AMLYN MODELS 5850 & A506

5.25 INCH - 8 MEGABYTE MINIPAC DISK DRIVE

OEM MANUAL

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ERRATA

1. The maximum rate at which the microprocessor responds to input control signal changes has been changed from 500 usec. to 750 usec. Therefore, the term "500 usec." should be changed to "750 usec." on the following pages of the manual:

   1-1, 1-12, 1-13, 1-17, 3-2, 3-3, 4-7, 4-9, 4-10, 4-11, 7-6

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PREFACE

This OEM manual contains preliminary information relative to the design of the 5850 & A506 MiniPac drives. All information is subject to change without notice.

PROPRIETARY NOTICE

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1.0 INTRODUCTION

1.1 Purpose

This manual contains information required for the original equipment manufacturer (OEM) to interface the AMLYN 5850 and A506 drives to a central processor or host system via a disk controller. The purpose of this manual is to present detailed functional characteristics and capabilities of the 5850 and A506. Maintenance and repair procedures are covered in the AMLYN 5850 and A506 Maintenance Manual (AMLYN P/N 1497-01) which may be obtained through AMLYN's Marketing Department.

1.2 Available Drive Models

AMLYN's 5.25 inch 8 megabyte drive is available in two models; the 5850 (P/N 1347-01) and the A506 (P/N 1346-01). The 5850 utilizes the same 50 pin signal interface connector as the Shugart Associates SA850 or equivalent Maxi-Drive (8 inch) and the same 4 pin power connector as other mini-floppy (5.25 inch) drives. The 5850 mounts within the 3.25" x 5.75" x 8.00" envelope of a standard mini-floppy drive with the same height, width and depth.

The A506 is implemented by adding an A506 Adapter card which converts the 5850's 50 pin (SA850 type) signal connector to a Seagate Technology ST506, or equivalent, Micro-Winchester two connector interface. This A506 Adapter card is attached to the Drive Control card at a right angle. The A506 control signals are presented on the 5850's 50 pin connector and are routed to the appropriate A506 connector pin. The 5850's data interface signals (Write Data and Read Data) are converted from TTL to differential levels on the A506 Adapter card to match the ST506's RS422 data interface signals. This manual will refer to the 5850 and A506 collectively as the 5850. Chapter 9 describes the unique aspects of the A506 interface and A506 Adapter card.

1.3 General Drive Description

The 5850 drive and MiniPac cartridge shown in Figure 1-1 utilize a combination of proven technologies to provide on-line storage of 8 megabytes of unformatted data. This data storage capacity is ideal for backup of both 8 inch and 5.25 inch Winchester disk drives, stand alone applications with future upgrades of add-on rigid disk drives, or applications directly replacing 8 inch Maxi-Drives or 5.25 inch drives. The 5850 features manganese-zinc-ferrite Read/Write (R/W) head technology, a MiniPac diskette cartridge, and microprocessor control of all drive interfaces and mechanisms including the closed loop servo system. Serviceability is maximized through straightforward, modular packaging of all drive subassemblies.

1.3.1 Head Carriage Assembly

The R/W head is mounted on a carriage assembly (shown in Figure 1-2) which also contains an optical scale and the photo-optical positioning sensors used in the closed loop servo system. This head carriage assembly is coupled to a stepper motor with a heliband mechanism for accurate low friction head movement. Under microprocessor control, Step instruction pulses may be queued at a 500 usec. rate to drive the head carriage assembly. The microprocessor then ramps the step pulse rate applied to the head carriage drive motor to perform slewed seek operations. This acceleration and deceleration of the R/W head during seeks results in quiet operation and minimum track

to track access times. The resulting track to track access is 3 msec. when moving between adjacent tracks and 230 msec. when moving from track zero to track 153. The average access time is 85 msec.

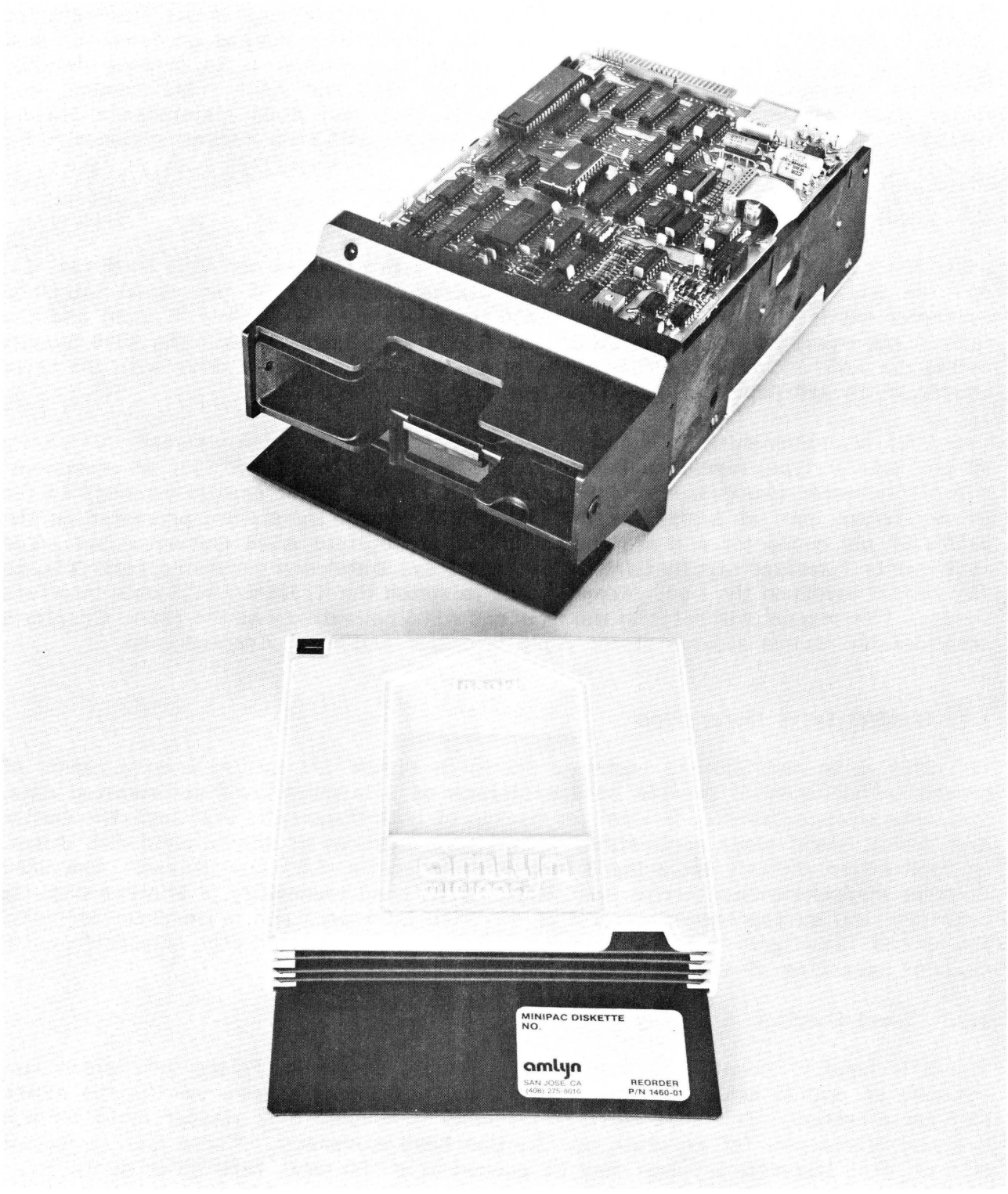

FIGURE 1-1
5850 Drive And Removable MiniPac Cartridge

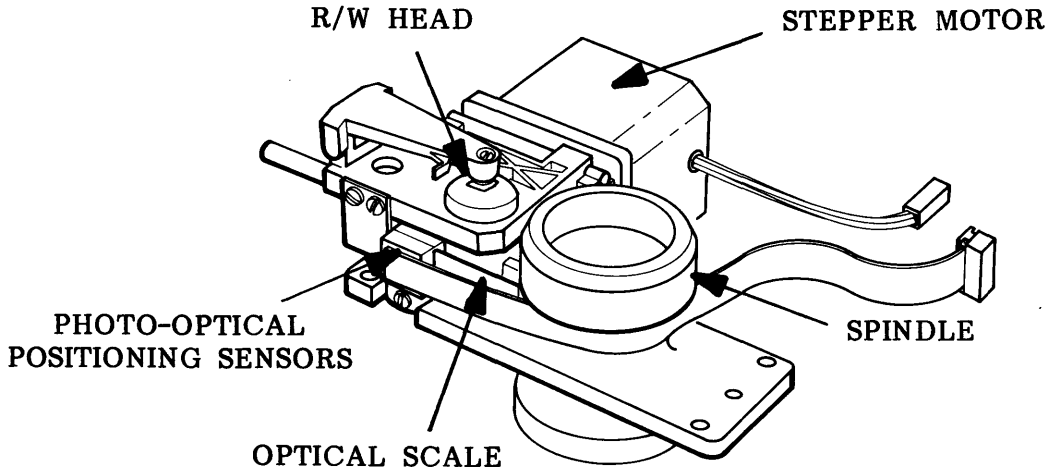

FIGURE 1-2
5850 Head Carriage Assembly

1.3.2 MiniPac Cartridge & Diskettes

Five mini-diskettes (5.25 inch) may be loaded into the AMLYN MiniPac diskette cartridge (shown in Figure 1-3). The MiniPac cartridge protects the diskettes and provides a convenient mechanism for handling. Each AMLYN mini-diskette allows single sided data storage of 1.6 megabytes (unformatted) per diskette. When using the IBM format, with 26 sectors per track and 256 bytes per sector, 1.025 megabytes may be stored per diskette. Other, more efficient formats may be used with a corresponding increase in capacity. The AMLYN diskettes contain a position reference track recorded outside the 154 data tracks. (The locations of the reference and data tracks are shown in Figure 1-4.)

1.3.3 Microprocessor Control of Mechanism and Interface

Microprocessor control allows the drive to emulate the operation of five daisy chained SA850's as well as small Winchester drives such as the ST506. Microprocessor control of the various drive mechanisms minimizes mechanical complexity and the need for the touchy track zero mechanical alignment required by other floppy disk drives. Closed loop servo control of the R/W head positioning is accomplished electronically by using an optical scale to measure the distance between the addressed data track and the reference track, and to provide feedback for control of the head carriage stepper motor. In addition, microprocessor control allows diskettes to be read which were recorded at other track densities.

