TIP®

(Tape Interchange Package)
Ver.–4.xx

OPERATOR'S GUIDE

(OG-100055 Rev. 0981)

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XS-100

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Appendices:

NOTE: Appendices A - G are included in this manual. Others are customer specific additions to this manual and are supplied in the rear pocket.

1.1 TIP Features

The Alloy Engineering **TIP** (Tape Interchange Package) supports either 1/4" tape cartridge or 9 track magtape subsystems and provides a software utility that permits transfer of programs and data files from a Winchester disk to an easy-to-handle 13.4 MB tape cartridge, or up to 42 MB of data on 9 track magtape. Facilitating off-premise data base storage and shipping, the subsystem features comprehensive menu driven software, and links under Digital Research CP/M and MP/M Operating Systems.

TIP, by combining powerful data handling capabilities with a simple, logical instruction set, can fill the backup needs of any CP/M, MP/M, or equivalent operating system. By supporting both ambiguous and unambiguous file names, file types, and user numbers, TIP allows the user to backup or restore a single file or an entire drive with equal ease, at a rate of 2 min./MB. TIP'S use of DYNAMIC FILE BACKUP instead of an imaging technique allows for maximum space efficiency on both the backup and restore operations. Further, this methodology can allow a user to reduce his disk usage space by perhaps twenty percent by backing up a disk, erasing it, and restoring its files. This will also improve average access time, as the restored files will be contiguously re-assigned.

TIP Tape Interchange Program is a utility program used to transfer files between disk and tape. Amoung TIP's features, are:

- Tape formating allowing file access by individual names and groups.
- Facilities to assist you in full data Backup.
- Easy to use Menu-Driven command format.
- Identical program operation under either Cartridge or 9- Track Systems.

1.2 Tape Format

TIP organizes data on tape much as an operating system organizes disk data. Each allows reference to a file by name, and does not require the user to know anything about the physical organization of data on the actual media. Appendices A and B show the actual tape record layout.

Data to tape is written in 8208 byte blocks, allowing a full 8K data record with a 16 byte file control block. This configuration allows 13.4 megabytes of storage on a 450 foot cartridge tape, or 42 megabytes on a 10.5 inch reel of 9-track tape. Data is written sequentially on each track, and the tape is rewound and the next track selected as each track is filled. This is transparent to the user. If a tape is filled during a backup operation a message requesting a new tape is issued, and the backup will continue in progress when a new tape is inserted. This feature is supported under restore, allowing restoration to continue from a new tape. The average backup/restore speed under CP/M is 2 minutes per megabyte.

Since the tape cartridges which TIP uses to store its files has a capacity of up to 13.4 megabytes (42 megabytes on 9-Track), often the user will find that he/she will need only a fraction of that total space for any one logical group of files to be saved. In order to make more efficient use of the media TIP versions 4.0 and later employs a **SAVE SET** feature.

The SAVEset scheme has been implemented to more easily allow the saving (and restoring) of multiple copies of files with the same name and type. Savesets are referred to as a two digit hexidecimal number within the range of 00 - 7F. The APPEND (A) command will automatically open a new saveset with the saveset number equal to 1+ the previous saveset number, unless manually overridden by the operator.

The saveset numbers are used by 4 commands: BACKUP (B), RESTORE (R), APPEND (A), and VERIFY (V). The DIRECTORY function has been changed also to display saveset numbers along with the file names.

On both Cartridge and 9-Track systems, written data is dynamically re-read and corrected automatically by the tape subroutines reducing restore errors to 5 in 10^{10}. It is normal for the Cartridge Tape Unit to rewrite 5 to 10 blocks per track. It is rare for the 9-Track to rewrite blocks.

The INSTALLATION / CHECKOUT section contains all the information necessary to install the TIP Tape Subsystem hardware, configure the TIP program to run on your computer system, and finally the facility to check that you have a successfully installed and properly running system.

2.1 Installing the Hardware

The tasks involved with installing a TIP subsystem are dependent upon the type of tape drive you require (cartridge tape or 9 track mag tape), and the type of Alloy controller employed to interface the tape unit to your system.

This section describes hardware installation involving 4 types of tape controllers. The DS-100 and DZ-80B both control the tape cartridge drive. The TS-100 and TZ-80 both control 9- Track mag tape drives.

Each of these boards have the facility to allow selection of their I/O port assignments via a 4 pin DIP switch. The I/O selection must be matched on the controller board and in the TIP software. Note that the TZ-80 Port Address group is fixed at 80-8F Hexidecimal.

2.1.1 Switch Settings

SWITCH #	SWITCH VALUE
SW1	80
SW2	40
SW3	20
SW4	10

NOTE: SW1-4 is reverse configuration on the DZ-80B

I/O GROUP	SW1	SW2	SW3	SW4
00 - 0F	OFF	OFF	OFF	OFF
10 - 1F	OFF	OFF	OFF	ON
20 - 2F	OFF	OFF	ON	OFF
30 - 3F	OFF	OFF	ON	ON
40 - 4F	OFF	ON	OFF	OFF
50 - 5F	OFF	ON	OFF	ON
60 - 6F	OFF	ON	ON	OFF
70 - 7F	OFF	ON	ON	ON
80 - 8F	ON	OFF	OFF	OFF
90 - 9F	ON	OFF	OFF	ON
A0 - AF	ON	OFF	ON	OFF
B0 - BF	ON	OFF	ON	ON
C0 - CF	ON	ON	OFF	OFF
D0 - DF	ON	ON	OFF	ON
E0 - EF	ON	ON	ON	OFF
F0 - FF	ON	ON	ON	ON

2.1.2 DS-100 Based systems (see figure 2-1 page 9)

Installation of the DS-100 hardware consists of selecting the proper I/O port group (see section 2.1.1), plugging the Alloy DS-100 tape controller card into the S-100 bus and cabling the controller card to the Cartridge Tape Drive.

The DS-100 subsystem is supplied with a 5-foot 50-pin connector data cable which connects the DS-100 controller to the cartridge tape drive.

The RED STRIPE on the data cable connects to the following:

Cartridge Drive ..... Toward the TALL heatsink or toward the right as the drive is viewed from the front.

DS-100 CONTROLLER ..... Toward the center of the PC board.

2.1.3 TS-100 Based systems (see figure 2-2 page 9)

Installation of the TS-100 hardware consists of selecting the proper I/O port group (see section 2.1.1), plugging the Alloy TS-100 tape controller card into the S-100 bus and cabling the controller card to the 9 track mag tape drive.

The TS-100 controller comes supplied with dual 8 foot 50-pin ribbon cables. Both ends of these cables are clearly marked with P1 & P2 designations. When connecting these cables to the Cipher Drive, you may connect the P1/P2 cables to either of the P1/P2 respective connectors at the rear of the drive. Note that the RED stripe on the cables should be positioned toward PIN-1 as marked on the Cipher PC board. Be sure to read the Cipher Installation Instructions before operating the drive, especially with respect to removing the shipping foam around the take-up-reel.

Note: If you are connecting these controllers to a PERTEC tape drive, P1 & P2 will connect to P4 & P5 respectively on these drives.

2.1.4 DZ-80B Based systems (see figure 2-3 page 9)

Installation of the DZ-80B hardware consists of selecting the proper I/O port group (see section 2.1.1), removing the Z-80A IC, plugging the Alloy DZ-80B tape controller card into the Z-80 socketon the processor board, reinstalling the Z-80A IC into the DZ-80B board and cabling the controller card to the Cartridge tape drive. NOTE: Care should be taken with reinstalling the Z-80 chip, with respect to pin damage and Pin-1 orientation.

The RED STRIPE on the data cable connects to the following:

Cartridge Drive ..... Toward the TALL heatsink or toward the right as the drive is viewed from the front.

DZ-80B CONTROLLER ..... Toward the center of the PC board marked pin one.

2.1.5 TZ-80 Based systems (see figure 2-4 page 9)

Installation of the TZ-80 hardware consists of removing the Z-80A from the ALTOS mother board, plugging the Alloy TZ-80 tape controller card into the ALTOS mother board.Then cabling the controller card to the Cipher tape drive. The I/O port group is fixed at 80H - 8FH. NOTE: Care should be taken with reinstalling the Z-80 chip, with respect to pin damage and Pin-1 orientation.

The TZ-80 controller comes supplied with dual 8 foot 50-pin ribbon cables. Both ends of these cables are clearly marked with P1 & P2 designations. When connecting these cables to the Cipher Drive, you may connect the P1/P2 cables to either of the P1/P2 respective connectors at the rear of the drive. Note that the RED stripe on the cables should be positioned toward PIN-1 as marked on the Cipher PC board. Be sure to read the Cipher Installation Instructions before operating the drive, especially with respect to removing the shipping foam around the take-up-reel.

Note: If you are connecting these controllers to a PERTEC tape drive, P1 & P2 will connect to P4 & P5 respectively on these drives.

2.1.6 Alloy's Family of Tape Controller Boards

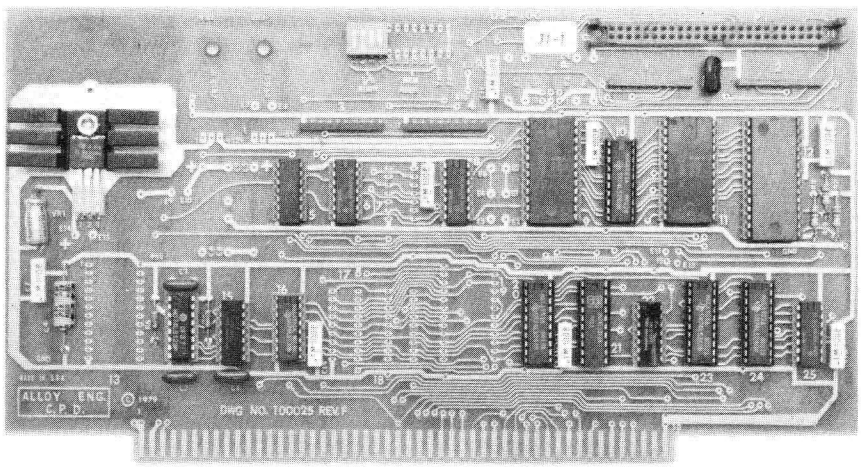


Fig. 2-1 (DS-100)

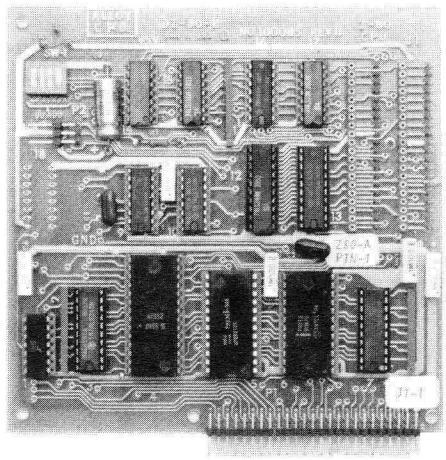


Fig. 2-3 (DZ-80B)

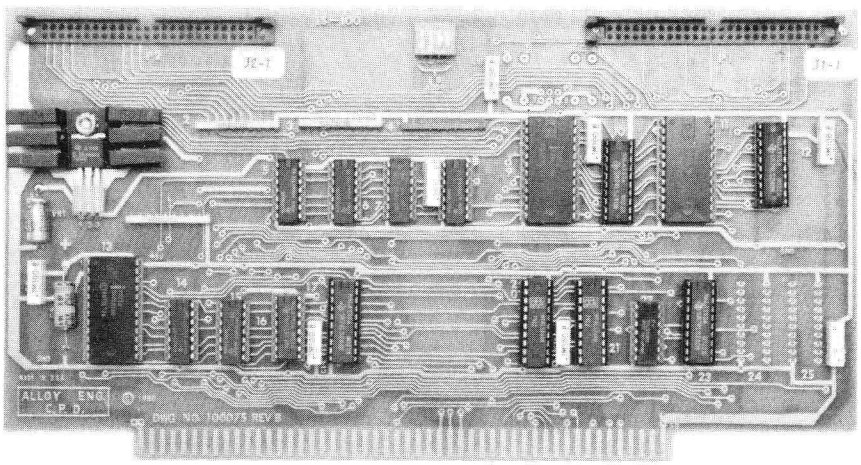


Fig. 2-2 (TS-100)

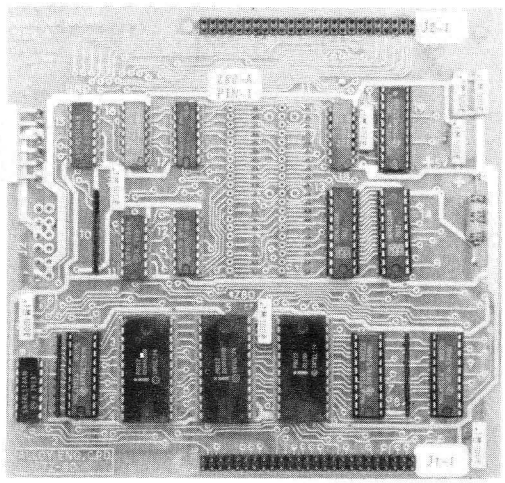


Fig. 2-4 (TZ-80)

2.2 Installing TIP

TIP has been designed to support a wide range of 4-Mhz. Z-80 based microcomputers. Many of these computers require that the TIP hardware and software communicate through differing I/O ports. For instance while I/O ports F0-FF work perfectly fine with Cromemco computers, you will find that these ports are directly in conflict with (and subsequently unusable) with Tarbell disk based systems, which already occupies these I/O ports. It is for this reason that Alloy Engineering has provided with each set of the TIP software distribution package, an Installation program which allows the system installer to configure TIP to run properly on each type of system

2.2.1 The INSTALL program

The program employed to service this function is 'INSTALL.COM'. INSTALL allows you the set-up choices of:

A. Running with a CP/M 1.4 compatible operating system (This includes CROMEMCO's CDOS and CROMIX)

B. Running with a CP/M 2.2 or MP/M compatible operating system

C. Including Alloy 9-Track Tape package (see Section 3 of this manual)

D. Selecting the proper I/O port group in which TIP's hardware and software may communicate. (Note: The installer must coordinate setting the I/O port group on both the controller card and in the TIP software so as they are identical. Please refer to the previous section Installing the Hardware.)

NOTE: Only two files included in the TIP distributing disk are actually executable programs (**INSTALL.COM** and **AS.COM**), all other files are present as part of the library which is used by the INSTALL program. If you specify creation of 9-Track utilities the Install program will generate the following programs:

TIP.COM TREAD.COM TWRITE.COM

If no 9 Track tape utilities are requested during the INSTALL process, then only **TIP.COM** will be generated.

