



INSTALLATION AND USERS GUIDE

TAPE BACKUP SYSTEM

MAY 16, 1985

TAPE BACKUP SYSTEM

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I M S I N T E R N A T I O N A L
T A P E B A C K U P S Y S T E M

SECTION 1 - GENERAL DESCRIPTION

1. Introduction

1.0 FEATURES:

The IMS Tape Subsystem combines a high capacity 1/4" cartridge tape drive and a software utility that permits the backup and restoration of programs and data files from a Winchester disk drive.

The "QIP" program is the utility used to transfer files between disk and tape. Its simple, logical instruction set supports both ambiguous and unambiguous file names, file types, and user numbers. QIP allows the user to backup or restore a single file or an entire drive with equal ease. QIP will run under any TurboDOS operating system in banked or non-banked memory.

1.1 TAPE FORMAT

QIP organizes data on the tape in a way that allows referencing of a file by name. A label is recorded at the beginning of the tape containing up to 255 characters of descriptive text. This label will be displayed when the tape is restored. The tape drive has 9 data tracks and uses the serpentine method of recording. This method allows the reading or writing of one track and then the reading or writing of the next track in the opposite direction without rewinding, which saves considerable rewind time when accessing multiple tracks of data. Data is written sequentially on each track. If the tape is filled during a backup operation, a message requesting a new tape is issued and the backup will continue once the new tape is inserted.

2. TAPE SYSTEM SPECIFICATIONS AND INSTALLATION
OF 1/4" CARTRIDGE TAPE DRIVE

The tape drive is a high capacity data storage device that consists of two parts: The QIC-02 formatter, and the drive mechanics.

The QIC-02 formatter performs most of the control functions between the tape drive and the host interface.

The tape drive uses the ANSI standard 1/4" tape cartridge which will accept and automatically adjust gains for either standard 45 MByte cartridges (450 ft.) or high-capacity 60 MByte cartridges (600 ft.).

Technical Specifications:

Tape speed : 90 IPS
Capacity formatted : 45 MBytes/60 MBytes*
Total tracks : 9
Recording form : Serpentine
Recording media : ANSI Spec. No. X3.55-Certified
Recording tape length : 450 feet/600 feet*
3MDC300XL/3MDC600A

Model 1120 QIC-02 Tape Controller

General Description:

The Model 1120 IC0-02 interface controller is a printed circuit board that occupies one slot in the IMS computer systems. The controller contains an 8257 programmable DMA circuit which provides the DMA interface between the QIC-02 1/4-inch tape drive and the S-100 bus. Interface to the tape drive is accomplished via a 50-pin ribbon cable.

Technical Specification:

Drive Interfaces: 50-pin header for QIC-02 streaming cartridge tape drives
Addressing: The Model 1120 requires eight I/O ports. The base address of these ports is D0H. The base address is hard wired. There are no strap selections for address changes.
Bus Interface: S100 IEEE specification
Power Requirements: +8 volts @ 1A
+16 volts @ 80 MA
Operating Environment: 0-55 deg.C

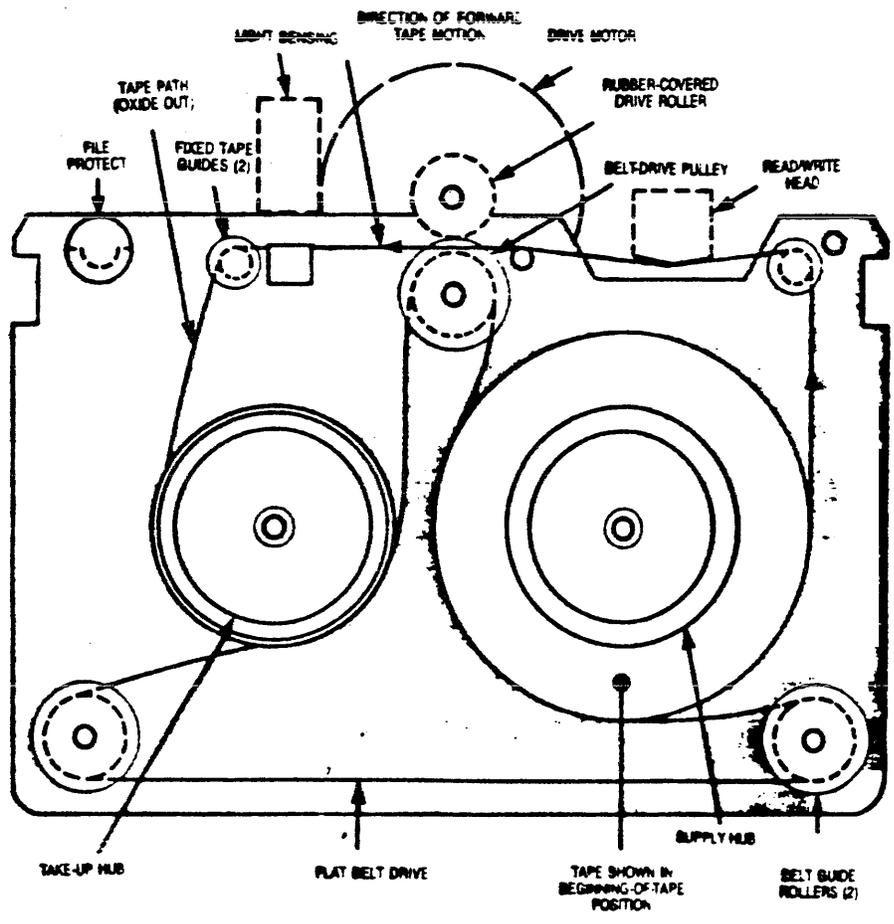
Cartridge (See Figure 1)