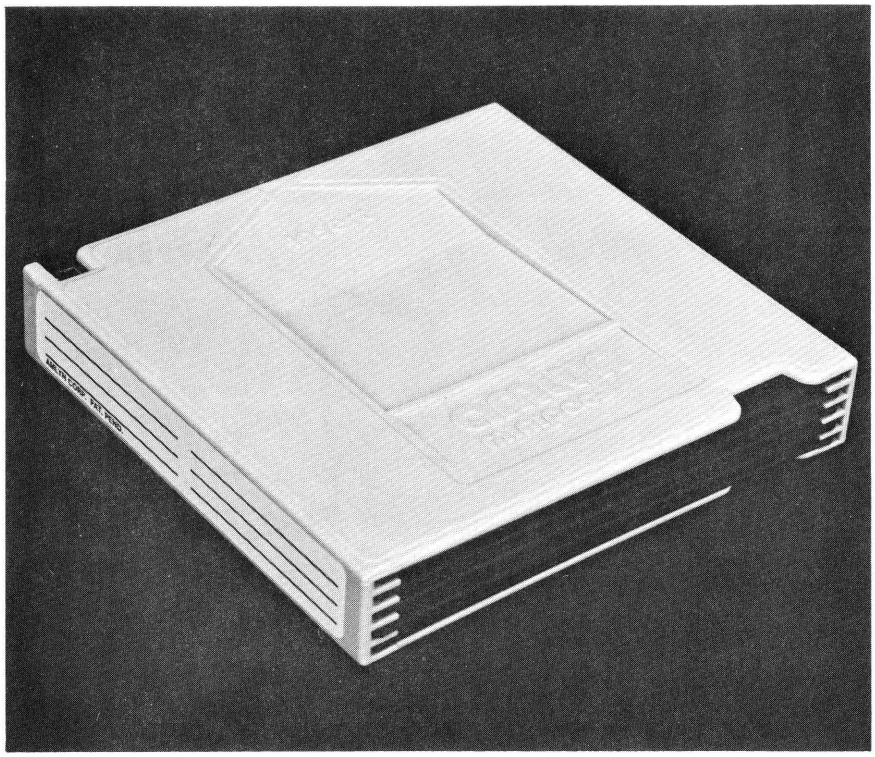

FIGURE 1-3
MiniPac Diskette Cartridge

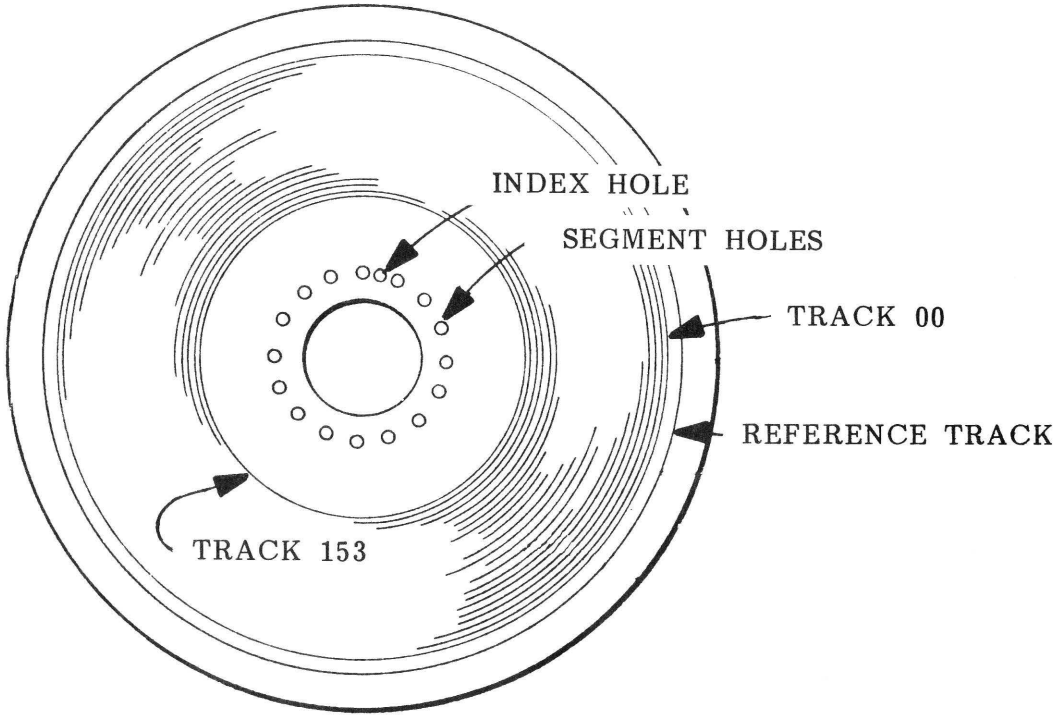

FIGURE 1-4
Data & Reference Track Locations

1.4 Key Features

MiniPac cartridge holds 5 diskettes for a total of 8 Mbytes of on-line storage.

1) MiniPac cartridge only 5.25" x 5.50" x 1.00".
2) Allows user to easily change entire cartridge or individual diskettes.
3) Diskette damage due to improper insertion or clamping is virtually eliminated.

Special Drive Features:

1) May be used for Winchester backup and as such allows your system to remain operational if your Winchester fails. Unlike streaming tape drives, the AMLYN backup duplicates the Winchester drive's operation, though at a slower data transfer rate.
2) Storage capacity per single-sided AMLYN diskette is the same as a double-sided, double density maxi-diskette, and is 60% more than a 96 TPI double-sided, double density mini-diskette.
3) Compatible with the IBM format, single or double density, or other standard formats such as those of popular Winchester drives.
4) Single-sided diskette recording.
5) Same power as standard mini-floppies. No AC or negative DC voltages required.
6) Same mounting envelope as any standard mini-drive.
7) Resident, self exercise diagnostics.
8) Microprocessor control allows mini-diskettes recorded at other track densities, such as 48, 96, or 100 TPI, to be read thus allowing Data Base conversions.
9) No difficult field mechanical alignments such as track zero. The microprocessor controls all drive mechanisms including R/W head positioning.
10) Microprocessor controlled compensation for diskette dimensional changes due to environment as well as misclamping errors without the need for embedded servo.
11) Manganese-zinc-ferrite R/W head.

Two Electrical Interfaces:

1) Model 5850 Interface - Electrically and functionally plug compatible to existing controllers which interface the SA850 or equivalent Maxi-Drives. The 5850 appears to existing controllers and software as five daisy chained SA850's.
2) Model A506 Interface - Plug compatible to controllers which interface the ST506 Winchester drives but with a slower data transfer rate, and 25% additional data storage capacity. Logically each of the A506 diskettes match each of the ST506 disk surfaces with 153 data tracks plus 1 alternate track. While the ST506 has four disk surfaces, the A506 has five diskettes, with the additional diskette available for operating system load or other uses.

1.5 Specification Summary

1.5.1 Performance Specifications

Capacity	Unformatted Double Density	IBM Format 256 Byte Sectors	ST506 Format
Per MiniPac Cartridge	8.0 megabytes	5.1 megabytes	6.3 megabytes
Per Diskette Surface	1.6 megabytes	1.0 megabytes	1.2 megabytes
Per Track	10.4 kilobytes	6.6 kilobytes	8.2 kilobytes

Average Rotational Latency = 83 msec.

Transfer Rate = 500 kilobits/sec.

Access Time:
- Adjacent Track To Track = 3 msec.
- Track Zero To Track 153 = 230 msec.
- Average Access Time = 85 msec.
- Settling Time = 15 msec.
- Diskette To Diskette = 1.9 sec. average
  2.9 sec. max.

1.5.2 Functional Specifications

Rotational Speed = 360 rpm
Recording Density = 9500 bpi
(inside track double density)
Flux Density = 9500 fci
Track Density = 170 tpi
Track Width = 3.5 mils
Cylinders = 154
Tracks = 770
Heads = 1
Encoding Method = FM, MFM,
or M^2FM

1.5.3 Physical Specifications

Disk Drive

Environmental Limits (Operational)
- Ambient Temperature = 40^{o} to $104^{o}F$ (4^{o} to $40^{o}C$)
- Relative Humidity = 20% to 80% Noncondensing
- Maximum Wet Bulb = $78^{o}F$ ($25^{o}C$)

Environmental Limits (Storage)
- Ambient Temperature = -13^{o} to $212^{o}F$ (-25^{o} to $100^{o}C$)
- Relative Humidity = 0% to 95%

MiniPac Cartridge With Diskettes

Environmental Limits (Operational)
- Ambient Temperature = 50^{o} to $125^{o}F$ (10^{o} to $51^{o}C$)
- Relative Humidity = 8% to 80% Noncondensing
- Maximum Wet Bulb = $85^{o}F$ ($29^{o}C$)

Environmental Limits (Storage)
- Ambient Temperature = -40^{o} to $125^{o}F$ (-40^{o} to $51^{o}C$)
- Relative Humidity = 8% to 80%

DC Power Requirements
+12 VDC +5% @ 1.1 A typical
+ 5 VDC ±5% @ 1.0 A typical
No AC Power Required.

Weight = 4.4 lbs. (2.0 kg)

Mounting Envelope Dimensions
Height = 3.25 inches (82.6 mm)
Width = 5.75 inches (146.0 mm)
Depth = 8.00 inches (203.2 mm)
Depth of A506 = 8.11 inches (206.0 mm)

Heat Dissipation = 86 BTU/hr. typical (25 watts)

Media Requirements
5 each UHR I or equivalent Mini-Diskettes
(See Tech Bulletin TB-005 for approved media sources.)

Diskette Cartridge Requirements
1 each AMLYN or equivalent MiniPac cartridge
(See Tech Bulletin TB-005 for approved sources.)

1.5.4 Reliability Specifications

MTBF: 5000 POH under heavy usage
8000 POH under typical usage

MTTR: 30 minutes

Component Life: 15,000 POH

Error Rates:
Soft Read Errors = 1 per 10^9 bits read
Hard Read Errors = 1 per 10^{12} bits read
Seek Errors = 1 per 10^6 seeks

Media Life:
Passes per Track = 3.5×10^6
Insertions = 30,000+

1.6 Drive Applications

Figures 1-5 through 1-8 show block diagrams of the drive in various applications. The 5850 drive may be used to expand the data storage capacity of existing systems using SA850 Maxi-Drives as shown in Figure 1-5.

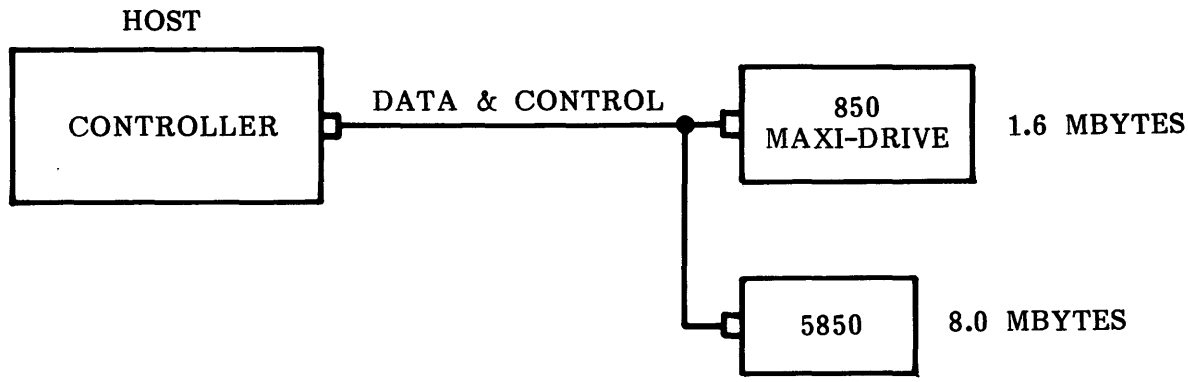

FIGURE 1-5
5850 Application Expands SA850 Maxi-Drive Storage

Figure 1-6 shows the drive in a single drive application. This single drive application could be implemented with either a 5850 or A506 depending on the controller used and future system expansion plans. If the system is designed for add-on Winchester drives, the A506 should be employed. If additional floppy drives are more appropriate for the application, the 5850 should be used for the initial drive. Figure 1-7 depicts a system using multiple 5850 drives.

FIGURE 1-6
Single 5850 Drive Application

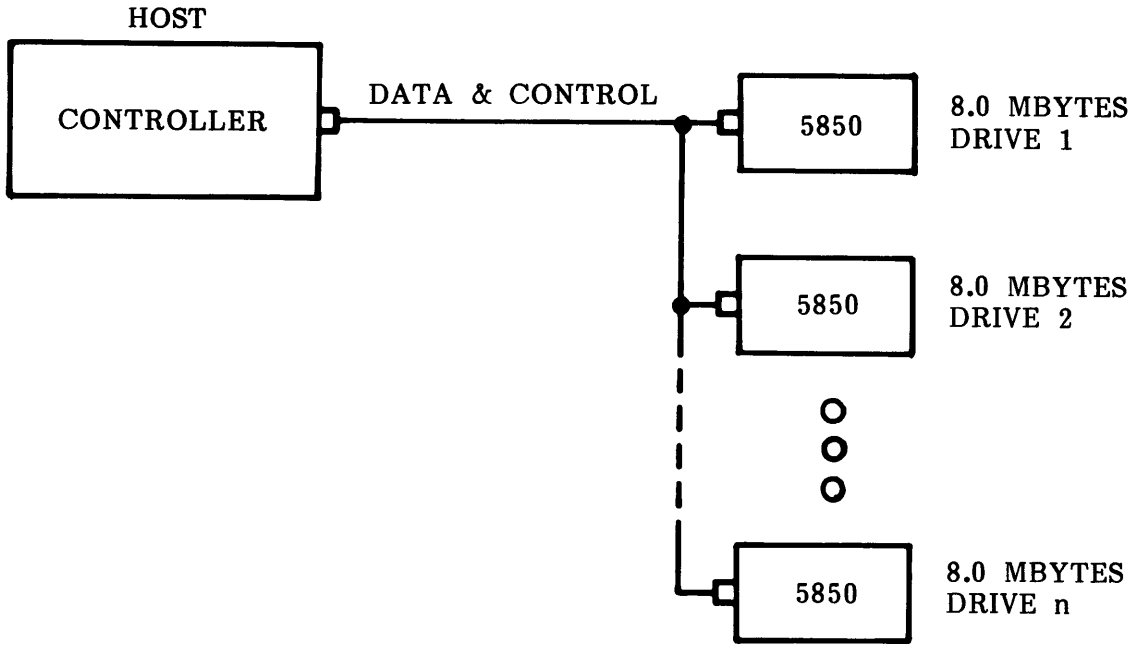

FIGURE 1-7
Multiple 5850 Drive Application

Figure 1-8 shows the model A506 used to back up a ST506 Winchester drive. This application requires a controller which can accommodate both the 5 megabit data rate of the ST506 drive, and the 500 kilobit data rate of the A506. Other applications are also possible such as using either the 5850 or A506 to back up 8 inch Winchester drives.