2.2.2 Sample INSTALL Sessions

The following example run of the INSTALL program demonstrates the installer selecting :

- A CP/M 1.4 (or compatible operating systems such as CDOS or CROMIX)

- Tape cartridge only (no 9 track mag tape drive support)

- I/O port group F0 - FF

Insert the TIP distribution disk into drive B: (INSTALL assumes that its entire set of library modules are on the currenty selected drive)

Type "INSTALL <CR>"
the following is an illustration of the INSTALL dialouge

```
Welcome to the wonderful world of
**** ALLOY  S-100 TAPE BACKUP ****
We are going to install your CUSTOM TAPE SUPPORT SOFTWARE.
If you accidently give the wrong answer to a prompt you
should halt this program using CNTRL C, and restart the run.

Are we running either CP/M version 2.0+ or MP/M? N
Then I will load the CP/M 1.4 compatible version of TIP.
TIP has been succesfully loaded.

Is this software for a 9 track tape drive? N
Then you must be using a cartridge drive.
I will load the associated tape utility module.
The tape utilities module has been succesfully loaded.

Now please enter the base address you would like
for the required 16 byte I/O port group.  This
value is in the range 0-F hexidecimal (giving a base
of 00-F0 hex) and should correspond to the switch
settings you have used on your controller board: F

*** Your CUSTOMIZED TAPE INTERCHANGE PACKAGE has been saved
as TIP.COM ***
```

2.3 Testing your newly installed tape system

Once you have installed TIP's hardware and software as described above you need a method in which to test your subsystem. Alloy recommends that you test your system by running TIP which provides a full range of functions which will aid you in checkout of your newly installed system.

The INITIALIZATION (I) function of TIP provides a very broad test. This command initializes tapes by writing a different data pattern at the beginning of each track, these patterns are then read to assure the mutual exclusivity of data written to each. Once TIP has determined that these tests were successful it then goes ahead and writes file marks to each to the tracks. This feature will be discussed in Section 3 TIP COMMANDS.

If any errors occur during this procedure, TIP will provide you with Disk Status and Interface Status codes. These ERRORS are defined in setion 3.5.

We now suggest that you experiment with various TIP operations including BACKUP, RESTORE, and VERIFY. We strongly recommend initial testing be done with non-critical data.

The TIP software section provides the reader with an operational guide. All TIP commands are explained along with examples of each. The ERROR MESSAGES are also all listed here.

3.1 INVOKING TIP

This utility is a comprehensive tape/disk interchange package. It is invoked via one of two calling methods; either

TIP or **TIP D:FILENAME**

is typed in response to the system prompt. The first method is used to invoke TIP in its standard form, and the second invokes TIP with its **AUTOMATIC BACKUP/RESTORE** feature enabled. Here 'FILENAME' specifies a submission file containing a series of file names to be processed by **TIP**. This file must have file type 'TIP', though this need not be specified on invocation, and must be stored under the current user number. 'D' is an optional drive specification. If 'D' is omitted, the currently selected drive is assumed. This file specification methodology is in accordance with standard CP/M and MP/M program invocation practices. The normal CP/M editor or an equivalent should be used to create the TIP submit file. Each line entry should correspond to the file name input procedure as described on page fifteen See section 3.5 for details on creating a submit file.

When called, TIP displays a menu of the possible options, prompts the user for his selection, performs the task, and returns to the menu. Return to the main program is achieved by typing an escape (ESC) during execution. Please note that if the program is aborted during a backup or restore the data written is not necessarily valid and should be rewritten.

3.1.1 TIP Command Menu

THE **COMMAND** MENU IS AS FOLLOWS:

CODE:	ACTION:
I	INITIALIZE TAPE
T	RETENSION TAPE
B	DISK TO TAPE BACKUP
R	TAPE TO DISK RESTORATION
A	DISK TO TAPE APPEND
V	FILE VERIFICATION
D	TAPE DIRECTORY
C	TAPE TO TAPE COPY
(ESC)	RETURN TO MONITIOR

3.2 File Naming Conventions

File names are input after the prompt 'FILE NAME:' or entered into the submission file using the following format:

D:NAME.TYPE[GU]

WHERE:

*	**D**	INDICATES THE SOURCE/DESTINATION DISK DRIVE, A - P
	NAME	INDICATES THE FILE NAME OF 1 - 8 ASCII CHARACTERS
*	**TYPE**	INDICATES THE FILE TYPE OF 1 - 3 ASCII CHARACTERS
*	**U**	INDICATES THE USER NUMBER 0 - 15 DECIMAL

(* - THESE SPECIFICATIONS MAY BE OMITTED - SEE BELOW)

The file name and file type on the destination will be identical with the source.

If no drive is specified the program will use the currently selected disk. Note that if no drive is given the colon should also be omitted.

If no file type is specified it is assumed to be all blanks (ASCII 20H). Note that if this field is not given the preceding period should also be omitted.

If no user is specified the currently selected user will be assumed. Note that if the user number is not given the [GU] sequence should be omitted entirely.

The file name and/or file type may contain question marks. These act as 'wild cards' and any file whose name/type matches the non-question mark characters will be selected. Further, using question marks will cause the procedure to iterate, finding all files whose name matches the ambiguous name specified.

An asterisk (*) may be specified for the file name and/or file type field. This is equivalent to filling that field with question marks. Further, an asterisk can be specified as the user number to cause all users to be copied.

To RESTORE all files from a particular tape (or series of tapes) the file name 'ALL' may be specified. This file name is not supported by the BACKUP or APPEND routines. See RESTORE command description for details.

3.3 TIP COMMANDS

3.3.1 (I) INITIALIZE TAPE

The initialize tape routine writes two file marks at the start of each of the first three tracks of the tape, and an 'EOT' sequence, consisting of a file mark, an end-of-tape record, and two file marks, to track four. These file marks indicate the end of data on each track, and are needed for compatibility with other tape handling facilities. As a self test this routine also writes a different record to each track following its FMK sequence, and then confirms each of these records after all tracks have been written. This test checks track separation and read/write capabilities. As this routine requires no file name specification, its operation remains the same under both standard and auto backup/restore modes.

3.3.2 (T) RETENSION TAPE

The retension tape command rewinds the tape, does a high speed search to the end of the tape, and again rewinds the tape. This procedure conforms to the manufacturer's recommendation for restoring the proper tension to a worn tape. Processing a tape with this command can often alleviate read/write errors. The only function that this provides on a 9-Track system is to waste the operators' time.

3.3.3 (B) DISK TO TAPE BACKUP

The disk to tape backup first initializes the tape (as per the I command), rewinds, and then accepts a file name to process, either from the console (under standard operation) or from the submission file (under auto backup/restore operation) (see file name input description). It then searches for this file on the disk and copies it to the tape. Once it has completed this action it returns to file name input mode to allow other files to be backed up. As no rewind occurs between file name inputs, the previously backed up data is not lost by specifying another file to backup. If the indicated file cannot be found on the disk this condition is reported and the routine returns to file input mode. If a carriage return (only) is specified as the file name an 'EOT' sequence (see INITIALIZE TAPE command)is written to tape to indicate end of data, and the program returns to the menu display while the tape is rewound.

3.3.4 (A) DISK TO TAPE APPEND

The disk to tape append searches for the end of the data on the tape, and starts backup procedures at this point instead of at BOT. In all other respects this routine is the same as the backup routine.

Starting with TIP Versions 4.00 the APPEND algorithm has been changed to search for the last track in use, starting with track 4. This system reduces the average time required to locate the end of data point on the tape.

NOTE: Due to this change tapes MUST be INITALIZED (I) prior to a backup if the APPEND is to be used. This is good common practice since the INITALIZE (I) routine also performs a diagnostic of both the tape subsystem and the tape.

3.3.5 (R) TAPE TO DISK RESTORATION

The tape to disk restoration is similar to the backup routine, except that here files are being read from the tape and written to the disk. Further, under standard operations mode, two additional user selections are supported by this procedure. Following file name selection the user is asked whether the search for the specified file should be conducted relative to the beginning of data on the tape. If the user responds 'yes' (Y) track one is selected and the tape is rewound prior to the file search. If 'no' (N) is specified the search will be conducted from the current tape position. Note that, regardless of this selection, no rewind/track 1 selection is performed between multiple files accesed via an ambiguous file name specification. The user is then asked if the source device should be ignored. If he responds 'no' (N) then only those tape files with a device code matching the disk drive in use, whether by default or specification, will be considered. If the user responds 'yes' (Y), then the source device in the tape FCB will not be considered at all. Under auto backup/restore mode all searches are relative to current position, and the source device code is not ignored.

3.3.5 **RESTORE** Cont´d.

When restoring multiple files via an ambiguous file name, RESTORE will search the entire tape for matches, terminating at the ´EOT´ sequence. This means that, when run under auto mode, the submission file may contain at most one ambiguous file name, and this must be the last entry in the file. To facilitate restoration of multiple files a file name of **ALL** is supported by this routine. If this file name is specified the routine will copy all files from the tape to the disk. These files will be restored to the user and device specified in their file control blocks. See file name input description and functional notes for further information.

3.3.6 **(V) FILE VERIFICATION**

The file verification routine verifies a disk file against its counterpart on tape. On entrance into this routine the user is prompted for the name of the file to verify. The response to this prompt is in accordance with the file name input procedure outlined below, except that ambiguous file names are not supported (i.e. no question marks or asterisks may be present in the file name). The procedure then searches for this file on the tape, and opens it on the disk. If the file is not present on either media an appropriate error message is reported and the routine restarts. Once both files have been found their contents are compared on a byte by byte basis. If any discrepancies are found, the extent, record number and byte number within the disk record (0 thru 7F hexadecimal) are displayed along with the byte value present in both the tape file and the disk file. If one file ends before the other the remaining bytes in the other are displayed, with XX being displayed as the byte value in the terminated file. After all bytes have been compared the routine returns to file name input mode. The routine is terminated by replying with a file name of CR only. It is suggested that the file name be preceded by a CNTRL-P to allow the displayed errors to be sent to the printer.

3.3.7 (D) TAPE DIRECTORY

The tape directory displays on the terminal the name, type, source drive, and user number for each file on the tape. In addition, the directory will also be printed on the CP/M list device if the user responds yes (Y) to the prompt:

PRINT DIRECTORY ON LIST DEVICE (Y/N)?

By the nature of the method used for this routine, every block of data on the tape is confirmed readable.

3.3.8 (C) TAPE TO TAPE COPY

The tape to tape copy initiates the tape control module's off line copy procedure. Please note that a dual tape drive is needed for this procedure to operate.

3.4 Applications Examples

Two examples have been included to illustrate how TIP is operated and how to expect TIP to repond to correct user input.

Example #1 shows a user initiatingTIP, INITIALIZING a tape, coping a file from Disk-to-Tape.

Example #2 shows a user initiating TIP,APPENDING files from Disk-to-Tape, Obtaining a Tape Directory, Restoring a file from Tape-to-Disk.

3.2.1 Example #1

```
A>TIP<CR>

**********************  WARNING!  **********************
THIS PROGRAM AFFECTS CPU CLOCK AND OTHER USERS
TYPE CNTRL C TO ABORT OR CR TO CONTINUE:<CR>

TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR

ACTION DESIRED:I
*** WARNING - TAPE INITIALIZATION IS DESTRUCTIVE ***
TYPE CR TO CONTINUE OR (ESC) TO ABORT:
TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR
```

```
ACTION DESIRED:B
*** WARNING - TAPE INITIALIZATION IS DESTRUCTIVE ***
TYPE CR TO CONTINUE OR (ESC) TO ABORT:<CR>
DISK TO TAPE BACKUP
ENTER SAVE SET CODE (CR FOR DEFAULT):<CR>

FILE NAME (CR=DONE):TIP.COM<CR>
COPYING FROM DRIVE A, USER 0 TO SAVE SET 00:
TIP      .COM
FILE NAME (CR=DONE):<CR>
TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR

ACTION DESIRED:<ESC>

A>
```

3.4.2 Example #2

```
A>TIP<CR>

****************  WARNING!  ****************
THIS PROGRAM AFFECTS CPU CLOCK AND OTHER USERS
TYPE CNTRL C TO ABORT OR CR TO CONTINUE:<CR>

TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR

ACTION DESIRED:A
SEARCHING FOR END OF DATA
TAPE POSITIONED AT END OF DATA
NEW SAVE SET DEFAULT IS 01H
ENTER SAVE SET CODE (CR FOR DEFAULT):<CR>
FILE NAME (CR=DONE):*.TIP<CR>
COPYING FROM DRIVE A, USER 0 TO SAVE SET 01:
SAVEALL .TIP
MONTHLY .TIP
WEEKLY  .TIP
DAILY   .TIP
FILE NAME (CR=DONE):<CR>
TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR
```

```
ACTION DESIRED:D
TAPE DIRECTORY
PRINT DIRECTORY ON LIST DEVICE (Y/N)? N<CR>
NAME     TYPE    DRIVE    USER    SS
--------------------------------
TIP      .COM       A        0     00
SAVEALL  .TIP       A        0     01
MONTHLY  .TIP       A        0     01
WEEKLY   .TIP       A        0     01
DAILY    .TIP       A        0     01
STRIKE RETURN TO RESTART:<CR>
TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR


ACTION DESIRED:R
TAPE TO DISK RESTORATION
ENTER SAVE SET CODE (CR FOR DEFAULT):01<CR>
FILE NAME (CR=DONE):A:DAILY.TIP<CR>
IGNORE SORCE CODE DEVICE AS IT IS WRITTEN ON TAPE (Y/N)?N
COPYING:
NAME      TYPE   DRIVE    USER    SS
--------------------------------
DAILY     .TIP      A        0     01
FILE NAME (CR=DONE):<CR>
TAPE INTERCHANGE PROGRAM - VERSION 4.xx
(c)1981 - ALLOY ENGINEERING COMPANY INC.

      CODE:              ACTION:
        I                INITIALIZE TAPE
        T                RETENSION TAPE
        B                DISK TO TAPE BACKUP + INIT
        R                TAPE TO DISK RESTORATION
        A                DISK TO TAPE APPEND
        V                FILE VERIFICATION
        D                TAPE DIRECTORY
        C                TAPE TO TAPE COPY
      (ESC)              RETURN TO MONITIOR


ACTION DESIRED:<ESC>

A>
```

3.5 Creating TIP Submit files

The TIP submit file facility allows the user to create command files containing TIP commands. The SUBMIT function of TIP will process these commands the same as if the user entered them from the keyboard. NOTE: tip command file type must be ".TIP".

