INTRODUCTION TO QIC TAPE DRIVES

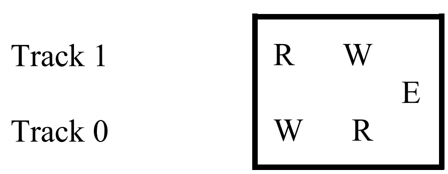
QIC TAPE DRIVES

QIC stands for quarter inch cartridge. These are the most common drives that we see. These drives do not include the minicartridge drives or the Exabyte 8MM or DAT 4MM drives.

As a general rule, there are three possible types of interfaces on these drives, namely QIC 36, QIC 02 and SCSI. The interface is the method of communication between the computer controller and the tape drive. Basically, the computer controller card takes instructions from the computer motherboard and translates these instructions into a language the tape drive can understand. This is done by means of sending the correct series of codes over the correct pin or pins on the cable to the tape drive and the drive will then also communicate with the controller also over the correct pin or pins on the cable. The use and definition of the various lines or pins on the cables differ on these different interfaces.

So long as there are the same number of connectors at each end of the cable, the cables are interchangeable between interfaces. HOWEVER, IF THERE ARE DIFFERENT NUMBER OF CONNECTORS AT EACH END OF THE CABLE, AS IS FREQUENTLY THE CASE ON EXTERNAL CABLES OR THE CABLES INSIDE OF THE EXTERNAL DRIVES, THE CABLES ARE NOT INTERCHANGEABLE - YOU CANNOT USE A QIC 02 EXTERNAL CABLE FOR TESTING A QIC 36 DRIVE, ETC.

All of the heads used in these QIC drives are the same basic construction. Each will have two write heads, two read heads and one full width erase head all combined into one head. They all essentially look like the following:



Thus, each of these heads are two channel heads, each channel consisting of both a write head and a read head. The function of the heads is that the tape will move in one direction using channel 0 for writing, then when it reaches the end of the tape, the tape will reverse direction and the data will be written with channel 1. When the tape reaches the beginning of the tape again, the stepper motor will move the head to a new position and write forward using channel 0. This continues until all of the tape has been written on by the drive.

The data is written onto the tape by means of altering the magnetic pattern on the tape. Current is applied to the head from the main PCB and it goes through the coils in the head, jumps the gap, and goes back out of the head to the PCB. The tape head contact across the gap is thus very important as it is during the jump where the magnetic field on the tape is altered thereby writing the data. Poor contact will result in a lower intensity of field resulting in minimal or no alteration in the tape making it difficult or impossible for the head to read the data.

The drives vary in capacity based upon how many tracks they can write onto a quarter inch wide tape which is contained within the cartridges, and how much data density that they can put onto each tape. The first is controlled by a combination of the stepper motor and the gap width on the heads. The second is controlled by the strength of the signal going to the head, the gap, and the chemical composition of the tape.

All of these quarter inch drives meet various QIC standards. We have already discussed above the QIC 02 and QIC 36 interfaces, which are two of the standards. These standards are designed to insure interchangability across drives and even manufacturers. Thus, with limited OEM proprietary exceptions, Archive drives can be run with Wangtek controllers, etc.

The QIC 36 and QIC 02 interfaces are unique to quarter inch tape drives. HOWEVER, the SCSI interface is a general purpose interface designed to allow the computer to communicate with a number of different types of peripherals, including hard drives, tape drives, optical drives, CD-ROM drives and even some printers. This interface is also designed to allow more than one peripheral to be attached to a single controller in the computer. In order to accomplish this feat, the controller and each separate peripheral must have a separate identification to allow the computer to communicate with the proper device. This is called the SCSI ID, and it is different from the controller address. As a general rule, the host adapter in the computer is generally identified as SCSI ID #7. Several controllers, in particular the ADAPTEC line, reserves SCSI IDs 0 & 1 for a hard drive. This means that the tape drive you are testing should not be set to SCSI ID 0, 1 or 7. A conflict in the SCSI ID settings may lock the system or cause other errors which could incorrectly be interpreted as drive problems.

Also, since the SCSI interface allows multiple devices to be attached to the same controller, there must be a method used to allow the computer to know which objects are the last in the daisy chain. This is accomplished through the use of terminators. The controller, being the first in line, and the last device in that line should have terminators, and any devices in between the two should <u>not</u> have terminators. Incorrect setup here will also frequently cause problems or errors which have nothing to do with the functioning of the device itself. It should also be noted that if the SCSI controller is attached to both internal and external devices, the terminators on the controllers may also have to be removed, but this varies from controller to controller.