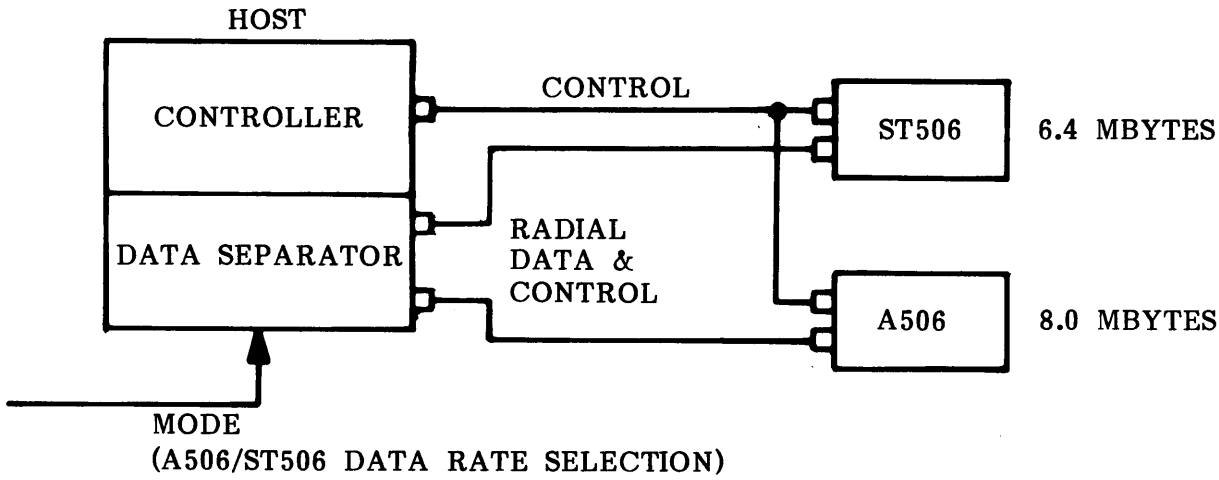

FIGURE 1-8
A506 Application Backing Up A Winchester Drive

1.7 SA850 Maxi-Floppy Compatibility

Numerous features have been provided in the 5850 drive so it may easily interface to a host system as a SA850 (or equivalent Maxi-Drive). At the same time, the 5850 provides five times the storage of a SA850 while occupying a single mini-floppy drive envelope. This subsection presents those features and controls which are identical to the SA850. It also describes how the 5850's added capacity and features are handled in a manner compatible to the design of SA850 disk controllers.

If compatibility to SA850 drives is not a concern, or an overview of the various 5850 operations is first required, the reader may skip to Subsection 1.8.

1.7.1 SA850 Controls And Features

The 5850 drive provides the highest level of compatibility to the SA850 interface as described in the following subsections. (See Sections 3 and 4 for more detailed descriptions of the interface signals discussed below.)

1.7.1.1 Control Signal Interface

The 5850 has the same signal interface connector with the same pinouts and logic levels as the standard SA850. The data rates are also identical. The signal interface connector is oriented on the 5850 drive as it is on the SA850 drive (the signal pin side of the connector is down when the drive is mounted horizontally). This connector orientation allows the cable routing to be consistent between SA850 and 5850 drives. The pinouts of the 5850 signal connector are shown in Table 4-1. For a comparison, Table 1-1 shows the SA850/SA851 drive signal connector pinouts.

1.7.1.2 Control Signals

The following 5850 I/O control signals operate just as they do on the SA850 drive:

1) Two Sided
2) Door Opened*
3) Index
4) Ready
5) Direction Select
6) Step
7) Write Data
8) Write Gate
9) Track 00
10) Write Protect
11) Read Data

*5850 Door Opened = SA850 Disk Change

The Door Opened signal operates in the same manner as on the SA850 drive, however, it was renamed to more accurately describe its function.

The timing of some of the above control signals may be changed to enhance the performance of the 5850 drive (e.g. Step pulses may be accepted at a much higher rate than the 3 msec. rate required by the SA850 drive to allow faster seeks). (These timing improvements are summarized below in Subsection 1.7.2.3.)

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
1	2	Spare
3	4	Spare
5	6	Spare
7	8	Spare
9	10	Two Sided*
11	12	Disk Change*
13	14	Side Select
15	16	In Use*
17	18	Head Load*
19	20	Index
21	22	Ready
23	24	Sector (851 Only)
25	26	Drive Select 1
27	28	Drive Select 2
29	30	Drive Select 3
31	32	Drive Select 4
33	34	Direction Select
35	36	Step
37	38	Write Data
39	40	Write Gate
41	42	Track 00
43	44	Write Protect
45	46	Read Data
47	48	Separated Data*
49	50	Separated Clock*

* These lines on the SA850 and SA851 are optional lines enabled by jumper plugs.

TABLE 1-1
SA850 & SA851 Signal Pin Assignments

1.7.1.3 Compatible Track And Data Format

The 5850 drive has the same number of data tracks as a two sided SA850 drive (154 tracks). In addition, the closed loop servo system on the 5850 drive does not require the uses of embedded servo information within the data tracks. Thus, any data format used on a SA850 drive may be used on the 5850 drive.

1.7.1.4 SA850 Options

SA850 control signals and options are functionally implemented on the 5850 drive. (See Table 7-1 for a cross comparison between SA850 and 5850 options.) Due to the additional features on 5850 drive, some of the options are implemented within the drive in a slightly different fashion. For example, Head Load does not actually control loading and unloading of the R/W head from the diskette surface. Rather, the Head Load signal gates the drive and diskette address inputs so changes in these inputs, between Read and Write operations to the same diskette, does not cause physical selections of other diskettes in the drive. Head Load also implements a logical addressing feature, and is used to notify the drive's microprocessor of the absence of Read and

Write operations so the motors may be turned off.

The following subsections discuss those signals which control the added features of the 5850 drive or implement drive functions in a "controller compatible manner" although not necessarily in an identical manner to the SA850.

1.7.2 Additional Capacity And Features

Some additional 5850 drive features, especially those relating to its added data storage capacity, are implemented in a manner which require few, if any, changes to host controller software. The following subsections summarize these differences.

1.7.2.1 Drive & Diskette Addressing

Because of the additional capacity of the 5850 drive, additional control signals are provided to address the drive and the individual diskettes. As may be seen by comparing Table 4-1 to Table 1-1, the four SA850 Drive Select signals (DS1 through DS4) are labeled and used as Disk Select signals (DS0 through DS3) on the 5850 drive. A fifth Disk Select signal (DS4) is provided on the 5850 interface to select the fifth diskette in Standard Address Mode (where activating a single DS line selects an individual diskette). The optional Binary Address Mode, available on the SA850 drive to address up to seven SA850's, is implemented on the 5850 drive to address up to 15 diskettes in three 5850 drives. Four input lines are dedicated to drive selection in either address mode to provide multiple drive addressing capability. These lines are labeled Unit Select (US0 through US3). Unit Select need not be used in a single 5850 application, or when addressing multiple drives in Binary Address Mode.

1.7.2.2 Implementation Of Side Select

The 5850 drive has 154 data tracks on one side of the diskette whereas the SA850 has 77 tracks on each side of the diskette. The SA850 Side Select signal enables the selection of one of the R/W heads, whereas this signal on the 5850 selects either even or odd numbered data tracks. The Side Select signal on the 5850 therefore operates as a Step pulse causing the R/W head to seek between adjacent data tracks. The 5850 may also be configured to operate as a single sided drive with 154 data tracks. In this mode, the host controller may require change to accommodate more than 77 data tracks.

1.7.2.3 Improved Access Timing Features

The following standard SA850 signals incorporate special features within the 5850 to improve access times:

1) Track 00

2) Step

3) Ready

The Track 00 output signal is generated by the 5850's microprocessor. The state of this signal is based on drive and diskette addressing commands and seek operations, not the physical position of the R/W head. The Track 00 output signal becomes active within 500 usec. of receiving enough Step pulses to address track zero. Since some controllers expect to see the Track 00 signal within 1 usec. of addressing a SA850

drive previously on track zero, the 5850 incorporates a slightly modified response to drive and diskette address commands to provide compatibility to these controller designs.

To speed up the Track 00 response when addressing a new diskette, the 5850 does not activate the Track 00 signal when a different diskette is addressed if, when previously addressed, the R/W head was located on track zero. The rationale for this design is: Controllers are designed to recalibrate a drive when a drive previously on track zero is selected and the Track 00 signal does not go True. The recalibration is accomplished by issuing Step pulses to seek track zero. The 5850 responds with its Track 00 signal active after receiving one Step pulse toward track zero. If the controller responds with a Step pulse to seek track zero after a new diskette is addressed, the 5850 will respond with its Track 00 signal within 500 usec. This may occur before the new diskette is actually loaded and the R/W head positioned over track zero. This feature allows improved speed because the next seek command may be initiated without waiting for the drive to physically move to track zero. The drive's microprocessor automatically queues these operations in a way which is transparent to the host system.

As mentioned earlier, Step pulses may be accepted and queued by the microprocessor at a rate much faster than a SA850 drive, thereby greatly improving seek times.

Ready is presented approximately 50 msec. after power up, at which time the 5850 is ready to accept drive and diskette address commands as well as seek commands. The SA850 requires approximately 5 seconds upon power-up for the AC spindle drive motor to come up to speed.

1.7.2.4 Disabling Invalid Read Data

The microprocessor disables Read Data and Index pulses during drive and diskette addressing and seek operations to speed Read and Write operations, and to provide compatibility to existing disk controllers. Read Data is not valid during these times. Most controllers monitor Read Data and Index pulses so that usage of this feature will automatically take advantage of the improved track to track access times.

1.7.2.5 5850 Optional Feature Signals

The 5850 drive has six optional signals which, if used by the host controller, may improve data access times and provide additional control functions:

1) Not Busy
2) Head Load
3) Fault
4) Fault Reset/Eject/Recalibrate
5) In Use
6) Composite Sector/Index

The following paragraphs summarize the action of these signals.

The microprocessor generates a signal which disables Read Data and Index pulses during drive and diskette addressing as well as seek operations. This signal is provided at the drive interface as Not Busy. If used by the host controller, it provides immediate notification that Read Data is valid or Write operations may be performed.

Head Load is used to gate certain input control signals. Physical selection of diskettes and physical seeks are only performed when Head Load is active and the Head Load Enable option is installed. Head Load may be used to gate off these controls between

Read and Write operations. If the host controller deactivates Head Load during periods of inactivity, the on board microprocessor returns the previously accessed diskette to the MiniPac cartridge and shuts off all drive motors.

The Fault signal is generated by the on board microprocessor when invalid Write operations are attempted. It does not inhibit future operations and may be reset by the Fault Reset input signal.

In addition to resetting the Fault output line, the Fault Reset signal may also control the ejection of diskettes back to the MiniPac cartridge and initiate a reference track recalibrate operation.

The optional In Use signal allows the host controller to control the In Use LED independently of drive operations. This signal may be useful to notify the system operator of necessary operations such as diskette change required. If this option is enabled, this signal is not "ORed" with the Diskette Select and Unit Select lines as on the SA850.

The Composite Sector/Index signal outputs the signal from the sensor which detects the Index and Sector holes on the diskette. This optional output allows the host controller access to the Sector signals. However, alignment adjustments of the Sector/Index sensor are not provided. Interchangeable hard sector operations, therefore, should not be attempted.

1.7.2.6 DC Power

The +5V and +12 DC Power interface is the same as standard mini-floppy drives and not the +24V, +5V, -5V DC and 117V AC of the SA850. The mini-floppy power was chosen to avoid the problem of changing spindle drive belts and pulleys to support both 50 HZ and 60 HZ power as well as to reduce the cost of the required power supply.

1.8 ST506 Micro-Winchester Compatibility

The A506 has been designed to easily interface host controllers which may operate with both the A506 and the ST506 or equivalent 5.25 inch Winchester disk drives.

If compatibility to the ST506 is not a concern, or an overview of the various A506 operations is first required, the reader may skip to Section 2.0.

1.8.1 A506 Controls And Features

This section describes the A506 features which are identical to the ST506.

1.8.1.1 Control Signal Interface

The A506 uses the same signal interface connectors, with the same pinouts and logic levels as the ST506. The mechanical dimensions of the signal interface connectors are shown in Figure 9.4 and 9.5. These connectors are oriented so the host controller I/O connectors need only be turned up (at a 90^{o} angle) for plug in when compared to the connector location on the ST506. This connector orientation allows the cable routing between ST506 and A506 drives to be consistent. The pinouts and signal assignments of the A506 signal connectors as shown in Tables 9-1 and 9-2. For a comparison, Tables 1-2 and 1-3 show the ST506 pinouts and signal assignments.