The tape cartridge drive uses an ANSI standard 1/4-inch tape cartridge. The tape cartridge has several distinct physical features designed for industry use:

- * Three Reference Locators
- * In-position Sense
- * Mirror Mechanism



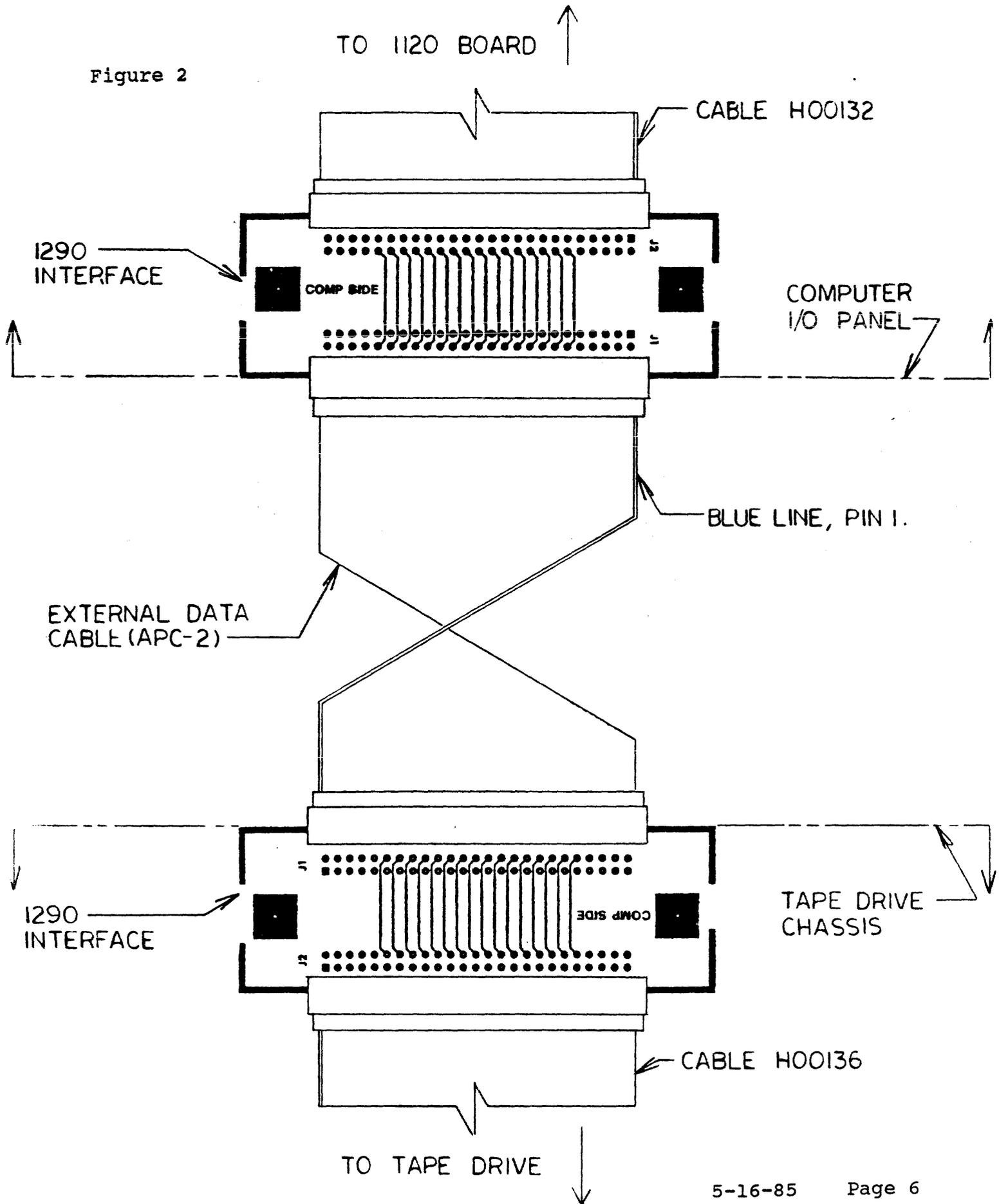
Figure 1
Tape Cartridge



Installation

1. Install the 1290 interface on the inside of the computer I/O panel using the two (2) 6-32 screws provided.
2. Install the A1120 controller in the card cage.
3. Connect the 1290 interface to the controller using cable H00132. (Note the blue wire designates Pin 1 on the cable. Route the cable so that Pin 1 is toward the center of the controller board at J1).
4. Connect the cable to the interface board, aligning the blue wire with the Pin 1 designator located on the interface board as shown in figure 1.
5. Install the external data cable between the tape drive unit and the computer I/O panel. Align the blue line with the Pin 1 designators located on the interface board as shown in figure 2.

Figure 2



3. BACKUP AND RESTORE PROGRAM INVOKING QIP

The QIP utility is invoked by typing QIP in response to the system prompt.

```
A> Master <cr>
A> QIP <cr>
```

When called, QIP displays a menu of the possible options, and prompts the user for his selection. The selected task is performed, and upon completion a prompt "ENTER FILE NAME" is displayed. At this point enter more file names or depress the carriage return to get back to the main menu.

PLEASE NOTE: Once the operation has begun it cannot be aborted without resetting the computer. If a reset is used to abort the program during a backup or restore, the data written may not necessarily be valid and should be rewritten.

QIP COMMAND MENU

The Command Menu is as follows:

```
(S)ave files to tape
(R)estore files from tape
(L)ist files on tape
e(X)it program
```

Select (S, R, L, or X):

3.1 QIP COMMANDS

(S) SAVE FILES TO TAPE