The submit function of TIP is invoked by entering TIP with a command line argument of your .TIP SUBMIT file name, i.e.:

```
TIP SUBFILE
```

A new feature has been added to the submit capability of TIP. If the first line in a control file (????????.TIP) is one of the single letter auto-mode commands listed below, the TIP program will bypass all questions and execute the command using the default values shown. The commands are:

CMD	FUNCTION	DEFAULTS USED
I	Initialize	N/A
B	Backup	SaveSet = 0
A	Append	SaveSet = Last SaveSet+1
D	Directory	Print Directory on List Device

Once the command is completed the program exits to the operating system (if no errors were encountered). With the SCHEDULER facility of MP/M to invoke TIP, backup can become a totally automatic task. If any other single letter command is used the program will enter auto-mode with no command queued, requiring responses to all questions except file name.

The following example has been included to illustrate how to make a SUBMIT file with the standard CP/M editor "ED". This file "SAVEALL.TIP", uses the append feature of TIP. At the end of each day the user inserts his/her tape and issues the command "TIP SAVEALL <CR>". This is how to make that file.

```
A>ED SAVEALL.TIP
*I<CR>
A<CR>
B:*.*<CR>
E:*.ASM[G*]<CR>
E:*.COM[G*]<CR>
A:*.DAT<CR>
<CR>
*<control>Z
*EXIT<CR>
A>
```

3.6 ERROR Messages

If TIP cannot respond to the users instructions, it considers the situation an "ERROR". This may be bacause TIP can't understand the command, e.g. an illegal filename, or a non-existent menu choice. In these cases, TIP displays an explanatory error message, and allows the user to re-enter the information.

TIP has three "interfaces": To the operator/user; to the operating system (for file operations); and to the hardware (controller card, tape drive, cartridge). Errors can occur at each of these. This section discusses each type of error and how to respond if any of these are encountered. At any error you can return to the operating system by typing <ESCAPE>

3.6.1 USER INTERFACE ERRORS

FILE NAME BAD, REENTER

LOADED TAPE IS WRITE PROTECTED

UNEXPECTED END OF DATA

TAPE COMMUNICATIONS, SYNTAX REJECT WITHIN TIP

TAPE ABORT WITH ATTEMPT

TAPE ABORT WITHOUT ATTEMPT

TAPE IS WRITE PROTECTED

FILE NOT FOUND

DISK FULL

3.6.2 Tape ABORT Errors

If the error received was an 'ABORT' from the tape drive, **TIP** will also display the tape sub-error code. These codes and their meanings are as follows:

NOTE: Be sure to keep the tape head clean this will eliminate many needless errors. Read Section 6 Preventitive Maintnance.

CODE:	MEANING AND SUGGESTED SOLUTION:
00	SELECTED DRIVE HAS EXECUTED AUTO-REWIND SINCE PREVIOUS INIT OR REWIND CMD. -- RETURN TO MASTER MENU OR RESTART **TIP** TO CLEAR ERROR
01	WRITE OPERATION REQUEST TO A WRITE PROTECTED DRIVE -- REPLACE TAPE WITH AN UNPROTECTED ONE (OR REMOVE WRITE PROTECTION FROM PRESENT TAPE) AND REISSUE COMMAND
02	COMMAND ISSUED TO NON-PRESENT DRIVE OR DRIVE WITH CARTRIDGE REMOVED -- BE SURE THAT CARTRIDGE IS PROPERLY SEATED IN THE DRIVE AND REISSUE COMMAND. IF THIS ERROR PERSISTS IT IS A HARDWARE PROBLEM
03	DRIVE FAILED TO RESPOND TO THE REQUESTED COMMAND -- THIS IS PROBABLY A HARDWARE ERROR
06	FILE MARK VERIFICATION ERROR AFTER WRITING IT -- RE-INITIALIZE TAPE AND TRY AGAIN. IF THIS PERSISTS, TRY A DIFFERENT TAPE.

Tape ABORT Errors

07	TRANSPORT ABORT PRIOR TO COMMAND COMPLETION -- PROBABLE HARDWARE PROBLEM
08	READ FAIL - MISSING DATA OR FMK -- PROBABLE BAD TAPE OR HARDWARE ERROR ON CARTRIDGE, IHER* (HARD ERROR) RECEIVED ON 9-TRACK
09	READ FAIL - LRCC RECORD ERROR -- AS PER 08
10	READ FAIL - SHORT RECORD ERROR -- AS PER 08 (or) Note: Many times this error is caused by operating a TIP subsystem on other than a 4-Mhz. Z-80A or one with Wait States.
11	READ FAIL - BAD VERTICAL PARITY -- AS PER 08
12	WRITE FAIL - R-A-W VERIFY ERROR -- AS PER 08
13	WRITE FAIL - READ DATA NOT DETECTED PRIOR TO RECORD WRITE OPERATION COMPLETION -- AS PER 08
14	READ FAIL - FILE MARK DETECTED -- PROBABLE HARDWARE, SOFTWARE, OR TAPE ERROR.

The 9 Track MagTape section provides the reader with the additional information which is needed to operate the Alloy 9 track MagTape packages.

Notel: Additional 9-Track modules for linkage into a variety of high level languages are available upon request. Please consult with ALLOY regarding availability and implementation.

Note2: In both TREAD and TWRITE the ASCII/EBCDIC conversion tables begin at address 4096 (1000_{16}) and are 256 (100_{16}) bytes long.

4.1 Introduction

As the speed and information handling abilities of microcomputers increases, so does the need for fast, reliable backup of large amounts of data. The **ALLOY NINE TRACK PACKAGE** fills this need. Consisting of a comprehensive tape/disk interchange utility, **mTIP**, plus tape-to-disk and disk-to-tape file conversion programs, **TREAD** and **WRITE**, this package allows easy and efficient disk/tape file transfer. As a convenience, this package also includes the source code file of **MTU4.ASM**, the tape control program that supports all the software in this package. The package operates under CP/M, MP/M or any other compatible operating system, making it available to micro users throughout the industry.

4.1.1 mTIP

The tape/disk interchange utility, mTIP, is a specially prepared version of ALLOY's popular cartridge tape utility, TIP. To the user, these utilities appear identical; both use the same menu oriented command structure and CP/M type file names for easy operation. mTIP, however, uses a totally different set of internal tape access subroutines designed to optimize its interactions with the nine-track tape unit. This utility allows dynamic backup of up to **42 MEGABYTES** of data on a standard 10.5 inch, 2400 foot reel of 1.5 mil thick tape. Please see Section 3 of this manual for further information and operating procedures for this utility.

4.1.2 MTU4.ASM

MTU4 contains the tape control subroutines which have been incorporated into all of the software in this package. This program allows the user to interact with the tape transport without writing complex control routines by providing a simple yet pervasive communications protocol. It is included in this package to allow the user to produce his own customized tape software. The specifics of this program and its use can be found in Section 5 (Programers Guide).

4.2 TREAD:

TREAD, is a tape-to-disk copy/conversion program which will read the ANSI compatible data records from the nine track, convert them to CP/M compatible ASCII disk records, and store them on disk. This program allows for conversion of data records from EBCDIC to ASCII format, record segmentation (with user-specified segmentor), and user-specified file name and disk selection.

TREAD is invoked by typing **TREAD** in response to the system prompt. The program then determines the tape record storage parameters by asking the user the folowing questions. All numeric responses should be decimal 0-65535 unless otherwise noted. A response of <CR> only is considered zero. The question sequence begins:

ENTER LOGICAL TAPE RECORD LENGTH:

The Logical Record Length on a tape corresponds to the number of contiguous bytes pertaining to each source image. i.e. usually 80, 132, or 133 decimal depending if the tape is Punch-card or Print image. Note that there are usually multiple logical records in each physical record (or 'BLOCK') on tape. The number of logical records per block is known as the BLOCKING FACTOR.

ENTER RECORD BLOCK PADDING (0-255):

Some IBM tapes have a Block Padding at the beginning of each physical block. This data would be of no use in the CP/M disk file and may be omitted in this operation. This number of bytes of data will be discarded from the beginning of each physical record read from tape.

Remember the following equation:

(Physical Block Size)= (Physical Block Padding)+ ((Logical Record Length)x(Blocking Factor))

The user should respond to each of the above questions by typing the appropriate decimal value. Each entry should be terminated with a carriage return.

The user is then asked if data read from tape should be translated from EBCDIC to ASCII, thus:

EBCDIC TO ASCII CONVERSION (Y/N):

If the user responds no (N) to the above then the data will be stored on disk as the values read from tape. If the user responds yes (Y) then each byte read will be assumed to be in EBCDIC and will be translated to ASCII. If a byte has no ASCII equivalent it will be translated to an ASCII question mark (?) with the high order bit set ($0BF_{16}$).

Next the program asks if the records are to be segmented:

SEGMENT LOGICAL RECORDS (Y/N):

If the user responds no (N) to this no adjustment is made to the data. If the user responds yes (Y) then each logical record read from tape is preceded and followed by a record segmentor. This allows data to be stored in a manner compatible with high level sequential file techniques.

If segmentation is requested the program then allows the user to enter the segmenter to be used:

ENTER APPROPRIATE RECORD SEGMENTOR FROM KEYBOARD:

The most common segmentors are the double quote (") and single quote (´). Check the file structure of the language the file is to be compatible with to determine the proper entry.

Now the programs checks if carriage return/line feed segmentation is desired:

HOW ABOUT A NIFTY CR/LF SEGMENTOR (Y/N):

If the user responds yes (Y) to this prompt each logical record will be followed by a carriage return and a line feed. If record segmentation has also been specified, this sequence will follow the final segmentor. The cr/lf segmentation can be used in conjunction with the record segmentation to provide fully delimited data files as required by many high level languages.

All of the information entered to this point is retained by the program for use throughout execution. To alter any of this information the program must be terminated and rerun. At this point the program will rewind the tape and fall into the actual copy routine.

The user is then prompted for FILE & RECORD skip counts:

ENTER FILE SKIP COUNT (0-255):
ENTER RECORD SKIP COUNT:

The user should respond with the number of Files & Records (respectivley) to skip from the current position of the tape to reach the desired position on tape to copy.

The user is then asked for the name under which the file is to be stored on disk. This is done exactly as in **mTIP** except that user numbers are not supported, the current user always being assumed. If the filename **CRT<CR>** is specified the data will be sent to the terminal instead of being written to disk. The data written to screen will be formatted exactly as it would have been on disk, i.e. any requested translation or segmentation will have been performed. The stream of data to the screen may be stopped by typing control-S (^S) at any time, and restarted by striking any key.

Finally, the program asks for the number of blocks to be written to this disk file:

BLOCKS PER DISK FILE:

The user should respond with the number of physical blocks of data to be written to the specified disk file. This allows the user to truncate the data copied from tape. If the response is **0<CR>** or **<CR>** only ALL remaining tape blocks will be copied.

Once all the above information has been entered the program proceeds to copy the file using the specified parameters. For each tape block read during the copy the program displays its block number (relative to the start of the copy) and its length. Note that the program places no restrictions on the size of the tape block, reading any length block from tape that will fit into available memory (that above 12288 or 3000_{16}). If any errors occur they are reported to the user and the program is restarted from the beginning on user acknowledgment of the error, or aborted if the user chooses by entering an escape (ESC) in response to the restart prompt. If the disk is filled during the copy the current output file is closed and the user is prompted to insert a new disk and specify a file name to output to. The program will then continue the copy in progress to the newly specified file. On successful completion of a copy the program requests the skip count to position to the next file to be copied. The program will continue to cycle through this point until a carriage return (only) is entered in response to the filename prompt, or control-C (^C) in response to any prompt, at which point the program is terminated.

4.3 TWRITE:

The counterpart of TREAD, **TWRITE** is a disk-to-tape copy/conversion program. **TWRITE** copies CP/M compatible disk files to tape in ANSI compatible format. This program allows for conversion from ASCII to EBCDIC format and user specified tape record structure.

The operation of the **TWRITE** program is nearly identical with that of the **TREAD** program, but is included here for convenience. As with TREAD, all numeric responses should be decimal 0-65535 unless otherwise noted, and a <CR> only is considered zero.

TWRITE is invoked by typing **TWRITE** in response to the system prompt. The program then prompts the user for the record structure parameters as follows:

ENTER LOGICAL TAPE RECORD LENGTH:

The response to this is exactly as in TREAD.

ENTER RECORD BLOCK FACTOR (0-255):

This is the number of logical records per physical tape block, as described under TREAD. Note that this program does not support block padding . The last physical block written to tape will not consider the block factor, but will merely write out however much data remains. This is as per ANSI standard practice.

Desegmentation requirments are then determined:

STRIP RECORD SEGMENTATION (Y/N):

If the user responds yes (Y) to this he is then prompted for the segmentation character to strip:

ENTER SEGMENTOR FROM KEYBOARD:

to which he should respond with the desired SINGLE character only, NO TERMINATING <CR> SHOULD BE ENTERED. The program will remove this character from the input data before passing it on to the tape. This feature may be used to remove delimiters from formatted input, and write only raw data to tape. If the user specified no (N) to the desegment prompt no character is entered and no character stripping will occur.

The program then checks if cr/lf stripping is desired:

HOW ABOUT STRIPPING OFF THOSE NIFTY CR/LF SEQUENCES (Y/N):

If the user responds yes (Y) then all carriage returns and line feeds are removed from the incoming data, just as with the segmentors.

The user is then asked if the data should be translated from ASCII to EBCDIC, thus:

ASCII TO EBCDIC CONVERSION (Y/N):

If the response is no (N) then data will be copied to tape exactly as it appears on the disk. If the user responds yes (Y) then each byte read will be translated to EBCDIC. If a byte has no EBCDIC equivalent it will be translated as an EBCDIC question mark (?) with the high order bit set (0EFH)

The program now determines where to begin writing on tape:

ENTER FILE SKIP COUNT (0-255):

This number of files will then be skipped from the begining of the tape, and the tape left in this position to begin writing.

The information entered to this point is retained for use throughout execution. To alter any of this data the program must be rerun. The program will now enter the actual copy circuit.

The user is now asked for the name of the file to be copied from disk. The name of the file is entered exactly as in MTIP except that user numbers are not supported, the current user always being assumed. Please refer to section 3.5 (page 11) for further information on this procedure. If a non-existent file is designated the program will inform the user of such and re-request the file name.