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
1	2	Reduced Write Current
3	4	Reserved (Head 2^2 For Future Product)
5	6	Write Gate
7	8	Seek Complete
9	10	Track 00
11	12	Write Fault
13	14	Head Select 2^0
15	16	Reserved (To J2 Pin 7)
17	18	Head Select 2^1
19	20	Index
21	22	Ready
23	24	Step
25	26	Drive Select 1
27	28	Drive Select 2
29	30	Drive Select 3
31	32	Drive Select 4
33	34	Direction In

TABLE 1-2
ST506 J1 Signal Pin Assignments

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
2	1	Drive Selected
4	3	Reserved
6	5	Spare
8	7	Reserved (To J1 Pin 16)
	9	Spare
	10	Spare
12	11	Gnd
	13	+Write Data
	14	-Write Data
16	15	Gnd
	17	+Read Data
	18	-Read Data
20	19	Gnd

TABLE 1-3
ST506 J2 Signal Pin Assignments

1.8.1.2 Control Signals

The following A506 I/O signals are functionally identical to the signal with the same name on the ST506 interface.

1) Write Gate
2) Track 00
3) Index
4) Ready
5) Step
6) Write Data
7) Read Data

The following I/O signals are functionally identical but have different names on the A506 and ST506 interface to more accurately describe their function.

	A506 Signal Name	ST506 Signal Name
1)	Not Busy	Seek Complete
2)	Fault	Write Fault
3)	Disk Select (3 Signals)	Head Select (2 Signals)
4)	Unit Select (4 Signals)	Drive Select (4 Signals)
5)	Direction Select	Direction In

Three of the above signals incorporate additional features when compared to the ST506. (These features are summarized in Subsection 1.8.2 and covered in detail in Section 4.)

1) Track 00
2) Step
3) Read Data

1.8.1.3 Track, Surface And Data Format

The A506 matches the ST506 as far as the number of data tracks per disk surface, the data formats on the disk surface and the number of disk surfaces. The ST506 has 153 data tracks per disk surface, whereas the A506 has 153 plus 1 spare. The closed loop servo system on the A506 drive does not require the use of embedded servo information within the data tracks. Thus, the ST506 data format (with 32 sectors of 256 bytes per track) may be used. Other data formats may be used as well. Each of the four disk surfaces on the ST506 match four of the diskettes in the A506. The fifth A506 diskette may be used for operating system storage or other uses.

1.8.1.4 DC Power

The ST506 and the A506 each require mini-floppy power; +12 VDC and +5 VDC. The +5V current is approximately the same, but the +12V current is approximately 50% less on the A506 (1.0 A typical, 1.5 A max. during power up versus 1.8 A typical and 4.5 A max. during power up).

1.8.2 Additional Capacity and Features

The additional capacity and features of the A506 are implemented in a manner which should require minimal changes to host controller software. The following subsections summarize these differences.

1.8.2.1 Addressing Of Additional Disk Surface

The ST506 interface uses two Head Select lines to address the four disk surfaces using a binary addressing method. The ST506 interface reserves an additonal Head Select line to address additional disk surfaces in future products. The A506 uses these three Head Select lines to address its five diskette surfaces with binary addressing logic as used on the ST506. These three lines on the A506 are referred to as Disk Select lines.

1.8.2.2 Improved Seek Timing

Step pulses may be queued at a 500 usec. rate on the A506 whereas the standard ST506 Step pulse rate is 3 msec. A customer installed option on the ST506 allows controllers to accelerate and decelerate (slew) the Step pulse rate to improve seek timing. The A506's microprocessor automatically executes the slewed seek algorithm as the Step pulses are received.

1.8.2.3 Single Actuator Seek Mode

A Single Actuator Seek Mode is provided as an option on the A506 to be compatible with the operation of ST506, or equivalent drives, when receiving Step pulses. With this optional mode installed on the A506, a Step pulse to a selected diskette causes a physical seek on that diskette surface, and a logical seek on the other four diskette surfaces. In other words, when in this mode a Step pulse causes an increase or decrease in all track addresses within the drive, and not just the track address of the selected diskette. (See Subsection 7.11 for details on setup of this option.)

1.8.2.4 Disabling Invalid Read Data

The A506 microprocessor disables Read Data and Index pulses during drive and diskette addressing as well as seek operations to speed Read and Write operations. Read Data is not present during this time. Most controllers monitor Read Data and Index pulses so that usage of this feature will automatically take advantage of the improved track to track access times.

1.8.2.5 Track 00 Signal Timing

The A506 implements a modified response of the Track 00 output after the selection of a new diskette. This improves the response time of the Track 00 output signal during diskette selection operations. Track 00 does not go active when selecting a diskette in the case when the R/W head was previously located at track zero on that diskette. The Track 00 signal goes active within 500 usec. of receiving the first Step pulse which would move the R/W head out toward track zero. This is a greatly improved response time compared to the 1.9 second average period before the Diskette is selected and the R/W head positioned over track zero.

1.8.2.6 Optional Head Load Feature

The A506 interface incorporates a Head Load signal which is not available on the ST506. The Head Load signal may be used to gate off the binary Disk Select address lines between Read or Write operations to the same diskette. By utilizing this feature, it is unnecessary to incorporate latch hardware on the output address lines of the disk controller.

1.8.2.7 ST506 Options

The ST506 has three options; Radial, Defeat Recal, and Half Step. The A506 does not implement the first two options. The third option on the ST506 is used to provide a Slewed Seek function. This Slewed Seek function is a standard feature of the A506 but is incorporated without the need for doubling the number of step pulses. The A506 provides a Half Step Mode to be compatible with the doubled number of Step pulses required by the ST506 when its Half Step option is incorporated. (See Subsection 9.7.3 for details.)

1.8.2.8 Future Cartridge Compatibility

The A506 interface includes two signals which will also be used on future 5.25 inch Winchester drives with removable data cartridges.

1) Write Protect
2) Door Opened

The A506 interface presents these two signals on the same I/O pins as DMA Systems and Seagate use on their new products.

2.0 FUNCTIONAL CHARACTERISTICS

2.1 General Operations

The 5850, as depicted in the functional block diagram (Figure 2-1), consists of the following six elements:

1) R/W, motor drive, and microprocessor control electronics.

2) Spindle drive mechanism.

3) R/W head.

4) Head carriage positioning mechanism.

5) Pac articulator mechanism.

6) Diskette picker mechanism.

These elements perform the following functions:

1) Interface, interpret and generate control signals.

2) Rotate diskette currently clamped to the spindle.

3) Read and write data on the diskette surface.

4) Position R/W head to the proper data track.

5) Articulate the MiniPac cartridge and select the proper diskette.

6) Move the diskette between the MiniPac cartridge and the drive mechanism.

2.2 Electronics

The 5850 electronics are contained on two printed circuit cards; the Drive Control card and the Motor Drive card. The Drive Control card contains the following:

1) Microprocessor electronics consisting of an Intel 8051* single chip microprocessor, with additional support chips. The microprocessor utilizes 128 bytes of random access memory (RAM), and 4 Kbytes of read only memory (ROM) to store the microcode control instructions.

2) Write driver and erase circuits.

3) Read amplifier and data detector circuits.

4) Reference track detection circuit.

*An Intel 8031 microprocessor with an external 2732A 4K x 8 PROM is used on initial units.

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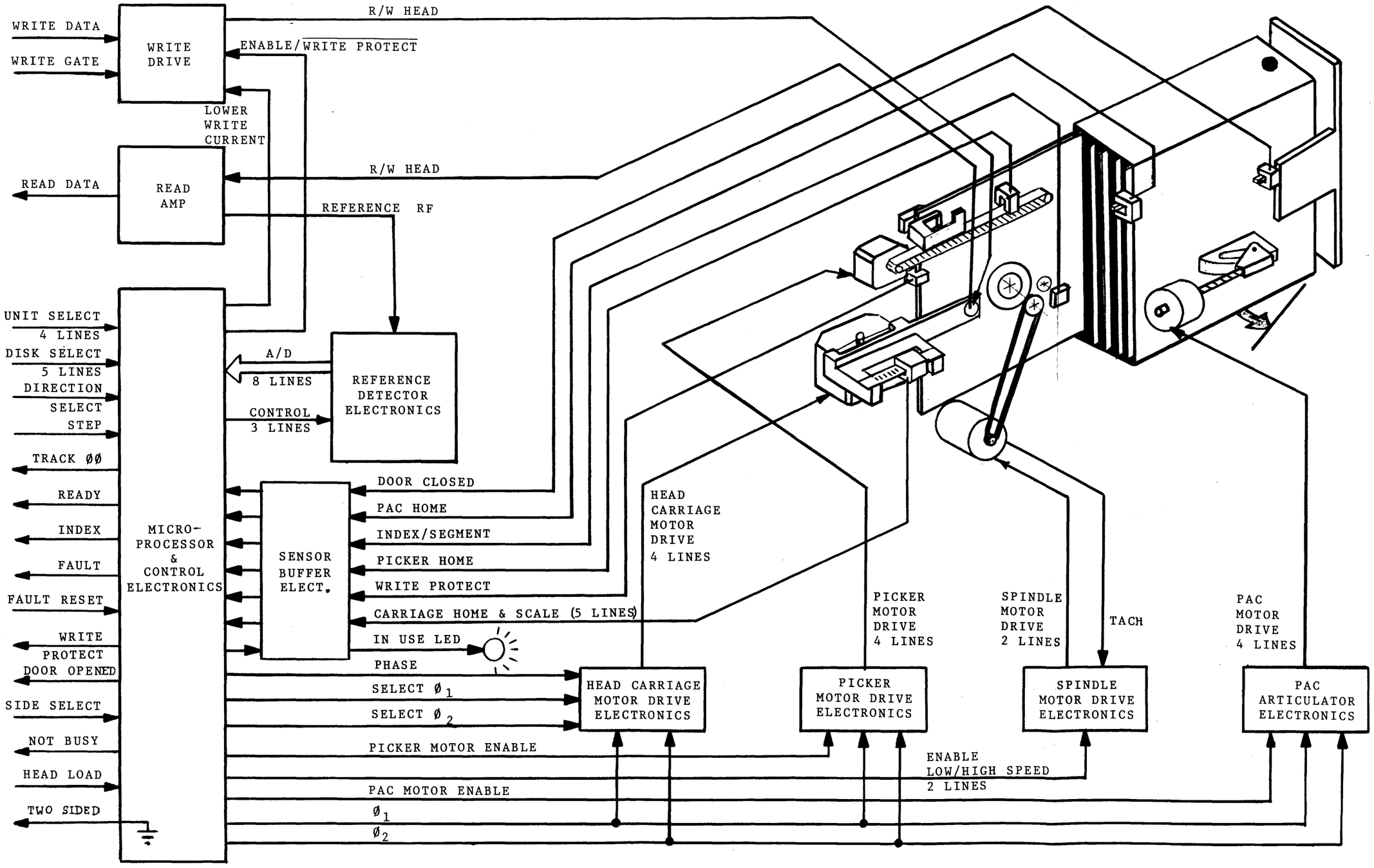

FIGURE 2-1
5850 Functional Block Diagram

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5) Photo interrupter interface circuitry for the following sensors located within the drive:

   a. Door Closed sensor.

   b. Picker Home sensor.

   c. Pac Home sensor.

   d. Write Protect sensor.

   e. Index/Segment sensor.

   f. Carriage Home sensor.

   g. Carriage Scale sensor assembly to determine the direction and location of the R/W head carriage.

The Motor Drive card contains the following:

1) Head Carriage motor drive circuitry.

2) Spindle motor drive circuitry.

3) Pac Articulator motor drive circuitry.

4) Picker motor drive circuitry.

2.3 Spindle Drive Mechanism

The diskette spindle drive motor rotates the spindle through a belt drive system. A registration hub, centered on the face of the spindle, positions the diskette selected by the picker mechanism. The collet which clamps the diskette to the spindle is actuated by the motion of the picker arm.

The spindle drive motor is a servo controlled DC motor, therefore, there is no need to change belts and drive pulleys for 50 vs. 60 Hz power. Two rotational speeds are automatically selected under microprocessor control; 360 RPM and 600 RPM. The normal rotational speed is 360 RPM. The 600 RPM rotational speed is used to rotate 48, 96, and 100 TPI diskettes at a rate which produces Read Data at the same data rates produced by the 5850 during normal operation with AMLYN diskettes.

2.4 R/W Head

The R/W head mounted on the head carriage assembly is a single element hot-pressed manganese-zinc-ferrite device with erase elements to erase data between tracks. The head has a 30 to 35 microinch R/W gap. The erase elements have 300 to 500 microinch gaps and are spaced 30 mils from the R/W gap. When the diskette is loaded, the R/W head is in direct contact with the diskette. The head surface has been designed to obtain maximum signal transfer to and from the magnetic surface of the diskette with minimum head and diskette wear.