The Save command performs a disk to tape backup. Upon execution it first asks, "Saving Unarchived Files Only". If "yes", it will backup only the files which do not contain an archive bit. (See file attribute section in the TurboDos User's Guide). If "no", all files may be backed up. The next question is "Skip FIFO files (Y/N)?" If "(Y)es", all specified files except FIFO files will be backed up. If "(N)o", all files, including FIFO files, will be backed up. Its next request is for the "Name and Date of Backup". This is simply a title for the tape that can be up to 256 characters long. This title is displayed when the tape is restored. After the title is entered, the next prompt is "Enter file number (0-9 or RETURN):" This is an append function to allow multiple logical groups of files on the same tape, e.g. Drive A = File 0 and Drive B = File 1, etc. A number is entered here from 0 to 9 to identify which logical group of files you will be backing up to.

NOTE: A <cr> always defaults to FILE NUMBER 0, even if you already have a FILE NUMBER 0 on the tape. Therefore, if you have files in a FILE NUMBER 0 and hit <cr> your data to be backed up will overwrite any files on the tape starting at FILE NUMBER 0.

CAUTION: Be sure to record which FILE NUMBERS you have selected, and which groups of files are assigned to each number as QIP has no way of telling you how many logical file groups reside on a tape. For example if you already have a FILE NUMBER 4 again QIP will overwrite all files on the tape starting at FILE NUMBER 4. After you have selected a file number the tape will rewind and upon completion QIP will be ready to accept file names to be processed. (See section 4 File Naming Conventions).

The file names can be entered from the console or from a TurboDOS "DO" file. It then searches for this file(s) on the disk and copies it to tape. Once it has completed this operation it returns to file name input mode to allow other files to be backed up. Since no rewind occurs between file name inputs, the previously backed up data is not lost by specifying another file(s) to backup.

If a carriage return (only) is specified as a file name, the tape rewinds and the program returns to the main menu.

NOTE: A second (S)ave operation at this point would have to be made to the next logical FILE NUMBER to keep from overwriting the just completed backup.