The program will now copy the designated file to tape using the specified parameters. During the copy a count of the number of blocks written to tape is dynamically displayed on the terminal. If any errors occur they are reported to the user and the program is restarted from the beginning on user acknowlegment of the error, or aborted if the user chooses by entering an escape (ESC) in response to the restart prompt. When the current disk file is exhausted, the program asks the user if more data files are to be written to this tape file:

MORE DISK FILES TO THIS TAPE FILE (Y/N):

If the user responds yes (Y) then the program prompts him for a new file name, and concatenates this data to the current tape file, using the existing paramters. When the user answers no (N) the current tape file is terminated with a file mark and the program requests the name of the next file to be copied. The program will continue with this cycle until it is terminated by a carriage return (only) entered in response to the filename prompt, or control-C (^C) in response to any prompt. A final file mark is then written to tape and the program terminates.

The Programmers guide has been provide to direct the programmer with a complete understanding of the total hardware and software control provided with the TIP tape system.

5.1 INTRODUCTION

The ALLOY TAPE UTILITY PROTOCOL involves a three byte activation sequence and a two byte returned status sequence. These codes are passed via common RAM locations. In addition, read and write data are passed via a common. The location and size of this buffer may be defined by the user by storing the appropriate values in the R.AREA and WRDCNT RAM locations. Note that these locations are set to their default values (8208 bytes long with starting location 3000H) each time an Interface 'Reset' is issued. There are no real restrictions on the record size, though the user should consider the amount of RAM available to him and efficient use of the data cartridge as limitations in establishing this count. The user must also be sure not to allow the Read/Write buffer to overlap other active RAM when determining the buffer starting address. The activation sequence includes the mode argument (MA), which specifies the data type (mask or write data), data record size, the drive selection, and the track selection, the positional argument (PA) which contains a count used by the 'space' commands, and the command argument (CA) which specifies the actual command to execute. The returned sequence includes the drive status (DS) which reports the status of the currently selected drive, and the interface status (IS) which reports the command status, as well as the currently selected drive and track. Commands are executed by setting up the activation words as described herein, and performing a CALL to the starting address of the tape utility. This address will be referred to herein as ATU. See individual word explanations and communications flow diagram (Fig. 1) for further information.

5.2 CODE STORAGE LOCATIONS

The activation/status bytes are passed via common RAM locations. For a utility module with starting address ATU, these locations are as follows:

ATU+76CH	-	Read/Write record buffer start	(R.AREA)
ATU+76EH	-	Read/Write record size (bytes)	(WRDCNT)
ATU+770H	-	Mode Argument	(MA)
ATU+771H	-	Positional Argument	(PA)
ATU+772H	-	Command Argument	(CA)
ATU+774H	-	Drive Status	(DS)
ATU+775H	-	Interface Status	(IS)
ATU+77CH	-	Tape Error Code	(ECODE)
		NOTE: See TABLE 1 for detailed error code definitions	

5.3 ACTIVATION SEQUENCE WORDS

The actual bit usage and effects of the activation sequence words (i.e. MA, PA, and CA) are as follows:

(MA) Mode Argument [ATU+770H]

For Cartridge Tape Utility (ATU):

B7-B4	Reserved		
B3	Drive	00 = Drive 1	10 = Drive 3
B2	Selection	01 = Drive 2	11 = Drive 4
B1	Track	00 = ANSI Track 1	10 = ANSI Track 3
B0	Selection	01 = ANSI Track 2	11 = ANSI Track 4

For Open Real Utility (MTU):

B7-B4	Reserved		
B3	Drive	00 = Primary	10 = Invalid
B2	Selection	01 = Secondary	11 = Invalid
B1-B0	Reserved		

(PA) - Positional Argument [ATU+771]

B7 - B0 Unsigned values $1\text{-}256_{10}$ used by 'Space' commands (see below). Note that the PA contains one less than the actual space count, i.e. values 0-255 correspond to space counts 1-256.

(CA) - Command Argument [ATU+772]

B7 Reserved

B6 If 0, operation is relative to current tape position. If 1, operation is relative to BOT (rewind prior to command execution)

B5 Disable 'auto-rewrite on error' facility (Edit mode).

B4 Interface/Software 'Reset' if set. (Allow 3 ms. following issue.)

Note: This is the only command which will not update the DS/IS upon completion. It must be sent at least once following application of power.

ACTIVATION
SEQUENCE WORDS

B3 - B0	Commands proper	
	0000	No-Operation (Rewind if relative to BOT) (Retransmit block if not)
	0001	Read
	0010	Write
	0011	Write File Mark
	0100	Foward Space Records*
	0101	Foward Space Files
	0110	Reverse Space Records*
	0111	Reverse Space Files
	1000	Send Current Status
	1001	Off Line Copy
	1010	Reserved on DS-100 and DZ-80 Variable Length Read on TS-100/TZ-80
	1011	Record Search Under Mask*
	1100-1111	High Speed Commands*

* Will abort on File Mark Detected

Write Data

The default length of this data block is 8208 bytes. This allows for a full 8K record with a 16 byte record header. Prior to calling the utility, this data should be stored in the read/write buffer, which has starting address 3000H. If other than the default starting addresses and length are used, they should be set after the "Initialize Software" call to the software.

Note: With respect to the Cartridge subroutines- ATU4.ASM, R.AREA must begin on a page(256) boundary and WRDCNT must be greater than 255 bytes.

RETURNED
STATUS WORDS

The status words are available in the specified RAM locations on return from the tape utility. There meaning and usage of these words (i.e. DS and IS) are as follows:

(DS) - Drive Status [ATU+774H]

Note - all of the following bits are high true

B7	1 = Cartridge / 0 = 9 track
B6	File Mark was detected
B5	Drive Rewinding
B4	'ON' with tape media loaded or "On-Line"
B3	BOT - Beginning of Tape
B2	EOT early warning (only File Mark Write operations are allowed under this condition). 36 inches of tape exist between EOT early warning and the physical end of tape.
B1	Warning flag that the drive has executed an auto-rewind (i.e. power up or remote rewind) since previous command. No 'relative to current position' commands will be accepted with this condition present unless preceded by a discrete rewind command.)
B0	Write-enabled (tape is <u>not</u> 'Safe'). This is also true if no cartridge is installed. The data cartridge has a screwdriver slot to alter this condition

5.4 RETURNED STATUS WORDS

(IS) - Interface Status [ATU+775H]

B7	Reserved	
B6	Data Block Follows (high true)	
B5	Command	00 = OK
B4	Status	01 = Abort w/o Attempt **
		10 = Abort with Attempt *
		11 = Syntax Rejection or Parity Error
B3	Current >	
B2	Drive >	
	>	
	> AS PER (MA) Mode Argument (see above)	
B1	Current >	
B0	Track >	

* An Abort With Attempt would indicate possible tape motion. The command that follows should therefore be 'relative to BOT' unless care is taken to understand the exact abort criteria and tape position.

** An Abort Without Attempt would be indicative of:

1) Reverse space at BOT or foward space at EOT

2) A write operation to a safe cartridge

3) Write data at EOT early warning

4)Any op to a drive without a cartridge installed

Read Data

The read data is available in the read/write buffer area on return from the tape utility. See WRITE DATA for further information.

5.5 COMMAND EXPLANATION

1 - READ:

The READ command will read a block of data from the tape, and store it in the read/write buffer at location 3000H. Due to the read-after-write checking, read errors should be very infrequent, unless the tape has been mishandled or abused. Aborts could possibly occur for the following reasons:

1. Dirty or mis-aligned Read Head.
2. Faulty read circuitry.
3. Tape was abused or stored near magnetic fields.
4. Specified record size did not agree with 'writing' parameter.
5. Reading proceeded beyond the second consecutive File Mark.
6. Incompatible recording format
7. Adjacent record was 'edited' with an inconsistent record size paramter, out of calibration servo board, or without disabling the 'auto-rewrite' facility.

Note also that a read operation will terminate if a file mark is detected, and no data will be tranferred. See 'Read Data' section under 'Interface to Host Transfer Words' for further information.

2 - Write:

Write will take the data found in the read/write buffer and write this onto the tape. The utility will attempt to rewrite the record if an error is detected, each time backspacing and erasing three inches of tape. The number of retries is application sensitive. All records are verified during writing using the read-after-write facility on the transport. If end of tape status is sensed during the write to tape the procedure will abort and the error status will be reported. If EOT is sensed after the record is written it will be reported in the drive status, but the interface status will indicate command status OK (00). Both of these possibilites must be considered in the host write routines. See 'Write Data' under 'Host to Interface Transfer Words' and 'Write Data Operational Flow' (Fig. 2) for further details.

COMMAND
EXPLANATION

3 - Write File Mark:

The Write File Mark command will write a file mark on the tape. This mark is used to seperate files on the tape, and two consecutive file marks must appear at the end of each track. To facilitate these uses file marks may be written after recieving end of tape status.

4 & 6 - Space Records:

The Space Records commands will space the tape in the specified direction past the number of records specified by the positional argument. Note that the value of the PA is one less than the number of records to space past. These routines will abort and signal an error if a file mark is encountered.

5 & 7 - Space Files:

These commands operate as per Space Records, but counting file marks instead of records. Obviously this routine will not abort on file mark detected.

8 - Send Current Status:

The current drive status (DS) and interface status (IS) are returned after the interface receives a 'ready' conditon from the selected drive. This is useful when issued 'relative to BOT' as the statuses will not be returned until the tape has completed its rewind operation.

9 - Off Line Copy:

This command may be issued to dynamically back-up recorded information. Drive 1 is always the source and drive 2 the destination. The copy firmware requires that the tapes conform to the following format:

A) All data records must be the same length and of a length specifiable by the mode argument. This length is determined from track 1 record 1.

B) ALL tracks must be logically terminated by two contiguuous file marks.

C) The destination cartridge must be of recording capacity equal to or greater than the source cartridge.

COMMAND
EXPLANATION

10 - Reserved

This command is not currently used by the utilities, and is reserved for future expansion. Issuance of this command will result in a 'Syntax Rejection' code being returned in the Interface Status (IS).

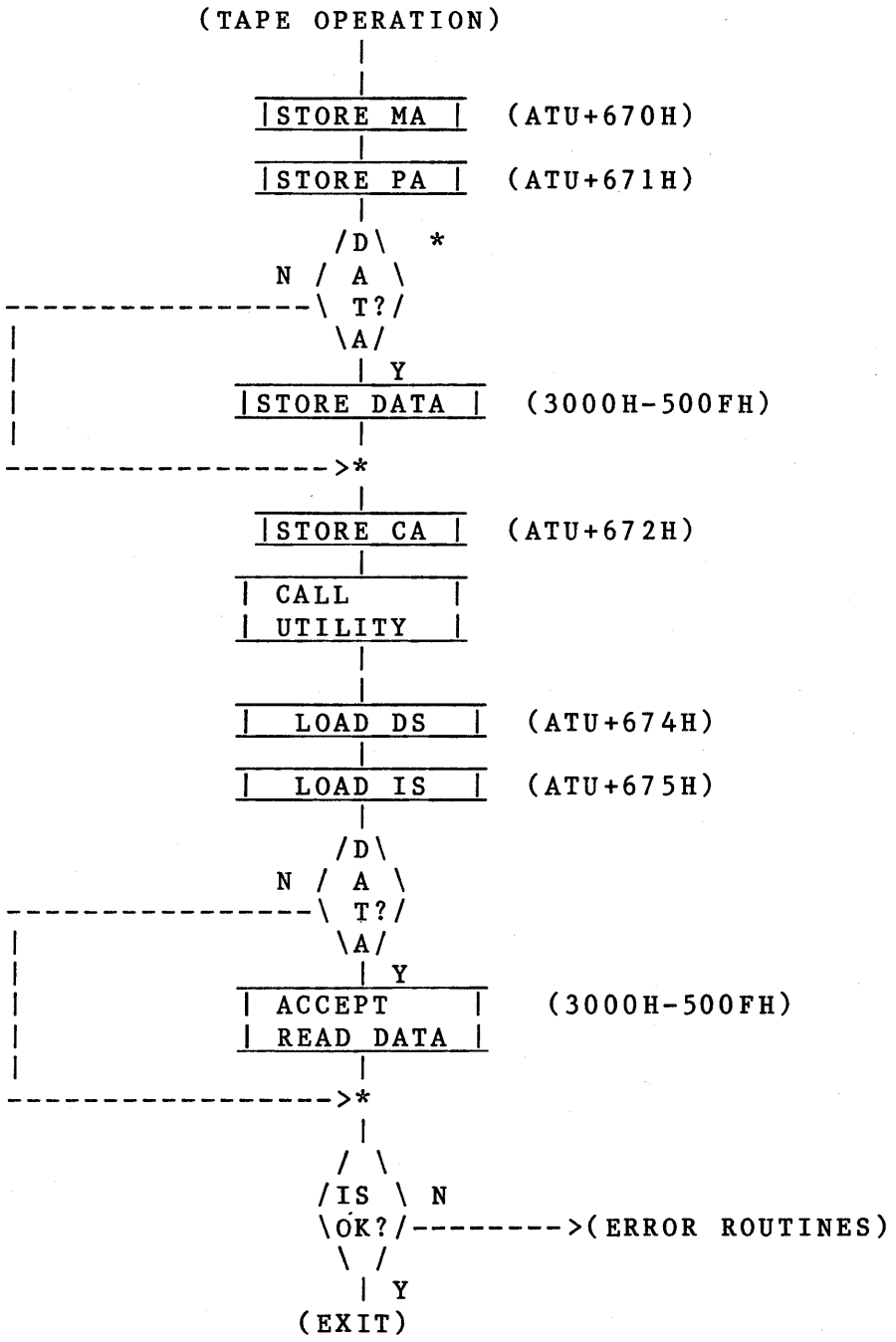
11 - Record Search Under Mask:

A mask of up to 16 bytes is associated with this command, and is stored in the mask buffer area, which begins at location 2900H, prior to calling the utility. The interface then searches the tape for a record whose initial data bytes match this mask. If a mask byte is $3F_{16}$ (ASCII ?) then the corresponding record byte is ignored (i.e. a match is assumed). When a matching record is found it is returned in its entirety,as per a read data. This command will abort with attempt if a file mark is detected.

12 thru 15 - High Speed Commands

These commands operate identically with commands 4 thru 7, except if the PA value is greater than 0, they will be executed at 90 I.P.S. Note that on the 9-Track open reel tape the dual speed option must be present, or these commands will execute at normal speed.