2.5 Head Carriage Positioning Mechanism

2.5.1 Full Step Movements Of The Head Carriage Assembly

The R/W head carriage assembly is accurately positioned by a heliband connecting the drive motor to the head carriage assembly. The drive motor is a 1.8 degree stepper motor which drives the R/W head in 5.9 mil (0.0059 inch) full step increments. These full step increments are equivalent to the 5.9 mil nominal spacing of the data tracks on the diskette. (Note: The actual position of the data tracks will not generally correspond to the full step positions of the motor as will be explained in Subsections 2.5.2 through 2.5.8.)

2.5.2 Sensing The Head Carriage Location

The head carriage assembly contains a scale which passes between sensors consisting of light emitting diodes (LED's) and photo transistors. The lines on this scale are spaced at 0.59 mil increments or 1/10th of the data track spacing. The control circuitry counts lines on the scale by monitoring the output of the four scale sensors. Quadrature detection is used to determine the direction of the scale motion and the number of lines that pass between the sensors.

2.5.3 Fine Movement Of The Head Carriage Assembly

A microstepping technique is employed to rotate the stepper motor and move the head carriage assembly in increments as small as 59 microinches (0.000059 inches), which is equivalent to 1/10th of the spacing between the scale lines, or 1/100th of the spacing between data tracks (See Table 2-1). This microstepping technique is accomplished by modulating the width of the drive pulses supplied to the stepper motor. This pulse width modulation technique results in a variable current flow in one of the stepper motor's drive coils, thereby locating the rotor at a position other than the normal full step position of the motor.

TRACK SPACING = 5.9 mils = 0.0059"
SCALE LINE SPACING = 590 microinches = 0.00059"
MINIMUM MICROSTEP INCREMENT = 59 microinches = 0.000059"

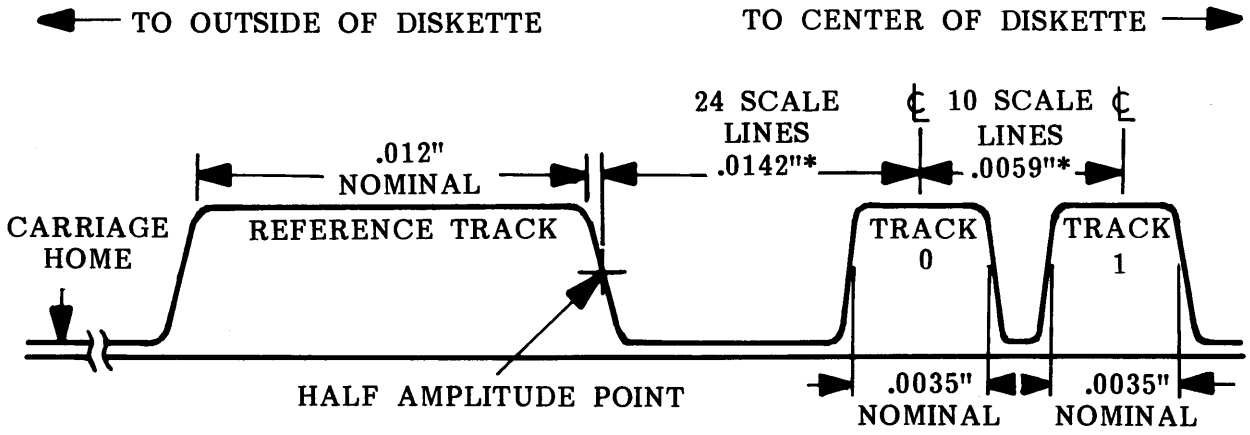
TABLE 2-1
Relationship of Head Carriage Movements

2.5.4 Locating The Reference Track

The location of the position reference track on any individual diskette is determined each time a diskette is taken from the MiniPac cartridge and clamped to the spindle. It is automatically recalibrated every 30 seconds thereafter. These recalibrations are transparent to host controller operations. Figure 2-2 depicts the spatial relationships between the reference track and the data tracks. The procedure for determining the exact reference point, from which the data tracks are located, is implemented as follows.

The head carriage assembly is moved to the carriage home position which places the R/W head well outside the reference track on the diskette. The carriage home position is detected by the microprocessor when the "carriage home" reference mark on the carriage scale passes through the carriage home sensor. The microprocessor then clears the counter which maintains the carriage position. Following movements of the head carriage assembly cause this counter to be incremented or decremented accordingly.

Once in this home position, the head carriage assembly is microstepped inwardly until the R/W head is in the flat signal portion of the reference track. When the flat signal portion of the reference track is detected, the R/W head is again microstepped inwardly until the signal level begins dropping off on the inside edge of the reference track. When the half amplitude point is detected, the microprocessor stores this location (the number of scale lines from the carriage home position) as the reference for locating all data tracks.



*AT 68°F & 50% RELATIVE HUMIDITY

FIGURE 2-2
Relationship Of Reference & Data Tracks

2.5.5 Closed Loop Track Following Servo System

Data tracks are located inside the reference track, and are spaced in increments of 10 scale lines. The head carriage scale is made of polyethylene terephthalate (Mylar), which expands and contracts in the same way as the diskette substrate. This compensates for diskette media dimensional changes due to thermal and hydroscopic effects.

In this manner, a closed loop servo system is implemented. The microprocessor controls this servo system by monitoring the outputs of the scale sensors and applying microstepped control to the head carriage motor drive circuitry. This results in high resolution positional control of the R/W head over the data tracks.

2.5.6 Correcting For Eccentricity

Clamping errors, which cause data track eccentricity, are compensated by locating the half amplitude point on the inside edge of the reference track (as described in Subsection 2.5.4) at eight locations around the diskette. These eight locations are derived from the segment holes in the diskette. (See Figure 1-4.) The eccentricity offsets are stored for these eight locations around the diskette and the head carriage assembly is microstepped as the diskette rotates to follow the data tracks. If excessive eccentricities are detected, the diskette is automatically reclamped.

2.5.7 Following Accesses To The Same Diskette

Before a diskette is returned to the MiniPac cartridge, the microprocessor stores the last track accessed by the disk controller and maintains this address until this diskette is again selected. This address may be modified after the diskette is returned to the MiniPac cartridge. Future logical address commands, or Step commands with the optional Single Actuator Step Mode installed, modify the track address.

Future accesses to this diskette use the method described above to locate the reference track and determine eccentricity. When these operations are completed, the R/W head is automatically moved to the last addressed data track. (See Sections 3 and 4 for additional details.)

2.5.8 Recalibrations Of Reference Track Location

A recalibrate operation is performed every 30 seconds after the diskette is selected from the MiniPac cartridge and clamped to the spindle. The microprocessor times the interval between each recalibration with a 30 second timer. At the end of each 30 second interval, the microprocessor waits for any physical access* to be completed, then begins the recalibrate operation. The operation is then repeated for determining the location of the inside edge of the reference track, including the eccentricity measurement. The R/W head is then returned to the previously addressed data track at the end of the recalibrate operation. This recalibrate operation requires approximately 750 msec. and is transparent to the host controller.

2.6 Pac Articulator Mechanism

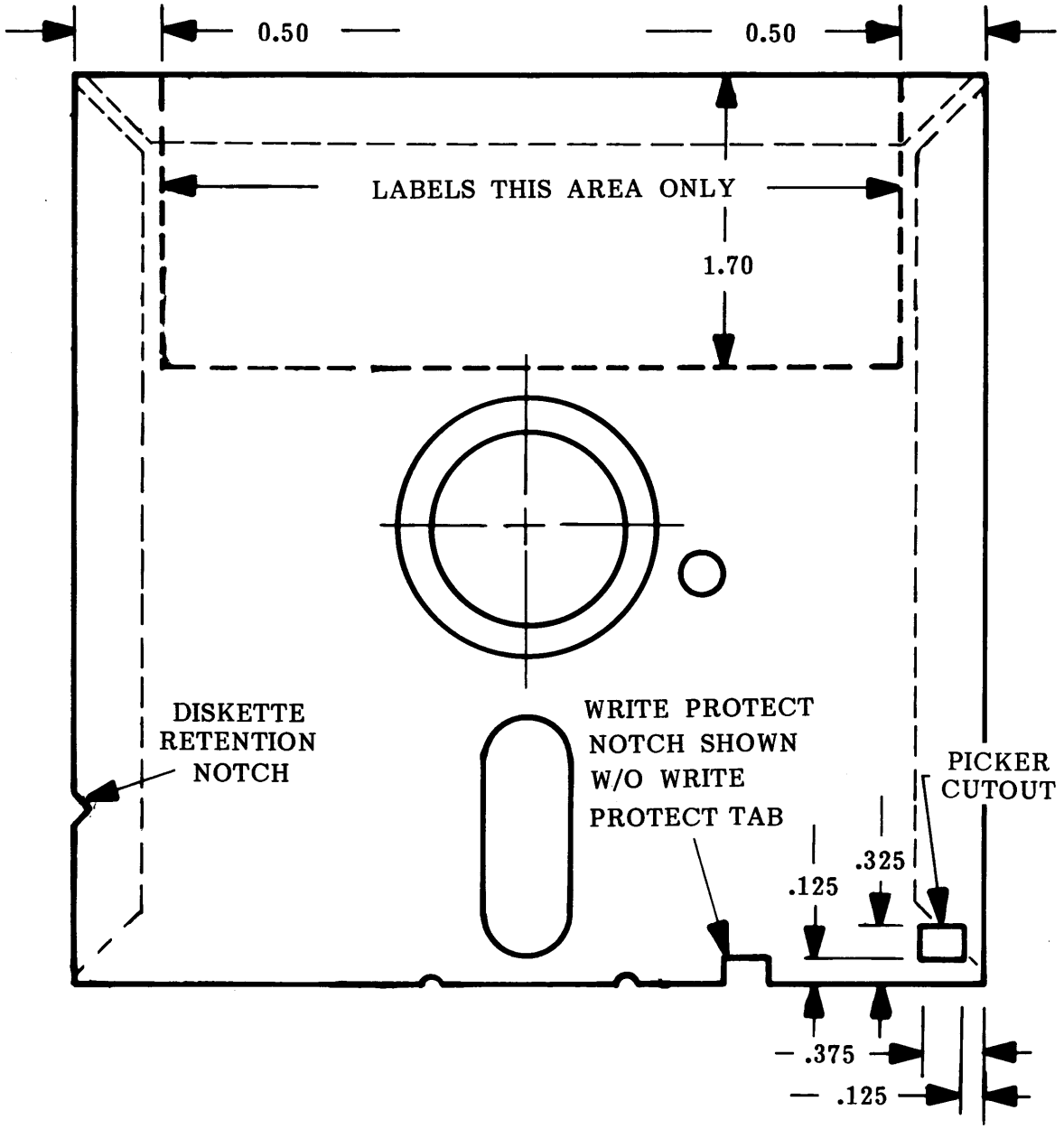
A stepper motor is employed to articulate the tray which holds the MiniPac diskette cartridge. The tray is articulated to the proper angle required for the Picker mechanism to remove and replace the selected diskette. The articulation is accomplished under microprocessor control by stepping the articulation drive motor a predetermined number of steps from the Pac Home position. The Pac Home position is determined when a flag on the MiniPac cartridge tray passes through a photo-interrupter switch module referred to as the Pac Home sensor.

*A "physical access" occurs whenever Unit Select is active (either via input signal or jumper plug installation), the Disk Select input lines are actively selecting a diskette in the drive, and the Head Load input signal is active (if the Head Load function is enabled by installation of a jumper plug). See Section 4 for further information on these input signals.

2.7 Diskette Picker Mechanism

This mechanism is controlled in a manner similiar to the Pac Articulator mechanism. The position of the Picker arm is determined by the number of step pulses issued from the microprocessor after a home position is sensed. The Picker Home position is sensed when a flag on the Picker arm passes between a photo-interrupter switch mounted on the base of the drive. The Picker mechanism picks the selected diskette from the MiniPac cartridge, moves and centers the diskette over the spindle and clamps the diskette to the spindle. This action is reversed when a different diskette is addressed. The diskette on the spindle is unclamped, moved back to the MiniPac cartridge, and the tray is articulated to present the newly addressed diskette to the Picker.

A cutout is provided in the corner of the AMLYN diskette so the Picker may grasp the diskette in the MiniPac cartridge (see Figure 2-3). In order for the Picker to remove a non-AMLYN diskette from the MiniPac cartridge, a cutout must be punched in the corner of the standard (non-AMLYN) diskette jacket. It is not necessary for the cutout to be rectangular. A round cutout may be punched using a standard one hole punch. It may be helpful to use an AMLYN diskette as a guide for locating the Picker hole. (See Subsection 8.1 for a description of the differences between an AMLYN diskette and a standard diskette.



TOP VIEW - THE LABEL SIDE IS UP. READING AND WRITING IS PERFORMED ON THE SEAL SIDE SURFACE ONLY.

FIGURE 2-3
AMLYN Diskette Dimensions

3.0 FUNCTIONAL OPERATIONS

This section provides a functional overview of drive operations. (See Section 4 for additional details on the drive's control and data signals.)