3.2 (R) RESTORE FILES FROM TAPE

The Restore command performs a tape to disk restoration. It is similar to the "save" command except that here the files are being read from the tape and written to the disk. The user is first asked to "Enter File Name" (see section 4 File Naming Conventions). Following the file name selection, the user is asked to "Over-ride Drive Letter Written on Tape". If you are restoring a file to a different destination drive (e.g. drive A to drive B) from the original source drive, answer "(Y)es". If the source drive is the same as the destination drive, answer "(N)o". The next question is similar to the previous; it asks "Over-ride User Area Written on Tape". If you are restoring a file to a different user area than the source (e.g. user 0 to user 5), answer "(Y)es". If the source user area is the same as the destination user area, answer "(N)o". QIP next prompts you to "Enter file number (0-9 or RETURN)": Enter the desired file number and the routine now restores the files to the specified drive and user area. On completion, the program returns to the main menu.

3.3 (L) LIST FILES ON TAPE

The (L)ist command will prompt you "Enter file number (0-9 or RETURN)": Enter the desired FILE NUMBER and the program will display on the terminal the tape name, source drive, and user number for each file in the specified FILE NUMBER. An Escape will suspend the listing process and ask, "Do you want to stop?". A "(Y)es" returns to main menu; a "(N)o" continues listing.

4. FILE NAMING CONVENTIONS

After the prompt "Enter File Name:" the following format should be used:

D: NAME.TYPE [GU]

Where:

D: Indicates the Source/Destination disk drive, letters A-P

Name Indicates the File Name of 1-8 ASCII characters
(e.g. PAYROLL.Type)

Type Indicates the File Type of 1-3 ASCII characters
(e.g. Name.COM)

[GU] Where [G] is the User command and U indicates the user
number 0-31 decimal.

The following exceptions to the above specifications exist:

If no Destination Drive is indicated, the program will Backup or Restore to the current selected disk.

If no user is specified, the currently selected user will be assumed.

An Asterisk (*) or a Question Mark (?) may be specified for the file name and/or file type field. You can use the ? in a file name or type as a wild-card to match any character in the corresponding position. The * can be used to indicate that all remaining character positions of the file name or type are wild-cards.

5. APPLICATION FEATURES AND EXAMPLES

5.1 FEATURES:

The QIP program can also be used from a TurboDOS .DO file enabling automatic backup procedures (see example 2 below). QIP will also run in the "background". In other words, a user can attach to the master and start the backup process running and detach from the master. At that point the user can go on with his regular processing while the master does the backup.

The QIP program also makes use of the TurboDOS archive bit. The archived attribute is used to provide a convenient mechanism for doing incremental file backup. This attribute can be set by using the SET command, and is cleared when the file is renamed or written to. QIP is able to read the TurboDOS archive bit for incremental backup, and will automatically skip any file that has the archive bit set. This helps when you are backing up a large hard disk where restoring the whole drive would be prohibitively slow.

The QIP software is capable of reading the TurboDOS archive bit and therefore can make incremental backups of data on large hard disks. Any file that has the archive bit set can be skipped over in the backup process by answering "yes" to the "Save unarchived files only?" question. This will allow you to backup only files that have been changed or renamed since that last time you set them to archived.

QIP is also capable of reading the TurboDOS FIFO attribute, and can be instructed to include FIFO files in a backup or ship FIFO files.

Since the tape cartridges which QIP uses to store files have a high capacity (up to 60mb) most backups will require only a portion of tape. In order to make more efficient use of the media QIP is provided with an append utility. The append utility allows for saving and restoring multiple copies of files with the same names, or multiple logical groups of files on the same cartridge. Each tape can store up to 10 logical groups of files.

5.2 THE FOLLOWING ARE EXAMPLES OF USING QIP:

EXAMPLE 1

A daily backup of all Data files (.DAT) on drive C, all user areas, and all files on drive D user area 1.

OB)MASTER<cr>

OA]QIP<cr>

(S)ave files to tape
(R)estore files from tape.
(L)ist files on tape
e(X)it program

Select (S, R, L, or X):S<cr>
Save unarchived files only (Y/N)?Y<cr>
Skip FIFO files (Y/N)? Y<cr>
Enter name and date of backup

Tuesdays backup of all data files XX/YY/ZZ

Enter file number (0-9 or RETURN): <cr>
Enter file name: C:*.DAT[G*]<cr>

. . . files are now stored to tape in file number 0 . . .

Enter file name: D:*. *[G1]<cr>

. . . files are now stored to tape in file number 0 . . .