5.6.1 COMMUNICATIONS FLOW



*WRITE DATA OR MASK

Fig. 5-1

5.6.2 WRITE DATA OPERATIONAL FLOW

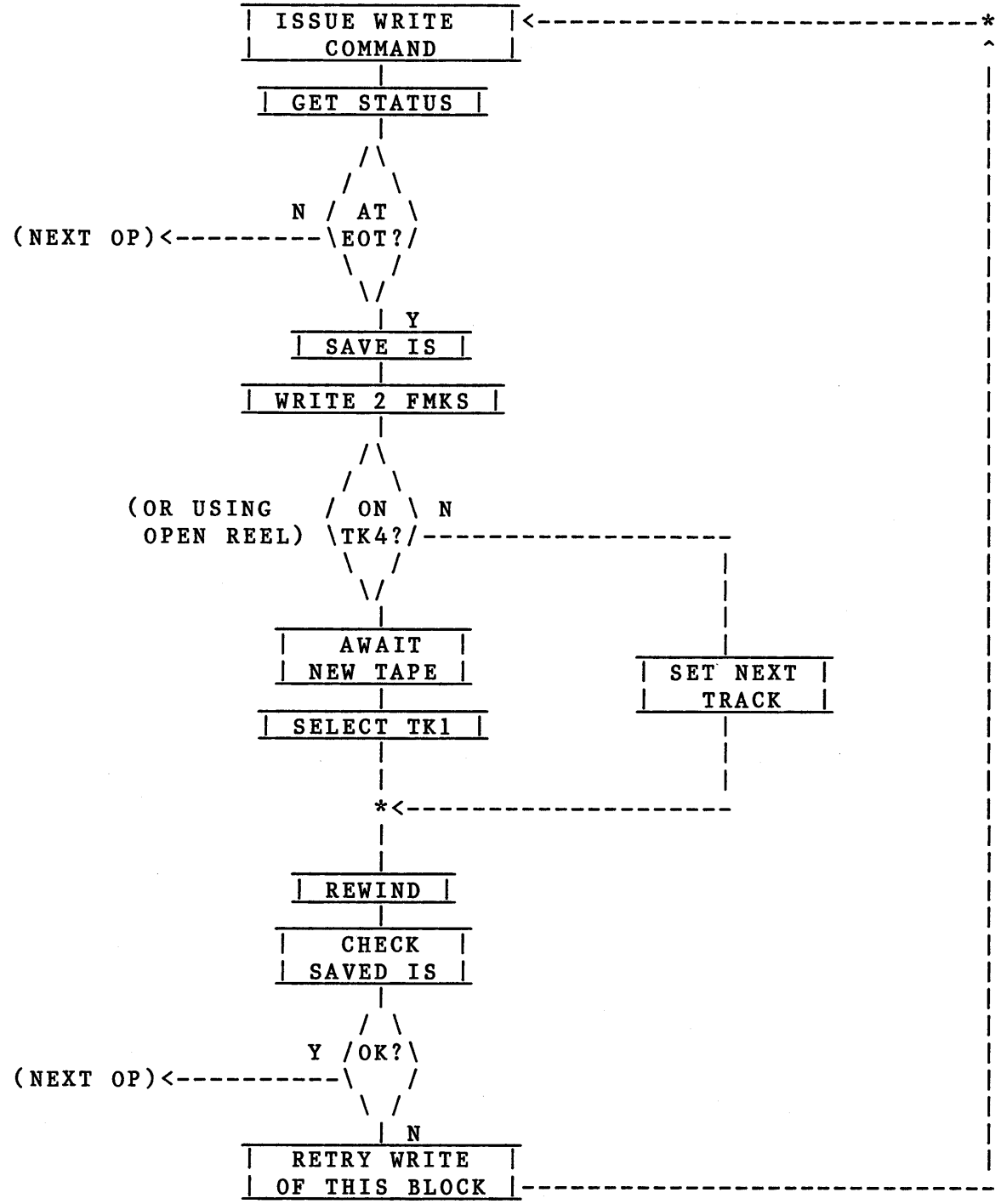


Fig. 5-2

5.7 ERROR CODES

CODE:	MEANING:
00	SELECTED DRIVE HAS EXECUTED AUTO-REWIND SINCE PREVIOUS INIT OR REWIND CMD.
01	WRITE OPERATION REQUEST TO A WRITE PROTECTED DRIVE
02	COMMAND ISSUED TO NON-PRESENT DRIVE OR DRIVE WITH CARTRIDGE REMOVED
03	DRIVE FAILED TO RESPOND TO THE REQUESTED COMMAND
06	FILE MARK VERIFICATION ERROR AFTER WRITING IT
07	TRANSPORT ABORT PRIOR TO COMMAND COMPLETION
08	READ FAIL - MISSING DATA OR FMK
09	READ FAIL - LRCC RECORD ERROR or IHER* ON 9-TRACK
10	READ FAIL - SHORT RECORD ERROR
11	READ FAIL - BAD VERTICAL PARITY
12	WRITE FAIL - R-A-W VERIFY ERROR
13	WRITE FAIL - READ DATA NOT DETECTED PRIOR TO RECORD WRITE OPERATION COMPLETION
14	READ FAIL - FILE MARK DETECTED

5.8 Running AS.COM

```
A>AS MTU4 A:D<CR>
```

The above command line assembles MTU4.ASM, creates an object file MTU4.HEX on the A: drive, and creates MTU4.PRN on the A: drive. If the :D were changed to :0 then no .PRN file is generated.

The preventive maintenance is a must read section for every user. Following a few simple rules will save needless wasted time, by preventing many errors before they occur. NOTE: This section of the TIP manual deals exclusively with the tape cartridge drive and media. For users with 9 Track drive systems Alloy recommends that you read the Cypher drive manual. In general, PM should be done after every 20 hours of operation.

6.1 Handling the Tape Cartridge

There are a few simple rules which the user must be aware of while handling the magnetic tape media

Be certain that no tape cartridge is in the drive while powering up, or powering down the tape drive or the computer system.

--- also ---

Never remove the tape cartridge while any kind of tape transfer is underway.

--- also --

Store your cartridges in a cool dry place when not in operation. Permanent damage may be done to the capstan is a tape is left in the unit!

6.1.1 Selecting the Proper Cartridge Tape Media

As of this printing, the only recommended tape cartridges for use with the 6400 BPI technology drives are as follows:

VERBATIM TC-8450 (450´)

3M-SCOTCH DC-300A (300´) or DC-300XL (450´) -see note

NOTE: DC-300XL lot numbers 087-XXX, 089-XXX, and 8105/0505 are known to contain <u>POOR</u> performing media and should be avoided.

Please note that Alloy sells **CERTIFIED MEDIA.**

6.2 Periodic Tape Unit Maintenance

Three components of the tape unit require periodic maintenance in order to insure overall system reliability. The cleaning removes contaminants from the tape unit which come in direct contact with the tape. The cleaning assures that there will be adequate contact between the tape head and the the media.

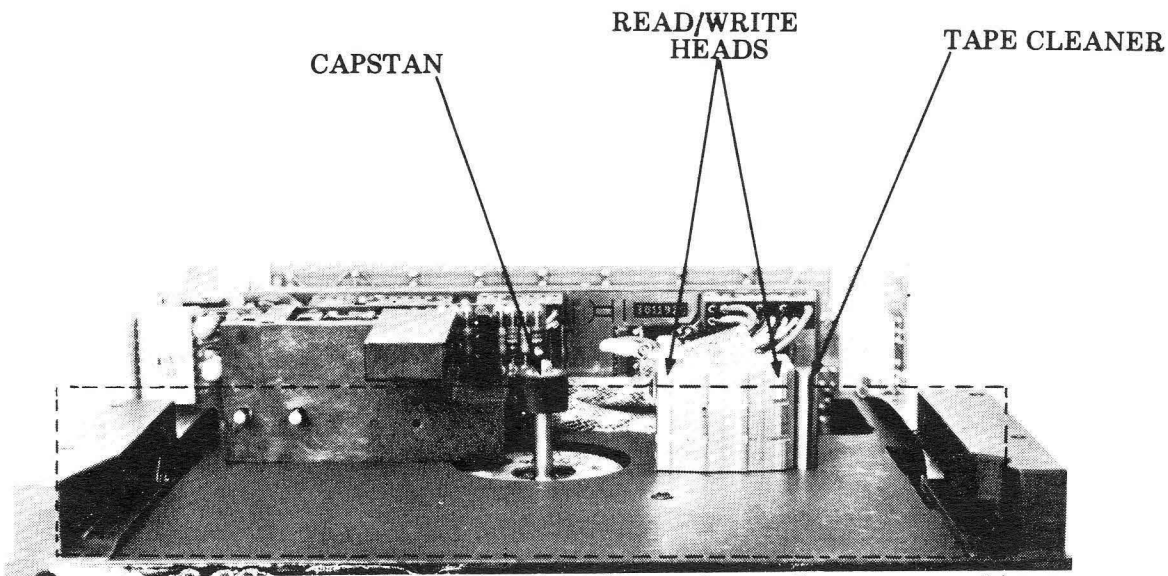
6.2.1 Tape Head Cleaning

A dirty tape head can cause data dropouts and error conditions during read and write operations. It is recomended that you clean your tape head frequently with a non-corrosive, non-residuecleaning agent such as isopropyl alcohol. Apply the alcohol with a cotton swab and be sure to wipe off any excess and allow the head to dry before using the unit.

CAUTION: - **Spray type head cleaners are not recomended**

- **Never clean the tape head witha hard object.This will result in head damage.**

6.6.6 Cartridge Tape Unit (picture)



(Area within dotted line is seen from front panel)

6.2.3 Cleaning the "Tape Cleaner"

The tape cleaner removes loose foreign material from the tape before it comes in conact with the tape head. This foreign material accumulates in and around the tape. The tape cleaner should be cleaned with the same frequency as the tape head.

To clean the tape cleaner insert a folded piece of paper in the bottom of the cleaner and lift up. This will lift out all foreign material. Compressed air or a brush may be used. It is also recommended that occasionaly you use the same cotton swab and alcohol method suggested in the tape head cleaning section.

CAUTION: Never clean the "Tape Cleaner" with a hard object If the tape cleaner should become chipped it could scratch the tape causing data loss or permanent damage.

6.2.4 Capstan Cleaning

The recommended method for cleaning the capstan is the same one recommeneded for the tape head; alcohol and a cotton swab.

CAUTION: Be very careful not to permit cleaning solvent to contaminate the drive motor bearing.

APPENDIX A -- Tip Record Format

The tape records written are 8208 bytes in length, allowing for a full 8K data record with a 16 byte file control block (FCB) header. This header on tape takes the following form:

```
-----------------------------------------
|US|F1|F2|/ /|F8|T1|T2|T3|SS|LB|SD|RC|
-----------------------------------------
 00 01 02 ... 08 09 10 11 12 13 14 15
```

WHERE:

US	CONTAINS THE USER NUMBER 00 - 0F HEXADECIMAL
F1 - F8	CONTAIN THE FILE NANE IN ASCII UPPER CASE, WITH HIGH BIT = 0
T1,T2,T3	CONTAIN THE FILE TYPE IN ASCII UPPER CASE, WITH HIGH BIT = 0
SS	CONTAINS THE SAVE SET NUMBER 00 - 7F HEXIDECIMAL
LB	CONTAINS THE 'LAST BLOCK' FLAG THIS IS TRUE FOR THE LAST TAPE BLOCK OF A FILE ONLY.
SD	CONTAINS THE SOURCE DEVICE CODE 00 - 0F HEXADECIMAL (CORRESPONDING TO DRIVES A - P)
RC	CONTAINS THE NUMBER OF 128 BYTE RECORDS IN THIS TAPE BLOCK THAT CONTAIN ACTIVE DATA.

APPENDIX B -- Cartridge Drive Data Format

Storage Details

Data is stored bit/byte serial sequentially on 4 DATA TRACKS.

Record Format

PREAMBLE	minimum 40 "zero" bits	
SEQUENCE	and a single "one" bit	
PRE-SYNC BITS	3 "zero" bits	
SYNC BYTE =	FFH	
RECORD TYPE BYTE	Data = 22H(cr) FMK = 55H	
DATA BYTE 1 DATA BYTE 2 DATA BYTE "n"		Omitted if "File Mark" > Calculation basis for LRCC byte
LRCC BYTE	(even parity)	
RECORD TYPE =	22H	
POSTAMBLE SEQUENCE	single "one" bit & minimum 40 "zero" bits	
Minimum 1.2" 1.25" nominal INTER-RECORD-GAp		

NOTE: All bytes consist of 8 data bits (LSB first) + 1 vertical parity bit (Even)

APPENDIX C -- DS-100, DZ-80B I/O Assignments

```
IDEIS1  =P+0     ; INPUT DEI STATUS-1


        B0-      SLD      ; DRIVE IS SELECTED
        B1-      BSY      ; DRIVE BUSY
        B2-      WND      ; DRIVE WRITE LOGIC ON
        B3-      FUP      ; FILE IS PROTECTED (SAFE)

        B4-      FLG      ; REWIND HAS OCURRED
        B5-      EWS      ; TAPE EARLY END WARNING
        B6-      LPS      ; TAPE IN LOAD-POINT AREA
        B7-      RDY      ; DRIVE 'ON WITH CART.'


ODEIL1  =P+5     ; OUTPUT DEI LATCH-1

        NOTE: THE SENSE OF THESE BITS IS LOW=TRUE

        B0-      REV*     ; MOVE REVERSE
        B1-      FWD*     ; MOVE FORWARD
        B2-      HSP*     ; MOVE AT HIGH-SPEED
        B3-      WEN*     ; SET WRITE-ENABLE

        B4-      PASS-THROUGH BIT* ; ALLOW FLG OP'S
        B5-      RWD*     ; REWIND THE DRIVE
        B6-      NOT USED
        B7-      SLG (HIGH TO SELECT DRIVE)


IMSR    =P+1     ; INPUT MISC. STATUS REG.

        B0-B3    NOT ASSIGNED

        B4-      PASS-THROUGH BIT
        B5-      DATA DETECTED
        B6-      PCI1-TXRDY
        B7-      PCI1-RXRDY


ODEIL2  =P+4     ; OUTPUT DEI LATCH-2

        NOTE: THE SENSE OF THESE BITS IS LOW=TRUE

        B0-      LED1* (ON LINE)
        B1-      LED2* (FAULT)
        B2-      RESERVED
        B3-      SL1*      ; Drive Select LSB

        B4-      SL2*
        B5-      TR1*      ; Track Select LSB
        B6-      TR2*
        B7-      SL4*
```

```
NOTE:   SEE SIGNETICS SPECIFICATION (2651) FOR
        BIT ASSIGNMENTS ETC. (Appendix O)

OPCIDR  =P+12    ; OUTPUT PCI DATA REGISTER

OPCISR  =P+13    ; OUTPUT PCI SYNC REGISTER

OPCIMR  =P+14    ; OUTPUT PCI MODE REGISTERS

OPCICR  =P+15    ; OUTPUT PCI COMMAND REGISTER

IPCIDR  =P+8     ; READ PCI DATA REGISTER

IPCISR  =P+9     ; READ PCI STATUS REGISTER

IPCIMR  =P+10    ; READ PCI MODE REGISTERS

IPCICR  =P+11    ; READ PCI COMMAND REGISTER
```