3.1 Power Sequencing

The +5V and +12V DC power may be applied to the 5850 in any sequence. The MiniPac cartridge may be inserted in the drive when the power is either On or Off. Ready becomes active 50 msec. after power is applied if the MiniPac cartridge is in the drive and the door is closed.

3.2 Drive/Diskette Addressing

The Shugart SA850 Maxi-Drive has four Drive Select interface lines (DS1 through DS4), which are used in two modes to address Maxi-Drives in multiple drive systems. These two modes are referred to as Standard Address Mode and Binary Address Mode. In SA850 Standard Address Mode, a disk controller may address up to four drives by activating a single DS line to enable an individual drive. In SA850 Binary Address Mode the DS lines address up to seven drives using a Binary Addressing scheme.

The 5850 uses five Disk Select lines (DS0 through DS4) and four Unit Select lines (US0 through US3) for diskette and drive addressing. This provides the maximum compatibility to the SA850 interface, plus supports the addressing capability for the greater data storage capacity of the 5850. The Standard Address Mode and Binary Address Mode are both available through jumper plug selection. The Standard Address Mode may address up to five diskettes in any drive enabled with an active US signal. (US may be either internally activated or activated over the signal interface.) The Binary Address Mode may directly address up to five diskettes in three individual 5850 drives with the four least significant DS lines (DS0 through DS3). The Binary Address Mode may also be used in a radial manner with individual drives enabled with an active US signal, and diskettes selected with a Binary Address on the four least significant DS lines.

As the DS and US lines address a 5850 drive and select a diskette, the MiniPac cartridge tray is articulated, the Picker mechanism draws the diskette out of the MiniPac cartridge, and clamps it to the spindle. The reference track is located by the control electronics (as described in Subsection 2.5) after which the R/W head is positioned to the data track whose address is maintained by the microprocessor. The first time a diskette is addressed, either upon power up, or after the drive door has been opened then closed, the R/W head is automatically positioned over track zero.

3.3 Track Addressing

Seeks between specific data tracks are accomplished by performing the following operations:

1) Addressing the specific drive and diskette with the US and DS signals. The US signal may be activated over the signal interface, or with an internal jumper.

2) Activating the Head Load line (if this feature is enabled).

3) Selecting the head movement direction with the Direction Select line.

4) Activating the Side Select line (if the Side Select Enable jumper is installed).

5) Pulsing the Step line to move from track to track.

6) Maintaining the Write Gate line inactive.

3.3.1 Side Select

To provide maximum compatibility to the SA850 interface and to provide addressing capability for its greater data storage capacity, the 5850 responds to the Side Select line in two modes:

1) SA850 Emulation Mode (if the Side Select Enable jumper is installed) - In this mode, the Side Select line controls the track selection logic in a manner which causes the 5850 to appear to the controller as a two sided drive with 77 tracks on each side. The tracks representing opposite sides appear as alternate tracks on the diskette.

2) AMLYN Mode (if the Side Select Enable jumper is removed) - In this mode, the Side Select line is not employed, and signals input on this line are ignored. The drive responds to Step and Direction Select input signals as a single sided sided drive with 154 tracks on each diskette.

3.3.2 Step/Direction Select

Addressing a number of tracks in sequence on a selected diskette is accomplished by proper control of the Direction Select line (and the Side Select line in SA850 Emulation Mode), and repeated pulsing of the Step line until the addressed track is reached. The seek operation is initiated on the trailing edge of the Step pulse. Step pulses may be queued at a 500 usec. rate to address the track desired. Step pulses should not be queued when performing a Read on a Non-AMLYN diskette. (See Secton 3.8 for further details on non-AMLYN diskettes.) Figure 3-1 depicts the timing characteristics of the Step and Direction Select lines during track accessing of AMLYN diskettes.

An option exists whereby Step pulses cause an increase or decrease in track addresses on all five diskettes, not just the selected diskette. This option is referred to as Single Actuator Mode and provides compatibility to ST506, or equivalent drives, which access multiple disk surfaces with a single actuator arm. (See Subsection 7.11 for jumper setup details.)

Another option exists which, when installed, performs one increase or decrease in track address for every two Step pulses received. This Half Step option provides compatibility to the same option on the ST506 drive. (See Subsection 9.1.1 for jumper setup details.)

3.4 Gating Of Drive & Diskette Addressing With Head Load

The Head Load line provides the capability to gate physical address commands. Maintaining the Head Load line active physically addresses a specific diskette and data track with the Head Load Enable option installed. Without the Head Load Enable option installed, all drive and diskette address commands are physically acted upon. Reads and Writes are performed only during physical accesses. Deactivating Head Load

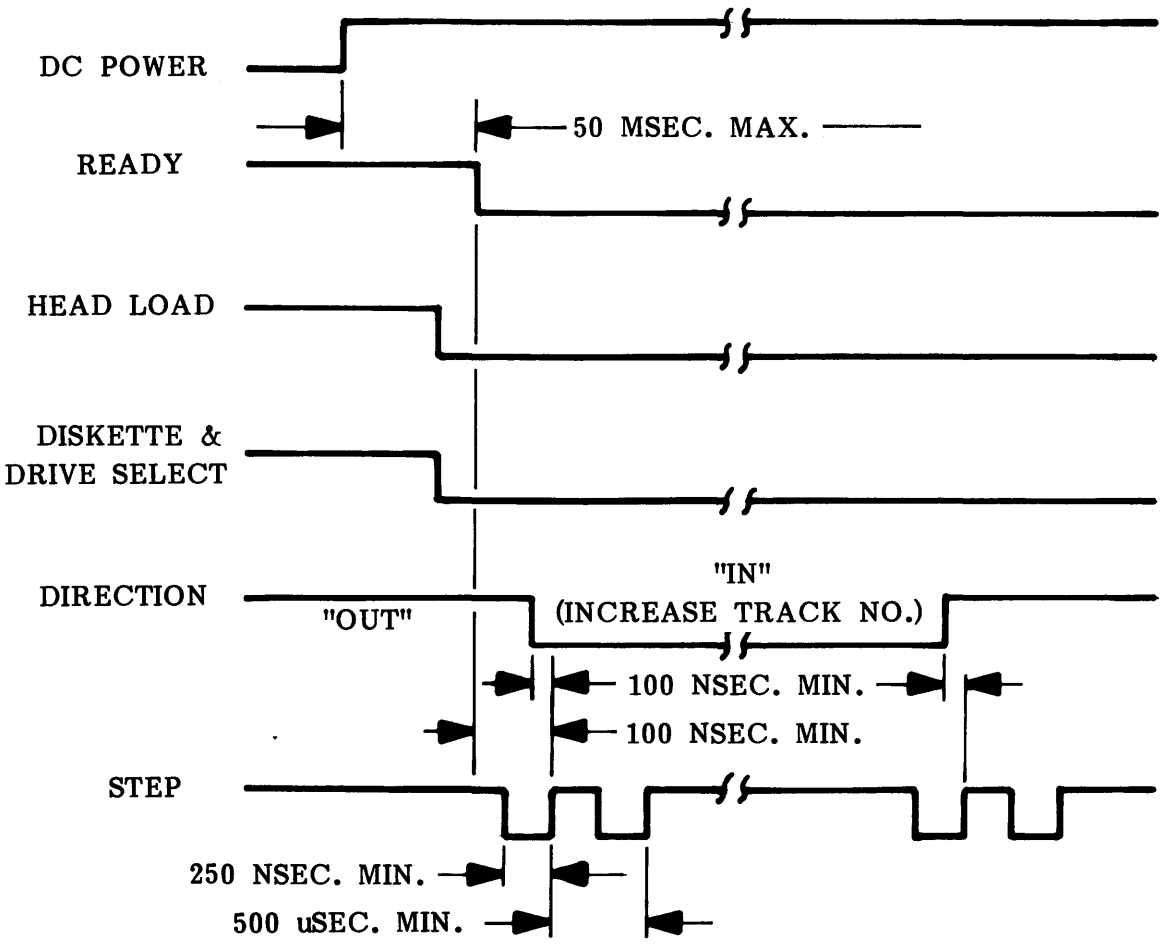


FIGURE 3-1
Track Access Timing

between Read and Write operations to the same diskette (when the drive and diskette address commands may not be stable, stops physical diskette change operations from occuring.) Logical addressing is optional and occurs with the Head Load Enable option installed and the Head Load signal inactive. Logical addressing may also be used to speed accesses to other diskettes in the drive by seeking new data tracks on these diskettes prior to their physical addressing. In addition, when in the logical address mode, (Head Load signal False) the previously addressed diskette is returned to the MiniPac and the drive motors are turned off if no physical accesses (Head Load becomes True) occur for 100 seconds. Thus, motor life is prolonged and diskette wear is minimized.

3.5 Read Operation

Data is Read from the 5850 by:

1) Addressing the drive and diskette with the US and DS signals. The US signal may be activated over the signal interface, or with an internal jumper.

2) Activating Head Load (if this feature is enabled).

3) Maintaining the Write Gate line inactive.

4) Stepping the R/W head to the desired track by control of the Direction Select, Side Select and Step lines.

5) Waiting for either the Not Busy signal to become active or Read Data or Index pulses at the drive interface.

Figure 3-2 shows the timing relationship the disk controller should expect between drive, diskette and track addressing, and the output of Read data. It should be noted that the 5850 gates Index pulses and Read data with the Not Busy signal during "side change", drive and diskette address change, and seek operations. It is not necessary to use the Not Busy signal. However, it is useful to minimize access times during Read and Write operations. Not Busy becomes active, and Index pulses and valid Read data become available at the interface only after the R/W head is stabilized over the addressed data track.

Recorded data can be encoded using a number of methods. The two most common methods are listed below:

1) Frequency Modulation (FM) for single density recording.

2) Modified Frequency Modulation (MFM) for double density recording.

Figure 3-3 shows the relationship of the recorded data to the bit cell period. Each bit cell begins with a clock bit with FM recording. In the center of each bit cell a data bit is recorded for a "one", and no data bit is recorded for a "zero". The clock bit is not present at the beginning of the bit cell if either the preceding bit cell or the current bit cell contains a data bit with MFM reccording. Separation of the data bits and clock bits is performed outside the drive. Separation of the MFM double density data must be performed with a phase locked loop circuit.

3.6 Write Operation

Data is written on a selected diskette by:

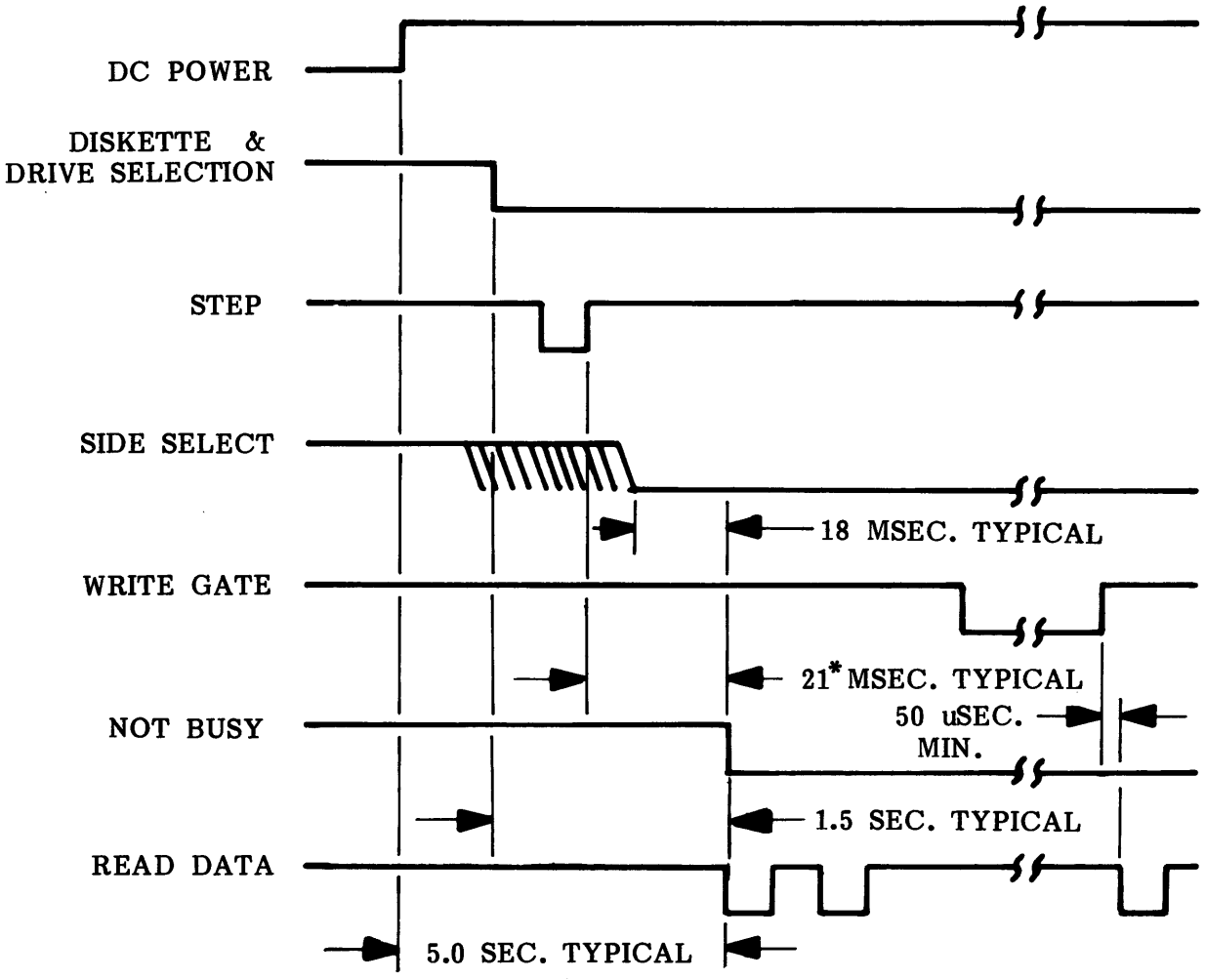
1) Addressing the drive and diskette with the US and DS signals. The US signal may be activated over the signal interface, or with an internal jumper.