Enter file name: <cr>

(S)ave files to tape
(R)estore files from tape.
(L)ist files on tape
e(X)it program

Select (S, R, L, or X):X<cr>

Note: If you have already exited the QIP program and remember that you wanted to backup an additional drive or user area, do not use the same file number as QIP will overwrite any data in that FILE NUMBER.

EXAMPLE 2

A weekly backup of all files on drive B user area 3, 4, and 5 and drive C user area 5. It will be easier to use a DO file for this backup.

The DO file should contain the following:

```
BACKUP.DO => file name.  
  
;back-up drive B user 3, 4, and 5  
QIP <cr>  
S<cr>  
N<cr>  
Y<cr>  
Weekly backup XX/YY/ZZ<cr>  
<cr>  
B: *.*[G3]<cr>  
B: *.*[G4]<cr>  
B: *.*[G5]<cr>  
;backup drive C user 5  
C: *.*[G5]<cr>  
<cr>  
X<cr>
```

To execute the file do the following:

```
0A) MASTER<cr>  
0A] DO BACKUP<cr>
```

The backup process is now automatic, when it is done it will drop out to the system prompt.

5.2 THE FOLLOWING EXAMPLES ARE SUGGESTED BACKUP PROCEDURES ONLY.

Daily Back-up using 4 tapes.

A simple backup procedure can be based on as little as 4 tapes. One tape is used to store the Master system, utilities and application files. Once this tape is made it should be put in the "SAFE" position and stored in a safe place.

The three remaining tapes are used for the daily backups. The tapes are rotated on a daily basis. As an example, tape 1 will be used on Monday, tape 2 will be used for Tuesday and tape 3 used for Wednesday. On Thursday tape 1 is used. Even if Monday's data is written over, there is still Tuesday's and Wednesday's tape to fall back on if data were lost.

With this scheme of data backup it would be best to back up all Data, Index and associated files each day.

Back-up Procedure For Large Accounting System

On a large system where it may not be practical to back up all the accounting files on all of the drives, you can use the archive attribute and only back up the files that were changed that day. At the end of the week you should make a total backup of all of the accounting files. This will ensure that if a seldom used file is lost, you should have it on the Friday backup.

The procedure might work as follows:

A. Initial System Back Up.

When the system is first installed, make a master back up of all system, utility and applications files. Once this tape is made, set it to the "SAFE" position and place it in a safe storage place. This tape should not be written to again unless the above files have been updated.

Set all accounting files to the Archive attribute using the SET utility, ie; SET ACCOUNT.*;A<cr>.

B. Daily Back Up Procedure.

At the end of each processing day, back up that day's data using the Save Unarchived File option in QIP. Only the files that were opened or changed that day will be saved to tape.

After the backup is complete, set all of the accounting files with the Archive attribute. This will set the system up for the next day's processing.

This will create a tape for each day, ie; a Monday tape, a Tuesday tape and so on. Each week you will use the same tape for the same day.

The Friday backup will be done differently.

C. The Friday Back Up.

The Friday backup should be a backup of all accounting files. This tape should be rotated with two other tapes. This tape would be used if the file that is needed can not be found on the Monday through Thursday tape. In an accounting or other complex application, not all data files are used on a daily basis.

D. Restoring Due To Loss Of Files.

In the event of a catastrophic system failure where all data was lost (hard disk drive crash), you would restore your files in the following order:

1. Initial system backup
2. Most recent Friday backup
3. Previous day's backup.

This will restore the data in the proper order, ensuring that old data is not written over new data.

This backup scheme uses a total of 8 tapes. This may seem like a lot of tapes to use to maintain a system back up, but it is more time consuming to completely backup a large accounting system every day with 3 rotating tapes. The cost of 8 tapes is not much when you consider the consequences of a catastrophic data loss.

6. ERROR MESSAGES

Tape Errors:

These error messages result from the operation of the tape drive.

NO REEL	This is displayed if a tape is not fully inserted into the drive.
NO DRIVE	This is displayed if the tape drive is not on-line.
WRITE PROTECTED	If an attempt is made to write a write-protected tape, this message is displayed.
R/W ABORT	A fatal error was encountered during a tape read or write. The tape is rewound to beginning of tape.
READ ERROR BAD BLOCKED RETURNED	There was an error reading the tape, but data was returned.
READ ERROR FILLER RETURNED	There was an error reading the tape and filler data was returned.
READ ERROR NO DATA	There was an error reading the tape. No data was returned.
READ ERROR NO DATA, EOM	There was an error reading the tape. No data was returned, and the tape is at the end.