APPENDIX D -- TS-100, TZ-80 I/O Assignments

```
ISTAT   =P+0     ; INPUT TAPE STATUS

  NOTE: L=LATCHED STATUS CLEARED BY OTCLR

        B0-      IONL     ; DRIVE IS ON-LINE
    L   B1-      IFMK     ; FILE MARK DETECTED
        B2-      IREW     ; DRIVE IS REWINDING
        B3-      IFPT     ; FILE IS PROTECTED (SAFE)

    L   B4-      IHER     ; HARD ERROR WAS DETECTED
    L   B5-      IEOT     ; END OF TAPE
        B6-      ILPT     ; TAPE AT LOAD-POINT AREA
        B7-      IRDY     ; TAPE UNIT IS READY

IMSR    =P+1     ; INPUT MISC. STATUS REG.

        B0-B3    NOT ASSIGNED

        B4-      TAPE DATA BUSY    (IDBY)
        B5-      FORMATTER IS BUSY (IFBY)
        B6-      DATA TO   TAPE BUFFER FULL
        B7-      DATA FROM TAPE BUFFER FULL
```

```
OCEOF   =P+2     ; CLEAR EOF STATUS

ORWD    =P+3     ; REWIND SELECTED DRIVE

OCONT   =P+4     ; OUTPUT CONTROL

        NOTE: THE SENSE OF THESE BITS IS LOW=TRUE

        B0-     LED1*   ;
        B1-     LED2*   ;
        B2-     LED3*   ;
        B3-     ITAD1*  ; LOW  = DRIVE 1
                        ; HIGH = DRIVE 0
        B4-     ILWD*   ; LAST WRITE WORD
        B5-     IFAD*   ; FORMATTER ADDR.
        B6-     IGO*    ; GO COMMAND TO FORMATTER
                        ;  BASED ON DATA IN OTDAT
        B7-     IDEN*   ; SELECT HIGH SPEED/DEN

OTDAT   =P+5     ; OUTPUT DATA TO TAPE

        NOTE: THE SENSE OF THESE BITS IS LOW=TRUE
        NOTE: THE INVERSE OF THE TAPE COMMAND IS
                ALSO SET BY THIS CMD INTO THE LOW
                ORDER 5 BIT OF THE LATCH.

ITDAT   =P+6     ; INPUT TAPE DATA

        NOTE: THE SENSE OF THESE BITS IS LOW=TRUE

OTCLR   =P+7     ; OUTPUT TAPE CLEAR

        CLEARS: ITDAT FULL
                OTDAT FULL
                IHER & IEOT F/F'S
                PULSES IFEN*
```

APPENDIX E -- DS-100, DZ-80B I/O CONNECTIONS

PIN #	SIGNAL	FROM	COMMENTS
2	SLD-	Drive	Selected
4	RDY-	Drive	Ready
6	WND-	Drive	Write Enabled
8	FLG-	Drive	Flag
10	LPS-	Drive	Load Point Sensed
12	FUP-	Drive	File Unprotected
14	BSY-	Drive	Busy
16	EWS-	Drive	Early Warning Sensed
18	RWD-	Controller	Rewind
20	REV-	Controller	Reverse
22	FWD-	Controller	Forward
24	HSP-	Controller	High Speed
26	WEN-	Controller	Write Enable
28	SL1-	Controller	Unit Select 2^0
30	SL2-	Controller	Unit Select 2^1
32	SL4-	Controller	Unit Select 2^2
34	SLG-	Controller	Select Gate
36	RNZ-	Drive	Read NRZ Data
38	RDS-	Drive	Read Data Strobe
40	DAD-	Drive	Data Detected
42	WDE-	Controller	Write Data Enabled
44	WNZ-	Controller	Write NRZ Data
46	TR2-	Controller	Track Select 2^1
48	WDS-	Drive	Write Data Strobe
50	TR1-	Controller	Track Select 2^0

NOTE: 1) All odd numbered pins are returns.

2) Mating connector: 3M Part Number 3425-3000 or equivalent.

PLUG NO.	LIVE PIN	GROUND PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	2	1	Formatter Busy	IFBY
P1	14	13	Reserved	-
P1	48	47	Read Data 2	IR2
P1	50	49	Read Data 3	IR3
P2	1	-	Read Data Parity	IRP
P2	2	-	Read Data 0	IR0
P2	3	-	Read Data 1	IR1
P2	4	-	Load Point	ILDP
P2	6	5	Read Data 4	IR4
P2	8	7	Read Data 7	IR7
P2	10	9	Read Data 6	IR6
P2	12	11	Hard Error	IHER
P2	14	13	Filemark	IFMK
P2	16	25	Identification	IIDENT
P2	20	19	Read Data 5	IR5
P2	22	21	End of Tape	IEOT
P2	26	25	Reserved	-
P2	28	27	Ready	IRDY
P2	30	29	Rewinding	IRWD
P2	32	31	File Protect	IFPT
P2	34	33	Read Strobe	IRSTR
P2	36	35	Write Strobe	IWSTR
P2	38	37	Data Busy	IDBY
P2	40	39	High Speed Status	ISPEED
P2	42	41	Corrected Error	ICER
P2	44	43	On Line	IONL

PLUG NO.	LIVE PIN	GROUND PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	4	3	Last Word	ILWD
P1	6	5	Write Data 4	IW4
P1	8	7	Initiate Command	IGO
P1	10	9	Write Data 0	IW0
P1	12	11	Write Data 1	IW1
P1	16	15	Reserved	-
P1	18	17	Reverse	IREV
P1	20	19	Rewind	IREW
P1	22	21	Write Data Parity	IWP
P1	24	23	Write Data 7	IW7
P1	26	25	Write Data 3	IW3
P1	28	27	Write Data 6	IW6
P1	30	29	Write Data 2	IW2
P1	32	31	Write Data 5	IW5
P1	34	33	Write	IWRT
P1	36	35	Reserved	-
P1	38	37	Edit	IEDIT
P1	40	39	Erase	IERASE
P1	42	41	Write File Mark	IWFM
P1	44	43	Reserved	-
P1	46	45	Transport Address 0	ITAD0
P2	18	17	Formatter Enable	IFEN
P2	24	23	Rewind/Unload	IRWU
P2	46	45	Transport Address 1	ITAD1
P2	48	47	Formatter Address	IFAD
P2	50	49	High Speed Select	IHISP

LOC.	HEX	TRANSLATION
1000	00	=> NULL (^@)
1001	01	=> SOH (^A)
1002	02	=> STX (^B)
1003	03	=> ETX (^C)
1004	37	=> EOT (^D)
1005	2D	=> ENQ (^E)
1006	2E	=> ACK (^F)
1007	2F	=> BEL (^G)
1008	16	=> BS (^H)
1009	05	=> HT (^I)
100A	25	=> LF (^J)
100B	0B	=> VT (^K)
100C	0C	=> FF (^L)
100D	0D	=> CR (^M)
100E	0E	=> SO (^N)
100F	0F	=> SI (^O)
1010	10	=> DLE (^P)
1011	11	=> DC1 (^Q)
1012	12	=> DC2 (^R)
1013	13	=> DC3 (^S)
1014	3C	=> DC4 (^T)
1015	3D	=> NAK (^U)
1016	32	=> SYN (^V)
1017	26	=> ETB (^W)
1018	18	=> CAN (^X)
1019	19	=> EM (^Y)
101A	3F	=> SUB (^Z)
101B	27	=> ESC (^[)
101C	22	=> FS (^\)
101D	EF	=> INVALID
101E	EF	=> INVALID
101F	EF	=> INVALID
1020	40	=> SPACE
1021	5A	=> !
1022	7F	=> "
1023	7B	=> #
1024	5B	=> $
1025	6C	=> %
1026	50	=> &
1027	7D	=> '
1028	4D	=> (
1029	5D	=>)
102A	5C	=> *
102B	4E	=> +
102C	6B	=> ,
102D	60	=> -
102E	4B	=> .
102F	61	=> /
1030	F0	=> 0
1031	F1	=> 1
1032	F2	=> 2
1033	F3	=> 3
1034	F4	=> 4
1035	F5	=> 5
1036	F6	=> 6
1037	F7	=> 7
1038	F8	=> 8
1039	F9	=> 9
103A	7A	=> :
103B	5E	=> ;
103C	4C	=> <
103D	7E	=> =
103E	6E	=> >
103F	6F	=> ?
1040	7C	=> @
1041	C1	=> A
1042	C2	=> B
1043	C3	=> C
1044	C4	=> D
1045	C5	=> E
1046	C6	=> F
1047	C7	=> G
1048	C8	=> H
1049	C9	=> I
104A	D1	=> J
104B	D2	=> K
104C	D3	=> L
104D	D4	=> M
104E	D5	=> N
104F	D6	=> O
1050	D7	=> P
1051	D8	=> Q
1052	D9	=> R
1053	E2	=> S
1054	E3	=> T
1055	E4	=> U
1056	E5	=> V
1057	E6	=> W
1058	E7	=> X
1059	E8	=> Y
105A	E9	=> Z
105B	EF	=> INVALID
105C	E0	=> \
105D	EF	=> INVALID
105E	5F	=> ANGLE THING
105F	6D	=> _
1060	4A	=> `
1061	81	=> a
1062	82	=> b
1063	83	=> c
1064	84	=> d
1065	85	=> e
1066	86	=> f
1067	87	=> g
1068	88	=> h
1069	89	=> i
106A	91	=> j
106B	92	=> k
106C	93	=> l
106D	94	=> m
106E	95	=> n
106F	96	=> o
1070	97	=> p
1071	98	=> q
1072	99	=> r
1073	A2	=> s
1074	A3	=> t
1075	A4	=> u
1076	A5	=> v
1077	A6	=> w
1078	A7	=> x
1079	A8	=> y
107A	A9	=> z
107B	C0	=> OPEN BRACE
107C	5F	=> |
107D	D0	=> CLOSE BRACE
107E	A1	=> TILDA
107F	07	=> DEL
1080	EF	=> INVALID
1081	EF	=> INVALID
1082	EF	=> INVALID
1083	EF	=> INVALID
1084	EF	=> INVALID
1085	EF	=> INVALID
1086	EF	=> INVALID
1087	EF	=> INVALID
1088	EF	=> INVALID
1089	EF	=> INVALID
108A	EF	=> INVALID
108B	EF	=> INVALID
108C	EF	=> INVALID
108D	EF	=> INVALID
108E	EF	=> INVALID
108F	EF	=> INVALID
1090	EF	=> INVALID
1091	EF	=> INVALID
1092	EF	=> INVALID
1093	EF	=> INVALID
1094	EF	=> INVALID
1095	EF	=> INVALID
1096	EF	=> INVALID
1097	EF	=> INVALID
1098	EF	=> INVALID
1099	EF	=> INVALID
109A	EF	=> INVALID
109B	EF	=> INVALID
109C	EF	=> INVALID
109D	EF	=> INVALID
109E	EF	=> INVALID
109F	EF	=> INVALID
10A0	EF	=> INVALID
10A1	EF	=> INVALID
10A2	EF	=> INVALID
10A3	EF	=> INVALID
10A4	EF	=> INVALID
10A5	EF	=> INVALID
10A6	EF	=> INVALID
10A7	EF	=> INVALID
10A8	EF	=> INVALID
10A9	EF	=> INVALID
10AA	EF	=> INVALID
10AB	EF	=> INVALID
10AC	EF	=> INVALID
10AD	EF	=> INVALID
10AE	EF	=> INVALID
10AF	EF	=> INVALID
10B0	EF	=> INVALID
10B1	EF	=> INVALID
10B2	EF	=> INVALID
10B3	EF	=> INVALID
10B4	EF	=> INVALID
10B5	EF	=> INVALID
10B6	EF	=> INVALID
10B7	EF	=> INVALID
10B8	EF	=> INVALID
10B9	EF	=> INVALID
10BA	EF	=> INVALID
10BB	EF	=> INVALID
10BC	EF	=> INVALID
10BD	EF	=> INVALID
10BE	EF	=> INVALID
10BF	EF	=> INVALID
10C0	EF	=> INVALID
10C1	EF	=> INVALID
10C2	EF	=> INVALID
10C3	EF	=> INVALID
10C4	EF	=> INVALID
10C5	EF	=> INVALID
10C6	EF	=> INVALID
10C7	EF	=> INVALID
10C8	EF	=> INVALID
10C9	EF	=> INVALID
10CA	EF	=> INVALID
10CB	EF	=> INVALID
10CC	EF	=> INVALID
10CD	EF	=> INVALID
10CE	EF	=> INVALID
10CF	EF	=> INVALID
10D0	EF	=> INVALID
10D1	EF	=> INVALID
10D2	EF	=> INVALID
10D3	EF	=> INVALID
10D4	EF	=> INVALID
10D5	EF	=> INVALID
10D6	EF	=> INAVLID
10D7	EF	=> INVALID
10D8	EF	=> INVALID
10D9	EF	=> INVALID
10DA	EF	=> INVALID
10DB	EF	=> INVALID
10DC	EF	=> INVALID
10DD	EF	=> INVALID
10DE	EF	=> INVALID
10DF	EF	=> INVALID
10E0	EF	=> INVALID
10E1	EF	=> INVALID
10E2	EF	=> INVALID
10E3	EF	=> INVALID
10E4	EF	=> INVALID
10E5	EF	=> INVALID
10E6	EF	=> INVALID
10E7	EF	=> INVALID
10E8	EF	=> INVALID
10E9	EF	=> INVALID
10EA	EF	=> INVALID
10EB	EF	=> INVALID
10EC	EF	=> INVALID
10ED	EF	=> INVALID
10EE	EF	=> INVALID
10EF	EF	=> INVALID
10F0	EF	=> INVALID
10F1	EF	=> INVALID
10F2	EF	=> INVALID
10F3	EF	=> INVALID
10F4	EF	=> INVALID
10F5	EF	=> INVALID
10F6	EF	=> INVALID
10F7	EF	=> INVALID
10F8	EF	=> INVALID
10F9	EF	=> INVALID
10FA	EF	=> INVALID
10FB	EF	=> INVALID
10FC	EF	=> INVALID
10FD	EF	=> INVALID
10FE	EF	=> INVALID
10FF	EF	=> INVALID