2) Activating Head Load (if this feature is enabled).

3) Stepping the R/W head to the desired track by control of the Direction Select, "Side Select" and Step lines.

4) Waiting for either the Not Busy signal to become active or Read Data or Index pulses at the drive interface.

5) Activating the Write Gate line and providing data on the Write Data lines.



*18 MSEC. TYPICAL WHEN SIDE SELECT JUMPER IS NOT INSTALLED.

FIGURE 3-2
Read Initiate Timing

Figure 3-4 shows the timing relationship the disk controller should expect between drive, diskette and track addressing and the ability to Write to the diskette. Again, the 5850 cuts off Index pulses and Read data with the Not Busy signal during Side Select, drive and diskette address changes, and seek operations. The Write Gate must not be activated until either Not Busy becomes active or Index pulses or Read Data are available at the 5850 interface. If the Write Gate is activated when Not Busy is False, a Fault output is generated.

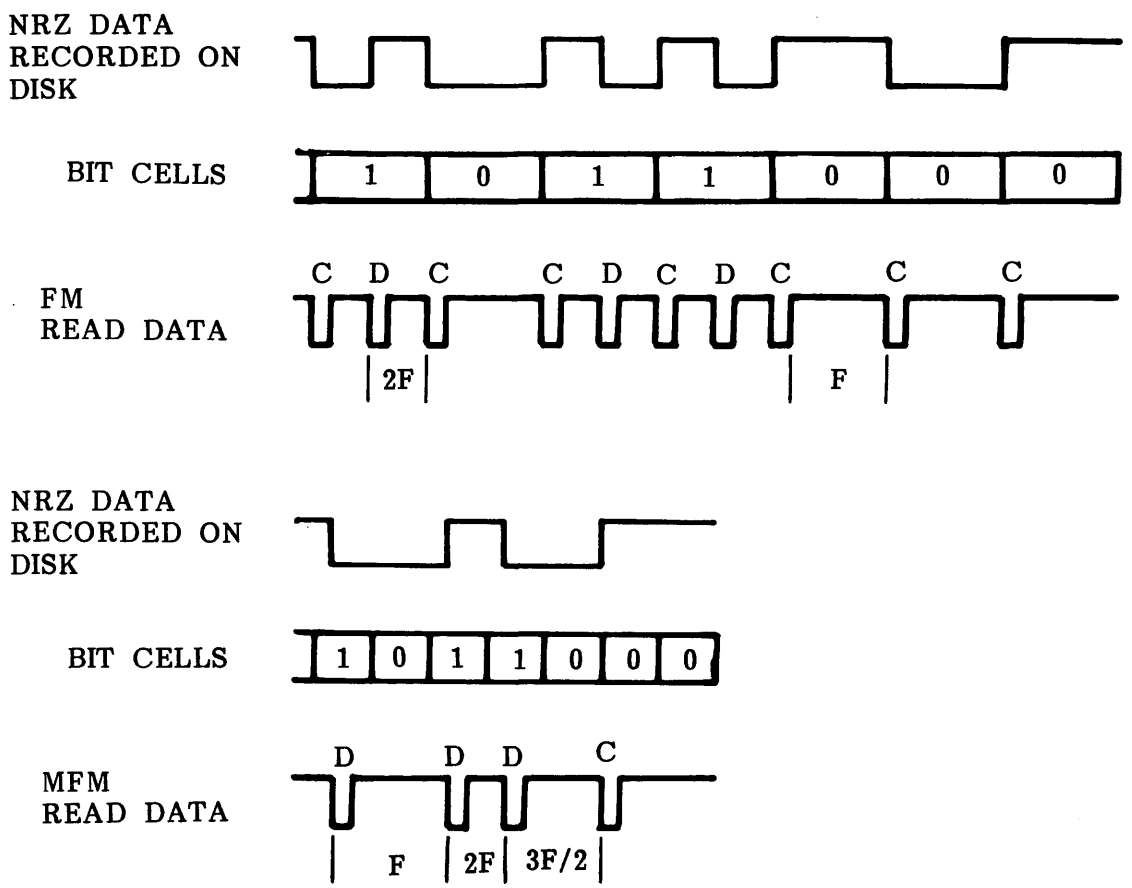


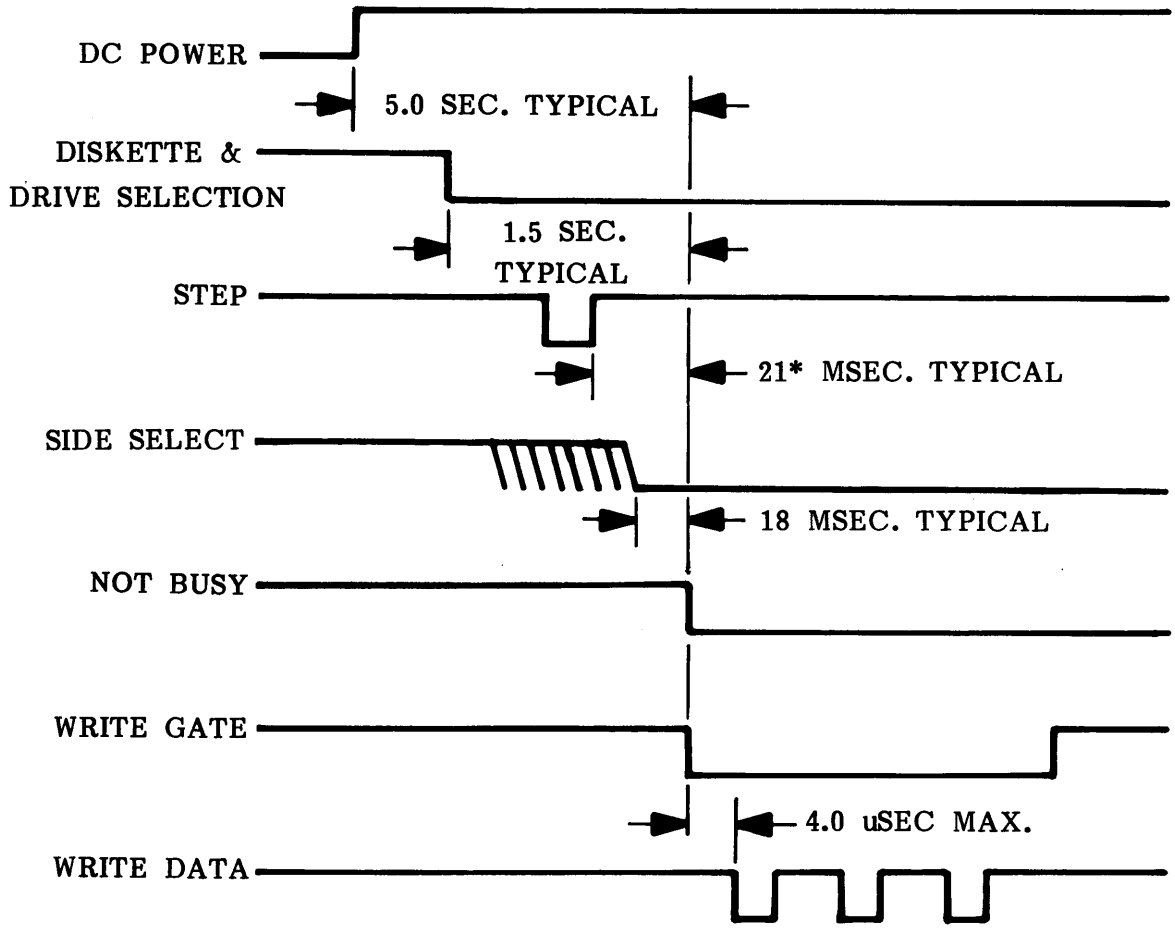
FIGURE 3-3
FM & MFM Code Comparison

Write data may be encoded using a number of encoding methods. The most common are FM and MFM coding. Figure 3-5 shows the Write Data Timing for both FM and MFM data.

If any of the "double density" coding methods are used such as MFM, or M^2FM, the Write data should be precompensated to counter the effects of bit shift. The amount and direction of compensation required for any given bit in the data stream depends on the pattern it forms with nearby bits. The 5850 requires the same precompensation as the SA850 drive. (See AMLYN Technical Bulletin TB-004 for additional information on write pre-compensation).

3.7 Reading Non-AMLYN Diskettes

The 5850 drive may read data recorded at 48, 96 or 100 TPI from the seal side surface of non-AMLYN 5.25 inch diskettes. No capability is present to Write on non-AMLYN diskettes. An attempt to Write on a non-AMLYN diskette will be inhibited and will generate a Fault output signal. Reading non-AMLYN diskettes may be useful when



*18 MSEC. TYPICAL WHEN SIDE SELECT ENABLE JUMPER IS NOT INSTALLED.

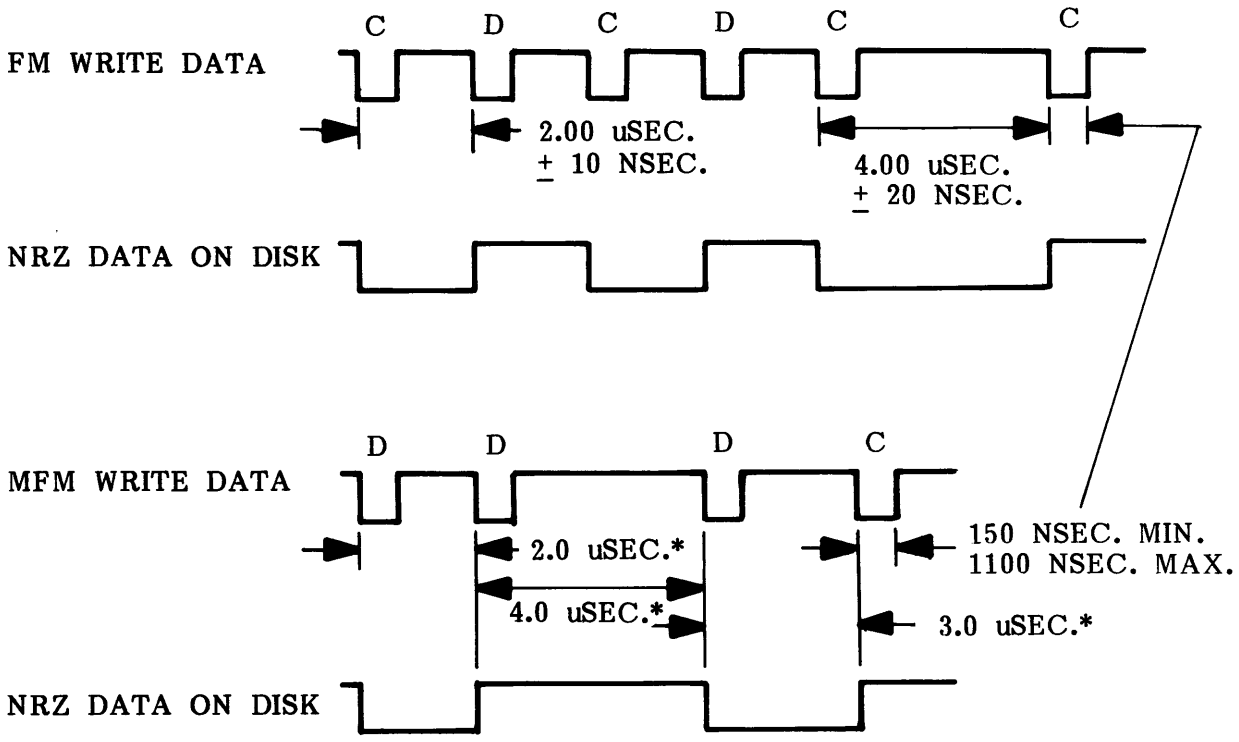
FIGURE 3-4
Write Initiate Timing

transferring software or existing databases to a 5850 based system. The feature of reading non-AMLYN diskettes is intended only for copying of these diskettes and not operational use.