ILLEGAL COMMAND

An illegal command was issued to the controller or a command was issued while in a read/write transfer mode.

MARGINAL BLOCK

More than eight retries were required to read a block. This usually indicates that a tape is nearing the end of its useful life.

ADDENDUM

Additions and errata to INSTALLATION AND USER'S GUIDE for IMS INTERNATIONAL TAPE BACKUP SYSTEM (May 16, 1985)...

Note: QIP cannot be run on 8-bit master, multi-user systems because of memory size limitations. QIP may be run on any of the following systems:

- a. 8-bit master, single-user systems;
- b. 16-bit master, single-user systems;
- c. 16-bit master, multi-user systems.

1. To exit QIP during a save, restore, or list:

Use Escape to exit the program.

Do not use the TurboDOS attention-detect and abort commands, (usually Ctrl-@ followed by Ctrl-c)!! The attention- detect/abort commands may lock the system, requiring a reset.

2. Note the following operating system change: In order to run the tape backup system under TurboDOS, the special support module **USRFCN** must be included during the system-generation process. This module is on your QIP release disk.

- a. Copy the module to a TurboDOS system generation disk.
- b. Include the text "**USRFCN**" in the GEN files for STDSINGL, STDSPool, AND SDTMASTR, where **USRFCN** is the user-defined function processor.
- c. Re-GEN these systems using the procedures described in the TurboDOS user's guide.
- d. Boot one of these new systems to enable QIP to execute properly. (If QIP is run without the USRFCN module in the system, an error message is displayed and the program is aborted.)

Note: Customization of the User-defined Function: If you currently have an application that takes advantage of the user-defined function processor, USRFCN, two routines must be added. These routines are contained within the USRFCN source code in the QIP release disk.

Standardize the method of accessing function 41 using the following recommended procedure:

When calling the user-defined function, an opcode in the range of 0-FF (hex) is passed in one of the registers.

- In 16-bit systems the BL-register is used.
- In 8-bit systems the L-register is used.

Opcodes 0-7F are reserved for use by L/F Technologies. Opcodes 80-FF are available for customer use. QIP currently uses opcodes 2 and 3 for DMA mutual exclusion.

3. If identically-named files from different directories are saved to tape, you can only restore all of them, and only to their original locations. A file over-write may result if you do not follow this procedure. When restoring several identically-named files to disks,
 - a. you cannot select a specific one of these files by specifying drive letter or user number, and
 - b. you cannot override the drive letter or user number specified on tape.
4. Please specify the correct save set number when restoring files from tape. For example, if you specify Save Set 1 when only Save Set 0 exists on tape, the following may result:
 - a. the program instructs you to insert another tape cartridge and use a <CR>.
 - b. Upon executing this instruction, the program will restore the files from Save Set 0.
5. You can restore a file to only two locations:
 - a. restore to the original file location, or
 - b. restore to your current location (it is generally best to restore a file to its original location.)

(For example, if you are currently in area 0F, you cannot restore a file to area 0E, if the file was originally from area 0I.)
6. Note: (p. 9, file name format) Omit the spaces shown in the example. The correct format is:

D:NAME.TYPER[GU]
7. Note: (p. 11, line 16) The prompt "Enter file number (0-9 or RETURN)" has been changed to read:

"Enter save set number (0-9 or RETURN):"

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2. Note the following operating system change: In order to run the tape backup system under TurboDOS, the special support module **USRFCN** must be included during the system-generation process. This module is on your QIP release disk.
 - a. Copy the module to a TurboDOS system generation disk.
 - b. Include the text "**USRFCN**" in the GEN files for STDSINGL, STDSPOOL, AND SDTMASTR, where **USRFCN** is the user-defined function processor.
 - c. Re-GEN these systems using the procedures described in the TurboDOS user's guide.
 - d. Boot one of these new systems to enable QIP to execute properly. (If QIP is run without the USRFCN module in the system, an error message is displayed and the program is aborted.)

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 - a. restore to the original file location, or
 - b. restore to your current location (it is generally best to restore a file to its original location.)

(For example, if you are currently in area 0F, you cannot restore a file to area 0E, if the file was originally from area 0L)
6. Note: (p. 9, file name format) Omit the spaces shown in the example. The correct format is:

D:NAME.TYPE[GU]

7. Note: (p. 11, line 16) The prompt "Enter file number (0-9 or RETURN:" has been changed to read:

"Enter save set number (0-9 or RETURN):"