In addition to these interface standards, there are data recording standards. These data recording standards are grouped essentially by track capacity and data capacity. The QIC 11 standard is essentially a 4 track standard, QIC 24 is a 9 track standard, QIC 120 is a 15 track standard, QIC 150 is an 18 track standard, QIC 525 is a 26 track standard, and QIC 1000 is a 30 track standard. These standards, without use of software data compression, will yield backup drive capacities as follows: QIC 11 - 45MB; QIC24 - 60MB; QIC 120 - 125MB; QIC 150 - 150MB; QIC 525 - 525MB; and QIC 1000 - 1.0GB. These capacities will be achieved with use of the correct tape - QIC 11 & 24 using DC600A; QIC 120 & 150 using DC6150; QIC 525 using DC6525; and QIC 1000 using DC9100.

Due to this method of recording, even and odd tracks are not placed next to each other on the tape, nor is track zero in either the precise center of the tape or at either edge. This means that the right QIC standard alignment tape must be used for each different QIC standard drive.

The tape itself has a series of holes in it at either end. The placement of these holes is specific to the type of tape and allows the sensors in the drive to learn certain information regarding the tape, including such things as the type of tape (eg 6150 or 6525) and when it is getting close to the end of the tape.

Check the appropriate drive manuals on the types of tape which can be used for each drive. For example, a 9 track drive cannot write on a 6525 tape and will generate error messages that have nothing to do with the function of the drive.

There are early warning end of media holes in response to which the tape drive should reduce the length of the data which is being written at any one time so as to not lose data as the head is switching tracks.

When the end of media hold is reached, this signals the drive to pause it's writing/reading, and switch from head(channel) 0 to head(channel) 1 and reverse the motion of the tape. Then when the beginning of media hole is reached, this signals the drive to pause it's writing/reading, to move the stepper motor to position the head to the next track, to switch from head 1 to head 0, and to reverse direction of the tape.

NOTE: (Added 1996): Neither the QIC36 nor the QIC02 interfaces are recognized by Windows95, or for any backup software which runs on Windows95. If you run older Windows 3.1 software and think you are backing up to your drive, you are creating a problem as the old software will truncate the Windows95 file names down to the old DOS 8.3 file name format which means that on restore you will not have the correct and complete file names. This will cause problems.

MINI-CARTRIDGE/FLOPPY INTERFACE DRIVES (including Travan)

The minicartridge drive bears many similarities to the QIC drives, but there are important differences.

First, the heads used are single gap, dual function heads, which means that unlike the QIC drives, they are not capable of the read after write function. These heads are either writing or reading.

Second, they communicate with the computer over the floppy interface cables which are also attached to the floppy drives contained in the system. This means that they also bear many similarities to floppy drives, in particular the need to format the media, the need for drive select jumpers which cannot conflict with other devices on the cable, and the use of terminators for the last drive in the chain.

Third, and perhaps most frustrating, is that since they communicate over the floppy interface and not a tape interface, there are no interchangeable data standards. Each manufacturer has developed software to manipulate the meaning of the signal lines on the floppy cables. This means that as a general rule, Irwin drives will only work with Irwin software, Alloy with Alloy software, etc. Also, it frequently means that even within manufacturers, there is not necessarily any interchangability. For example, there is no guarantee that an Irwin 80MB drive can read a tape written on an Irwin 40MB drive using the identical version of software.

Recently, the drive manufacturers have been releasing mini-cartridge drives which have a SCSI interface. Thus, the discussion set out above in the QIC section regarding the SCSI interface applies to these drives as well.

In addition, due to the increasing popularity of these drives, a QIC 80 universal format has now been recognized. This is known as XIMAT. This will allow a pre-formatted tape to be used across the manufacturer lines. For the end user, this eliminates the 1-2 hour formatting time. Of course, once used, the tapes are not interchangeable in terms of being able to read data across software packages. Any drive capacity higher than the 80/250MB capactiy will use a standard interchangable format. Also, these now have pre-formatted tapes available, thereby eliminating a good deal of time associated with formatting.

Despite the adoption of the universal format, most drive manufacturers still have proprietary format options as well.

Further, the capacity of the drives is highly misleading. Drives advertised as 120MB such as the Colorado Jumbo 120, is actually a 40MB drive using a longer tape and data compression. On the other hand, the Mountain FS8000 is advertised as 125MB capacity is a 80MB drive using a longer tape, and is also sold as an FS8000+ which is the same drive but achieves 250MB capacity through software available data compression.

Because of the use of the floppy interface, data transfer rates are extremely slow. Also, because of the single function head, a separate verification run is absolutely essential in order to insure the data integrity. A good example of this need is shown by the drives behavior during a format process, the drive may spend hours “formating” a tape, only to discover at the very end of the process when it switches to read mode that the tape has not been formatted.