LOC.	HEX	TRANSLATION
1000	00	=> NULL (^@)
1001	01	=> SOH (^A)
1002	02	=> STX (^B)
1003	03	=> ETX (^C)
1004	BF	=> INVALID
1005	09	=> HT (^I)
1006	BF	=> INVALID
1007	7F	=> DEL
1008	BF	=> INVALID
1009	BF	=> INVALID
100A	BF	=> INVALID
100B	0B	=> VT (^K)
100C	0C	=> FF (^L)
100D	0D	=> CR (^M)
100E	0E	=> SO (^N)
100F	0F	=> SI (^O)
1010	10	=> DLE (^P)
1011	11	=> DC1 (^Q)
1012	12	=> DC2 (^R)
1013	13	=> DC3 (^S)
1014	BF	=> INVALID
1015	BF	=> INVALID
1016	08	=> BS (^H)
1017	BF	=> INVALID
1018	18	=> CAN (^X)
1019	19	=> EM (^Y)
101A	BF	=> INVALID
101B	BF	=> INVALID
101C	BF	=> INVALID
101D	BF	=> INVALID
101E	BF	=> INVALID
101F	BF	=> INVALID
1020	BF	=> INVALID
1021	BF	=> INVALID
1022	1C	=> FS (^\)
1023	BF	=> INVALID
1024	BF	=> INVALID
1025	0A	=> LF (^J)
1026	17	=> ETB (^W)
1027	1B	=> ESC (^[)
1028	BF	=> INVALID
1029	BF	=> INVALID
102A	BF	=> INVALID
102B	BF	=> INVALID
102C	BF	=> INVALID
102D	05	=> ENQ (^E)
102E	06	=> ACK (^F)
102F	07	=> BEL (^G)
1030	BF	=> INVALID
1031	BF	=> INVALID
1032	16	=> SYN (^V)
1033	BF	=> INVALID
1034	BF	=> INVALID
1035	1E	=> RS (^^)
1036	BF	=> INVALID
1037	04	=> EOT (^D)
1038	BF	=> INVALID
1039	BF	=> INVALID
103A	BF	=> INVALID
103B	BF	=> INVALID
103C	14	=> DC4 (^T)
103D	15	=> NAK (^U)
103E	BF	=> INVALID
103F	1A	=> SUB (^Z)

LOC.	HEX	TRANSLATION
1040	20	=> SPACE
1041	BF	=> INVALID
1042	BF	=> INVALID
1043	BF	=> INVALID
1044	BF	=> INVALID
1045	BF	=> INVALID
1046	BF	=> INVALID
1047	BF	=> INVALID
1048	BF	=> INVALID
1049	BF	=> INVALID
104A	60	=> `
104B	2E	=> .
104C	3C	=> <
104D	28	=> (
104E	2B	=> +
104F	BF	=> INVALID
1050	26	=> &
1051	BF	=> INVALID
1052	BF	=> INVALID
1053	BF	=> INVALID
1054	BF	=> INVALID
1055	BF	=> INVALID
1056	BF	=> INVALID
1057	BF	=> INVALID
1058	BF	=> INVALID
1059	BF	=> INVALID
105A	21	=> !
105B	24	=> $
105C	2A	=> *
105D	29	=>)
105E	3B	=> =>
105F	5E	=> ANGLE
1060	2D	=> -
1061	2F	=> /
1062	BF	=> INVALID
1063	BF	=> INVALID
1064	BF	=> INVALID
1065	BF	=> INVALID
1066	BF	=> INVALID
1067	BF	=> INVALID
1068	BF	=> INVALID
1069	BF	=> INVALID
106A	7C	=> |
106B	2C	=> ,
106C	25	=> %
106D	5F	=> _
106E	3E	=> >
106F	3F	=> ?
1070	BF	=> INVALID
1071	BF	=> INVALID
1072	BF	=> INVALID
1073	BF	=> INVALID
1074	BF	=> INVALID
1075	BF	=> INVALID
1076	BF	=> INVALID
1077	BF	=> INVALID
1078	BF	=> INVALID
1079	5C	=> \
107A	3A	=> :
107B	23	=> #
107C	40	=> @
107D	27	=> '
107E	3D	=> =
107F	22	=> "

LOC.	HEX	TRANSLATION
1080	BF	=> INVALID
1081	61	=> a
1082	62	=> b
1083	63	=> c
1084	64	=> d
1085	65	=> e
1086	66	=> f
1087	67	=> g
1088	68	=> h
1089	69	=> i
108A	BF	=> INVALID
108B	BF	=> INVALID
108C	BF	=> INVALID
108D	BF	=> INVALID
108E	BF	=> INVALID
108F	BF	=> INVALID
1090	BF	=> INVALID
1091	6A	=> j
1092	6B	=> k
1093	6C	=> l
1094	6D	=> m
1095	6E	=> n
1096	6F	=> o
1097	70	=> p
1098	71	=> q
1099	72	=> r
109A	BF	=> INVALID
109B	BF	=> INVALID
109C	BF	=> INVALID
109D	BF	=> INVALID
109E	BF	=> INVALID
109F	BF	=> INVALID
10A0	BF	=> INVALID
10A1	7E	=> TILDA
10A2	73	=> s
10A3	74	=> t
10A4	75	=> u
10A5	76	=> v
10A6	77	=> w
10A7	78	=> x
10A8	79	=> y
10A9	7A	=> z
10AA	BF	=> INVALID
10AB	BF	=> INVALID
10AC	BF	=> INVALID
10AD	BF	=> INVALID
10AE	BF	=> INVALID
10AF	BF	=> INVALID
10B0	BF	=> INVALID
10B1	BF	=> INVALID
10B2	BF	=> INVALID
10B3	BF	=> INVALID
10B4	BF	=> INVALID
10B5	BF	=> INVALID
10B6	BF	=> INVALID
10B7	BF	=> INVALID
10B8	BF	=> INVALID
10B9	BF	=> INVALID
10BA	BF	=> INVALID
10BB	BF	=> INVALID
10BC	BF	=> INVALID
10BD	BF	=> INVALID
10BE	BF	=> INVALID
10BF	04	=> EOT (^D)

LOC.	HEX	TRANSLATION
10C0	7B	=> OPEN BRACE
10C1	41	=> A
10C2	42	=> B
10C3	43	=> C
10C4	44	=> D
10C5	45	=> E
10C6	46	=> F
10C7	47	=> G
10C8	48	=> H
10C9	49	=> I
10CA	BF	=> INVALID
10CB	BF	=> INVALID
10CC	BF	=> INVALID
10CD	BF	=> INVALID
10CE	BF	=> INVALID
10CF	BF	=> INVALID
10D0	7D	=> CLOSE BRACE
10D1	4A	=> J
10D2	4B	=> K
10D3	4C	=> L
10D4	4D	=> M
10D5	4E	=> N
10D6	4F	=> O
10D7	50	=> P
10D8	51	=> Q
10D9	52	=> R
10DA	BF	=> INVALID
10DB	BF	=> INVALID
10DC	BF	=> INVALID
10DD	BF	=> INVALID
10DE	BF	=> INVALID
10DF	BF	=> INVALID
10E0	5C	=> \
10E1	BF	=> INVALID
10E2	53	=> S
10E3	54	=> T
10E4	55	=> U
10E5	56	=> V
10E6	57	=> W
10E7	58	=> X
10E8	59	=> Y
10E9	5A	=> Z
10EA	BF	=> INVALID
10EB	BF	=> INVALID
10EC	BF	=> INVALID
10ED	BF	=> INVALID
10EE	BF	=> INVALID
10EF	BF	=> INVALID
10F0	30	=> 0
10F1	31	=> 1
10F2	32	=> 2
10F3	33	=> 3
10F4	34	=> 4
10F5	35	=> 5
10F6	36	=> 6
10F7	37	=> 7
10F8	38	=> 8
10F9	39	=> 9
10FA	BF	=> INVALID
10FB	BF	=> INVALID
10FC	BF	=> INVALID
10FD	BF	=> INVALID
10FE	BF	=> INVALID
10FF	BF	=> INVALID

APPENDIX H -- STANDARD TERMS AND CONDITIONS / LIMITED WARRANTY

1. **GENERAL** - An order constitutes a contract between **Alloy-CPD** and the Buyer when accepted in writing by **Alloy-CPD** at its home office as shown on the face hereof. A contract resulting from the acceptance of an order may be cancelled or altered by the Buyer only if agreed to in writing by **Alloy-CPD** at its home office subject to payment of associated charges necessary to protect **Alloy-CPD** from loss. Any of the terms or provisions of the Buyer's order which are in any way inconsistent with or in addition to the terms and conditions contained herein shall not be binding on either party unless expressly accepted in writing by its authorized representatives.

2. **DELIVERY** - Shipping dates are based upon prompt receipt of all necessary documents from the Buyer. Shipments are scheduled after acceptance of an order in accordance with the Buyer's requirements. Unless specifically stated to the contrary, however, where existing priorities and schedules prevent strict compliance with requested delivery dates, orders are entered as close as possible to the requested date and the Buyer is advised of the actual shipping schedule. **Alloy-CPD** shall not be liable for delays in delivery or other default by reason of any occurrence or contingency beyond its reasonable control, nor shall it be liable for any special or consequential damages caused by any delay in delivery or failure to manufacture or deliver.

3. **PRICES - Alloy-CPD** certifies that the prices contained herein are as favorable to the Buyer as those extended to any other customer in effect on the date of this document for substantially similar items and quantities under similar conditions. The prices stated are exclusive of any federal, state, municipal or other government tax now or hereinafter imposed upon the production, storage, sale, transportation or use of the products described herein. Such taxes applied directly to the sale hereunder shall be paid by the Buyer, or in lieu thereof, the Buyer shall provide a tax exemption certificate acceptable to the taxing authorities. Note: On sales outside the U.S., all required import duties, licenses & fees shall be payable by the Buyer in addition to the stated prices.

4. **PAYMENT** - Unless otherwise specifically stated to the contrary, the terms of payment shall be **NET - 30 DAYS** from the date of shipment of the hardware. In case of partial shipments, pro-rata payments shall become due on each shipment. On overdue accounts, a finance charge shall be charged and payable at the rate of two percent per month on the amount of the unpaid balance. **Alloy-CPD** may require full or partial payment in advance if, in its judgement, the financial condition of the Buyer at any time prior to shipment so warrants.

5. **WARRANTY** - See attached **Limited Warranty** statement.

6. **CHANGES** - By mutual agreement the order may be suspended or changes may be made in quantity, designs, specifications, place of delivery, methods of shipment and packaging. If any such change causes an increase or decrease in the price of the equipment or in the time required for performance, **Alloy-CPD** shall promptly notify the Buyer and assert its claim within thirty days from the date the change is agreed upon, and an equitable adjustment shall be made. In any event, changes shall not be binding upon nor be put into effect by either party unless confirmed in writing by its appropriate representative.

7. **TERMINATION** - The Buyer may terminate work under this Agreement, either in whole or in part. Notice of termination under this paragraph must be submitted by the Buyer, in writing, sixty days in advance of its effective date. During that final sixty days, deliveries shall continue in accordance with the existing delivery schedule. Where special equipment or services are involved, the Buyer shall be responsible for all related work in process; however, **Alloy-CPD** shall take all reasonable steps to mitigate damages immediately upon receipt of said termination notice and shall notify subcontractors to do likewise.

8. **PROPRIETARY INFORMATION** - All proprietary information which is specifically designated as such, disclosed by either party to the other in connection with this order, shall be used solely for installation, operation, maintenance and support of equipment furnished under this order only and shall be protected by the recipient from disclosure to others with the same degree of care as that which is accorded to its own proprietary information. Information will not be subject to this provision if it is or becomes a matter of public knowledge without the fault of the recipient party, if it was a matter of written record in the recipient party's files prior to disclosure to it by the other party, if it was or is received by the recipient party from a third person under circumstances permitting its disclosure or its disclosure is required by any United States Governmental Agency.

9. **PATENT PROTECTION - Alloy-CPD** shall undertake at its own expense, the defense of any suit or proceeding brought against the Buyer in so far as such suit or proceeding is based upon a claim that any equipment made to **Alloy-CPD** design and furnished hereunder constitutes an infringement of any patent of the United States, on condition that the Buyer promptly notifies **Alloy-CPD** in writing of such suits or threats thereof and cooperates by giving **Alloy-CPD** any requested authorization, information and assistance for the defense of same. The foregoing shall not apply in instances in which normally non-infringing **Alloy-CPD** equipment is rendered infringing by the Buyer's alteration, combination with other equipment, or use of said equipment. The sole obligation of **Alloy-CPD** shall be full compliance with this clause.

10. **APPLICABLE REGULATIONS - Alloy-CPD** certifies that it complies with the requirements of the Fair Labor Standards Act of 1938 as amended, the Walsh-Healy Public Contacts Act and Equal Opportunity Employment as defined in Executive Order Number 11246.

If the Buyer's order is placed as a subcontract under a United States Government prime contract, only those clauses of the Armed Service Procurement Regulation that are required by Federal law are hereby incorporated by this reference, except as a representation contained or incorporated herein shall be construed as a representation that **Alloy-CPD** offers its standard products on a cost reimbursement basis or that **Alloy-CPD** makes any representation regarding the cost of standard products.

11. **ENFORCEABILITY** - No delay or failure of either party in exercising any right hereunder and no partial or single exercise hereof shall be deemed to constitute the waiver of such right or any other rights hereunder.

If any provisions of this Agreement shall become inoperative or unenforceable as applied in any particular case or becomes in conflict with any other provisions hereof, such circumstances shall not have the effect of rendering the provisions in question invalid, inoperative or unenforceable in any other case or circumstances. The invalidity of any one or more phrases, sentences, clauses or sections in this Agreement contained shall not affect the remaining portion of this Agreement or any part thereof.

12. **AGREEMENT** - This Agreement supersedes and cancels all prior agreements, if any, by the parties hereto and constitutes the entire understanding between the parties with respect to the subject matter hereof. Any assignment of this Agreement, or any of the rights hereunder by the Buyer shall be void without written consent of **Alloy-CPD.** All disputes and controversies arising out of the performance of this Agreement shall be settled by arbitration in accordance with the laws of the State of Massachusetts.

