test canceled by operator

You can now enter another command, or end the program.

The other commands available in TAPETEST are intended for more detailed troubleshooting, and can be used if you are receiving over-the-phone technical assistance from Flagstaff Engineering.

Problems With Your Tape System?

If you receive error messages from TAPETEST, go back and check your system installation:

- Is the card seated snugly in its slot?
- Are the cable connections solid? Are the cables connected properly? (Make sure that any edge connectors are on the right way, both on the controller card and the tape drive. Refer back to the section in Chapter 2 which covers your tape controller.)
- Is the device driver properly installed?
- Have you rebooted the computer after changing the CONFIG.SYS file and installing the tape device drive?
- Are the DRQ and DAK jumpers on the tape card both on the same set of jumpers (1, 2 or 3)? Are you using the correct DMA channel?
- Do the parameters you gave on the device driver statement in CONFIG.SYS (if any) correspond to the actual jumper settings (I/O address and DMA channel) on the controller card?
- Is the tape drive on line, set to the proper tape speed, data transfer rate, density, and tape address? Is there a good tape mounted which is not write-protected?
- Is the transfer rate the drive is set for within the limits for the controller card? The system will not work properly if the transfer rate is too high. Check the tape drive documentation for information on changing the transfer rate if you suspect this problem.

If you cannot get your system to work properly, call Flagstaff Engineering for technical assistance at (602) 779-3341, 8-5 weekdays, Mountain Standard time.

Changing the Tape Card's Address

Do I Need To Change The Address?

As explained in Chapter 2, you shouldn't need to change the I/O address setting of the tape card in 99% of all cases. However, it is possible for another device to exist at the default address assigned to the tape card. If this happens, the tape card would not work at all, and the system may be rendered unbootable.

Before proceeding further, please note that we are talking about I/O (port) addresses only, NOT memory addresses: the tape controllers do not occupy any memory address in the PC.

If you think you may have an I/O address conflict, the first step is to find the actual I/O addresses used by all the devices in your system: then you can select an address for the tape card which won't conflict with any other device. Determining these addresses may not be easy, since many add-on adapters are very poorly documented. Refer to the list below (Table 2) to determine where most standard I/O devices are situated in the computer's address space. If you have any unusual adapters not listed here, refer to whatever documentation you have for that adapter to locate its I/O addresses (if any--some adapters don't use I/O at all).

Assuming you know which I/O addresses you CAN'T use, you then need to select an address for the tape controller. In theory, this can be any hex address between 0 and 3F8: in practice, you should only select addresses above 200 hex, since most of the addresses below this may be used by devices belonging to the computer itself. The address you select is the "base" address for a series of 8 I/O addresses, and the last digit (hex) of this address must be 0 or 8: for example, a starting address of 2F6 is impossible to set.

Now comes the fun part: converting the 3-digit hexadecimal port address into a binary set of jumper settings! This is actually not going to be as hard as it sounds: you don't need a degree in advanced mathematics to accomplish this.

First of all, we're going to convert the number from hexadecimal to binary. This is done 1 hex digit at a time, using the following table. For each hex digit, you get 4 binary digits (a binary digit being either "0" or "1"). For example, if the hex digit is "E", the corresponding binary digits from the table are "1 1 1 0". Do the conversion from left to right, and write the

result down on paper in groups of 4 digits. For example, the hex number 350 converts to

0 0 1 1 0 1 0 1 0 0 0 0

Address Conversion Work Area

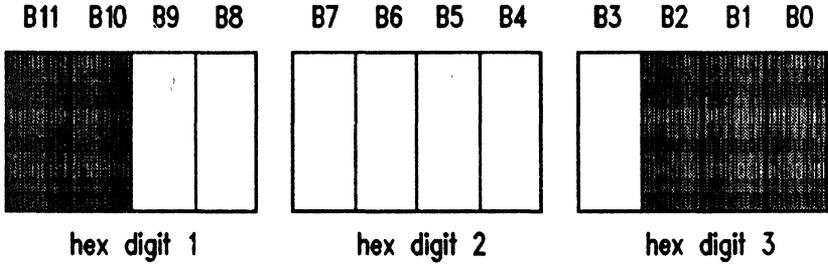


TABLE 1: Hex To Binary Conversion

Hex Digit	Binary Digits
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
A	1 0 1 0
B	1 0 1 1
C	1 1 0 0
D	1 1 0 1
E	1 1 1 0
F	1 1 1 1

Changing the Tape Card's Address

Now copy your binary number into the work area above. Notice that each digit is numbered (B0, B1, etc.). These numbers correspond to the jumpers for selecting the I/O address on all the Flagstaff Engineering tape controller cards; the only difference is that the controller card jumpers only occupy 7 out of the 12 "bits" (binary digits) of the address number. The other digits are assumed to be "0"s. The only problem is that they are upside down, so take the controller card and turn it upside down. Now the jumpers will be numbered in the same order as the diagram above.

To set the jumpers, put a jumper wherever there is a "0", and leave the jumper off wherever there is a "1". Double-check your work; make sure you write down the selected address number; then proceed with the card installation.

If you change the tape address, make sure to change the address parameter on the DEVICE statement in the CONFIG.SYS file. Refer to Chapter 3, "Setting Up Your CONFIG.SYS File."

TABLE 2: I/O Addresses in the PC, XT and AT

Address (hex)	Standard Usage
200 - 20F	Game adapter
210 - 217	IBM expansion unit
278 - 27F	Parallel port 2 (LPT2:)
2F8 - 2FF	Serial port 2 (COM2:)
300 - 31F	Prototype adapter
320 - 32F	Hard drive adapter
360 - 36F	"Reserved" (PC & XT)
378 - 37F	Parallel port 1 (LPT1:)
380 - 38F	SDLC / bisynch. port 2
390 - 393	Cluster adapter
3A0 - 3AF	Bisynch. port 1
3B0 - 3BF	Monochrome display/printer adapter
3C0 - 3CF	"Reserved" (AT only)
3D0 - 3DF	Color Graphics display adapter
3F0 - 3F7	Diskette controller
3F8 - 3FF	Serial port 1 (COM1:)