LIMITED WARRANTY

ALLOY ENGINEERING COMPANY, INC., Computer Products Division (Alloy-CPD), in recognition of its responsibility to provide quality products, components, and workmanship, warrants each product it manufactures and each part and component thereof installed by **Alloy-CPD** (except those excluded by Para. 4 below) to be free from defects in material and workmanship for a period of **120 DAYS** after shipment. This warranty is subject to the terms and conditions below:

1. **WARRANTOR** - This warranty is granted by Alloy Engineering Company, Inc., 12 Mercer Road, Natick, MA 01760 [Telephone (617) 655-3900 or TWX: 710-346-0394]

2. **PARTIES TO WHOM WARRANTY IS INTENDED** - This warranty shall extend to any owner and to any person to whom the warranted system is transferred during the duration of this warranty.

3. **PARTS AND COMPONENTS COVERED** - All parts and components of the warranted system manufactured and/or installed by **Alloy-CPD** are covered by this warranty, except those parts and components excluded by Para. 4 below.

4. **PARTS AND COMPONENTS NOT COVERED** - The following components are not covered by this warranty: (a) any part or component that shall have been subject to abnormal electrical or mechanical abuse, negligence or accident (as determined by **Alloy-CPD**); (b) any part or component that shall have deteriorated from ordinary wear and tear, such as paint; (c) expendable items that would normally be replaced within the warranty period, such as Magnetic Tapes and Cartridges.

5. **PROCEDURE FOR OBTAINING PERFORMANCE UNDER THIS WARRANTY** - In order to qualify under this warranty, the owner must notify **Alloy-CPD** within ten days after discovery of the defect and receive authorization by **Alloy-CPD** to return the defective system or component to **Alloy-CPD.** Upon receipt of such system or component, if it is found not to be defective in material or workmanship, **Alloy-CPD** shall notify the owner of the fact and request instructions for its return to the owner. All cost of transporting the system or component to and from **Alloy-CPD** shall be paid by the owner.

6. **REMEDY** - If, within the duration of this warranty, a system or component covered by this warranty is returned to **Alloy-CPD** and proves to be defective in material or workmanship, **Alloy-CPD** shall (at its option) repair or replace the defective item at its expense. Replacement of a defective component pursuant to this warranty shall be warranted for the remainder of the warranty period applicable to the replaced component. After the expiration of this warranty, a system or component return to **Alloy-CPD** will be repaired and returned at a cost commensurate with the parts and labor required; in no case will this charge exceed one hundred dollars ($100.00) without prior notification and approval of the owner.

7. **DESIGN CHANGES - Alloy-CPD** reserves the right to make changes in the design or material of its products without incurring any obligation to incorporate such changes in any product previously manufactured. From time to time, however, **Alloy-CPD** will issue Applications Notes to its customers to notify them of product improvements which may be retrofitted at the option of the customer.

8. **EXCLUSIONS AND DISCLAIMERS** - This warranty does not extend to normal preventative maintenance procedures, nor to any defect due to negligence of others, failure to operate or maintain the system in accordance with instructions furnished, electrical or mechanical abuse, accidents, alterations, or ordinary wear and tear. This warranty and the remedy provided herein are exclusive and expressly in lieu of all other warranties expressed or implied either in fact or by operations of law, statutory or otherwise, including warranties or merchantability or fitness for use. Under no circumstances will **Alloy-CPD** assume liability for special, consequential, or punitive damages arising from or in any way connected with use of its products.

J1-1 GND
-2 GND
-3 -12 V
-4 +5V
-5 +5V
J1-6 +12V
C1 10µf
C4–C12 .1µf

C2 150pf
RP1- 4.7K +5
7C 74LS123
TPWAIT
+5

AB3 4C 74LS00 HDSEL

TPWR 6C 74LS32 IOWR
TPRD 6C IORD

AB4 AB5 AB6 74LS32 6C 6C 74LS32
5C 74LS10
AB7 IORD IOWR 4C 74LS00
5C 74LS10
4C 74LS00

MRRESET 4C 74LS00
IC 74LS240

AB0 AB1 AB2 3C 74LS138 Y0–Y7
AB3 G2A G1 G2B

D0 D1 D2 D3 D4 D5 D6 D7 +5
2A 8212
DS2 DS1 MD STBR
Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8
SL1 SL2 TR1 TR2 SL4

2B 8212
REV FWD HSP WEN RWD SLG
7406 1000pf C3

J5-3 TPWAIT
-8 TPDMA
-28 IORD
-5 IOWR
-32 MRRESET
-24 TPWR
-26 TPRD
-23 D0
-19 D1
-15 D2
-11 D3
-21 D4
-20 D5
-18 D6
-13 D7
-34 AB0
-31 AB1
-29 AB2
-27 AB3
-16 AB4
-12 AB5
-7 AB6
-4 AB7
J5-2 Y14

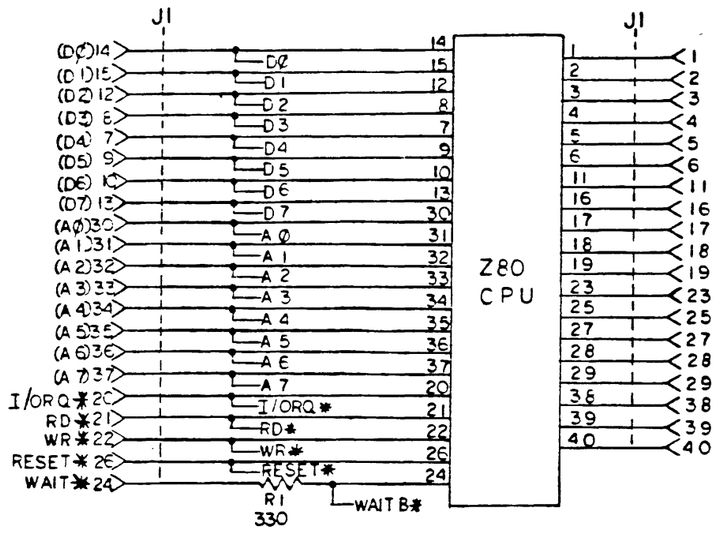
4.7K RP2- +5
2D 74LS240
D0 D1 D2 D3 D4 D5 D6 D7
SLD BSY WND FVP FLG EWS LPS RDY

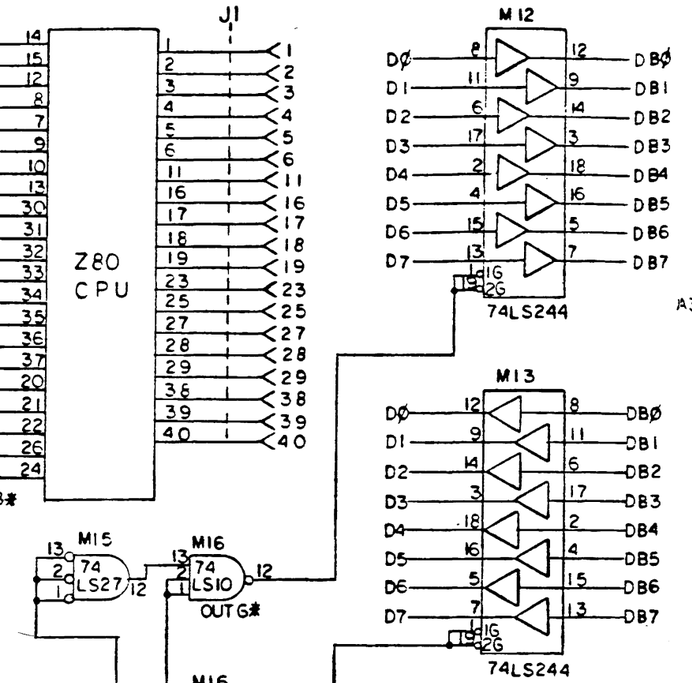
4.7K RP1- +5
+5 4.7K RP1-
IC 74LS240
D4 D5 D6 D7
WDS RNZ RDS DAD
TXC RXC DCD A0 A1 R/W RESET CTS OE DSR GND
TXEMT TXRDY RXRDY RXD TXD RTS
2C 2651
AB0 AB1 AB2 WND HDSEL
D0 D1 D2 D3 D4 D5 D6 D7
7406 WNZ WDE
74LS240 7406

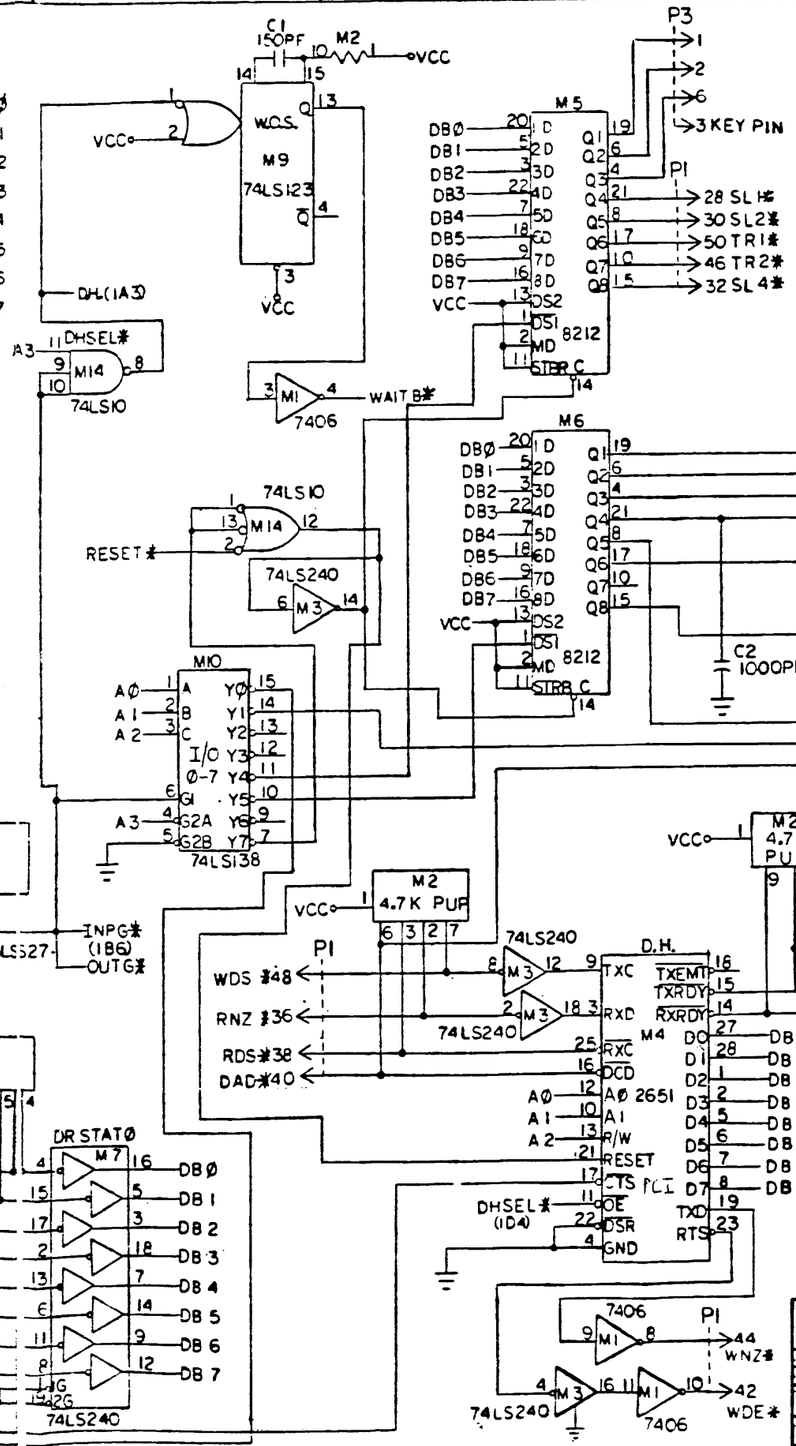
SLD J2-2
RDY -4
WND -6
FLG -8
LPS -10
FUP -12
BSY -14
EWS -16
RWD -18
REV -20
FWD -22
HSP -24
WEN -26
SL1 -28
SL2 -30
SL4 -32
SLG -34
RNZ -36
RDS -38
DAD -40
WDE -42
WNZ -44
TR2 -46
WDS -48
TR1 J2-50
J2-1 thru J2-49 odd are grounded

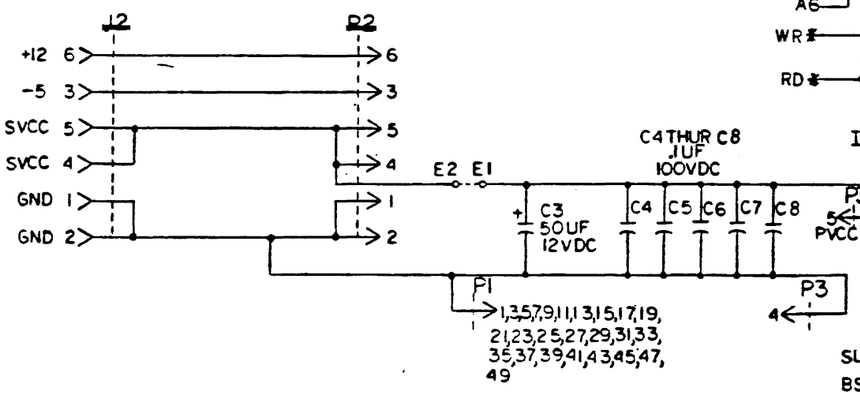
SCHEMATIC
8500/ TAPE DRIVE CONTROLLER
8500-0011 REV A

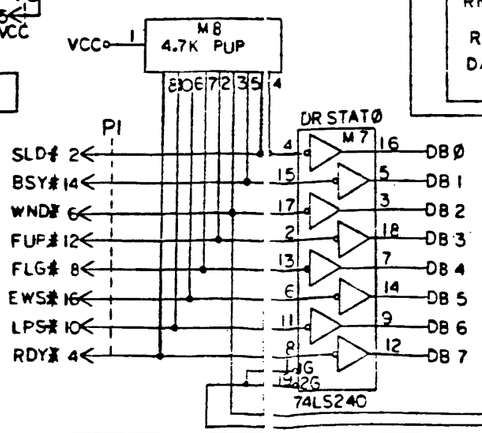
REVISIONS			
A	RELEASED AS DRAWN	6/18/80	MC
B	ROTATED Z-80 180°	4/17/80	MDC











NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS VALUES ARE IN OHMS AND ARE 1/4W, ±5%
   B. ALL CAPACITORS VALUES ARE IN MICROFARADS
   C. C.R.U. (Z80) SIGNALS ARE NOT REFERENCED WITH COORDINATES

ALLOY ENGINEERING COMPANY

DZ-80 INTERFACE SH 1 OF 1

SIZE C | SCALE: | B