The following subsections describe the procedures for Reading non-AMLYN diskettes.

3.7.1 Detection Of Non-AMLYN Diskettes

If, when a diskette is clamped, the drive does not detect the 16 segment holes in the diskette, or the reference track, it assumes it has loaded a non-AMLYN diskette. It



*SEE AMLYN TECHNICAL BULLETIN TB-004 FOR DETAILS ON PRECOMPENSATION.

FIGURE 3-5
FM & MFM Write Data Timing

then initiates a special mode of operation. In this mode, the diskette is rotated at 600 RPM to produce the same output data rate as would normally appear at the output of the 5850 drive or SA850 drive (eg. 250/500 kilobits/sec. with FM/MFM recording respectively). It is assumed the host system knows a non-AMLYN diskette has been inserted into the drive so it may properly read sector headers etc. from the non AMLYN diskettes. No Index pulses are output when reading a non-AMLYN diskette. (See Subsection 7.8 for information on installing a jumper to output Composite Sector/Index.)

3.7.2 Seeking Data Tracks On Non-AMLYN Diskettes

Upon addressing a non-AMLYN diskette, the R/W head is automatically positioned over track zero. The Track 00 output signal does not become active until the first Step pulse is received to recalibrate the R/W head to track zero. This is the same operation as on an AMLYN diskette. Step pulses and Direction Select control signals should be supplied by the host controller to seek other data tracks. However, the rate at which Step

pulses can be received must be slower. Step pulses must not be queued as during normal operations with AMLYN diskettes. Valid Read data should be observed at the output before each new Step pulse is applied. The maximum Step pulse rate, when reading non-AMLYN diskettes, is approximately 700 msec. The slow seek rate, when reading non-AMLYN diskettes, allows time to detect the signal amplitude peak of each data track and position the R/W head over it. The Not Busy output signal may also be used by the controller to determine when the R/W head is positioned over each data track.

If either the Head Load, the Unit Select signal, or the Disk Select signals are deactivated for over 100 seconds, the non-AMLYN diskette is returned to the MiniPac cartridge as with an AMLYN diskette. If the Non-AMLYN diskette is again selected, the R/W head is positioned over the data track address maintained by the microprocessor. If a different diskette is selected, and then the non-AMLYN diskette re-selected, the R/W head is positioned over the data track last addressed on the non-AMLYN diskette unless the optional Single Actuator Step Mode is installed. If this option is installed, the non-AMLYN diskette track address is modified the same as the Seek command to the other diskettes. Logical seek operations with the non-AMLYN diskette are acted upon according to the state of the side select command.

If the Head Load signal is deactivated and the non-AMLYN diskette is logically addressed and logical seeks are performed, the state of the Side Select Enable jumper and Side Select input signal are acted upon. However, when performing a physical access to a non-AMLYN diskette, Step pulses cause a movement of one track regardless of the state of the Side Select Enable jumper and the Side Select input signal.

3.7.3 Performing Read Operations

As the R/W head is positioned over specific data tracks, as described in the two preceding subsections, Read data is output only after the nominal center of the data track is located and all settling is completed. The Not Busy signal is also activated when settling is completed, just as when Reading an AMLYN diskette.

3.8 Self Exercise

A self exercise routine may be initiated by installing a jumper plug. (See Subsection 7.11 for setup details). While in this mode, all other drive inputs are ignored and all outputs are held inactive. This routine selects each diskette in sequence and performs a seek from track zero to track 153 and back to track zero. The purpose of this routine is to perform a confidence test on all drive mechanisms and circuitry.

4.0 ELECTRICAL INTERFACE

The interface of the 5850 drive is divided into two categories:

1) Signal

2) Power

These two categories are covered in the following subsections.

4.1 Signal Interface

There are two types of interface signals:

1) Control

2) Data

All lines in the signal interface are digital and are either input signals to the drive or output signals to the host via the Drive Control card interface connector P1/J1. Table 4-1 should be used as a reference for all interface connections. The interface signals are all TTL level compatible. Negative True logic is used for all signals. The TTL signal specifications and logic definitions are as follows:

- Active/True = V_{in} 0.0V to +0.4V
  @ I_{in} = 40 mA (max)

- Inactive/False = V_{in} +2.5V to +5.25V
  @ I_{in} = 250 uA (open)

- Input Impedance = 150 ohms

All output signals are driven with an open collector TTL device capable of sinking a maximum of 40 ma at a maximum voltage of 0.4V when outputting an Active/True signal. When this line driver is off during the outputting of an Inactive/False signal, the collector current is a maximum of 250 microamperes. See Figure 4-1 for the recommended interface circuit.

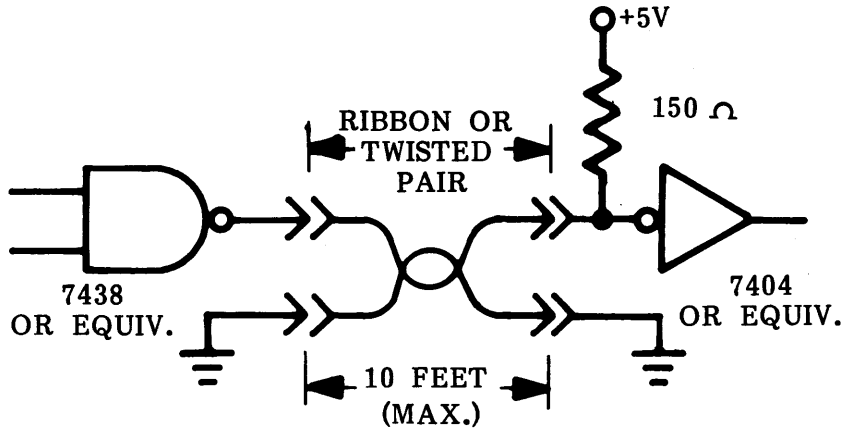


FIGURE 4-1
Recommended Interface Circuit

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
1	2	Unit Select 0
3	4	Unit Select 1
5	6	Unit Select 2
7	8	Unit Select 3
9	10	Two Sided
11	12	Door Opened
13	14	Side Select
15	16	Not Busy
17	18	Head Load
19	20	Index
21	22	Ready
23	24	Disk Select 4
25	26	Disk Select 0
27	28	Disk Select 1
29	30	Disk Select 2
31	32	Disk Select 3
33	34	Direction Select
35	36	Step
37	38	Write Data
39	40	Write Gate
41	42	Track 00
43	44	Write Protect
45	46	Read Data
47	48	Fault
49	50	Fault Reset/Eject/Recalibrate

TABLE 4-1
5850 Signal Pin Assignments

Table 4-2 lists the I/O signals which have trace cut points and jumper pads to facilitate assigning these signals to different I/O connector pins. In addition, some I/O signal routing may be physically or logically modified through changes to jumper plug settings. As an example, the Unit Select line may be connected to one of four signal connector pins and this selection is made with a change in a jumper plug. In radial or single drive applications, the jumper plug may be installed to internally activate the drive thereby freeing all four US input lines for other uses. Details on set up of the jumper plugs are covered in Section 7.

The following subsections provide a detailed description of the 5850's control and data lines. (For timing diagrams on these signals see Section 3.)

Pin	Signal	Pin	Signal
2	Unit Select 0	22	Ready
4	Unit Select 1	24	Disk Select 4
6	Unit Select 2	26	Disk Select 0
8	Unit Select 3	28	Disk Select 1
10	Two Sided	30	Disk Select 2
14	Side Select	32	Disk Select 3
16	Not Busy	48	Fault
20	Index	50	Fault Reset

TABLE 4-2
I/O Signals With Jumper Pads

4.1.1 Input Lines

There are sixteen signal input lines. The input signals are of two types; those intended to be multiplexed in a multiple drive system and those which control multiplexing. The input signals to be multiplexed are:

1) Side Select
2) Direction Select
3) Write Gate
4) Write Data
5) Head Load
6) Step
7) Fault Reset/Eject/Recalibrate

The above signals are multiplexed by the five Disk Select signals (DS0 through DS4) and the four Unit Select signals (US0 through US3) in Binary Address Mode. In Standard Address Mode, the Disk Select signals are also multiplexed by the Unit Select signals.

4.1.1.1 Input Line Termination

The 5850 is provided with two removable resistor packs for termination of the input lines. The last drive on the interface must have these lines terminated for the drive to function properly. Termination of these lines must be accomplished by either of two methods.

1) As shipped from the factory, two resistor Single Inline Packs (SIPs) are installed in sockets labeled SIP1 and SIP2. These resistor packs must be removed from all drives except the last one on the bus.

2) External termination may be used provided the terminator is beyond the last drive on the bus. Each of the input lines must be terminated with a 150 ohm, 1/8 watt resistor, pulled up to +5 VDC. If external termination is used, the resistor packs must be removed from each drive. (The signals listed in Table 4-3 require termination.)

WARNING

INTERFACE SIGNAL LEVELS WILL NOT BE CORRECT IF MULTIPLE DRIVES ARE CONNECTED WITH EACH HAVING THE TERMINATION RESISTOR PACKS INSTALLED. IN ADDITION, DAMAGE MAY RESULT TO THE HOST LINE DRIVER CIRCUITS IF CONNECTED TO MORE THAN TWO SETS OF TERMINATION RESISTORS INSTALLED.

Connector Pin	Signal Name
14	Side Select
18	Head Load
24	Disk Select 4
26	Disk Select 0
28	Disk Select 1
30	Disk Select 2
32	Disk Select 3
34	Direction Select
36	Step
38	Write Date
40	Write Gate
50	Fault Reset

TABLE 4-3
5850 Input Signals Requiring Termination

4.1.1.2 Unit Select (US)

The US line may be connected to multiple I/O pins on the 5850 signal connector or tied to ground (activated) to permanently select the drive. A total of four input connector pins are available (P1 Pins 2, 4, 6, and 8). Subsection 7.3 describes the jumper plug configuration required to permanently select the drive, as well as to provide the means of selecting a drive in a multiple drive system. The addressing of multiple drives by activating the individual US signal pins at the interface of a multiple drive system is depicted in Table 4-4.

No action is taken for 100 seconds when US is deactivated. After 100 seconds the diskette selected by the Disk Select (DS) lines is returned to the MiniPac cartridge and all drive motors are turned off. The logic remains active to either receive new US commands, or perform logical addressing or logical seek commands by control of the Head Load signal. This delayed response to the deactivation of the US lines prevents diskettes from being returned to the MiniPac cartridge between Read and Write operations.

	LOGIC INPUT				DRIVE NUMBER			
I/O Pin:	8	6	4	2	D	D	D	D
Signal:	US3	US2	US1	US0	3	2	1	0
	F	F	F	F	-	-	-	-
	F	F	F	T	-	-	-	S
	F	F	T	F	-	-	S	-
	F	T	F	F	-	S	-	-
	T	F	F	F	S	-	-	-

NOTE: - = Drive not selected.
S = Drive selected.
T = True = 0.0 to 0.4 VDC.
F = False = 2.5 to 5.25 VDC.

TABLE 4-4
Drive Selection

4.1.1.3 Disk Select (DS)

The five DS lines may be used to select diskettes within the 5850 in two different modes; Standard Address Mode and Binary Address Mode. The two modes are jumper plug selectable. (See Subsection 7.4 for details on setup of jumper plugs to select these two modes.) The state of these jumper plugs is read during power up.

The Standard Address Mode may be used to select the 5 diskettes in the 5850 by activating the US line (if this input is used) plus activating an individual DS line as shown in Table 4-5.

	LOGIC INPUT					DISKETTE NUMBER				
I/O Pin:	24	32	30	28	26					
Signal:	DS4	DS3	DS2	DS1	DS0	4	3	2	1	0
	F	F	F	F	F	-	-	-	-	-
	F	F	F	F	T	-	-	-	-	S
	F	F	F	T	F	-	-	-	S	-
	F	F	T	F	F	-	-	S	-	-
	F	T	F	F	F	-	S	-	-	-
	T	F	F	F	F	S	-	-	-	-

NOTE: - = Diskette not selected.
S = Diskette selected.
T = True = 0.0 to 0.4 VDC.
F = False = 2.5 to 5.25 VDC.

TABLE 4-5
Diskette Selection
Standard Address Mode

No action is taken for 100 seconds if the state of the five DS lines change from selecting a diskette to selecting no diskette. After 100 seconds, the previously addressed diskette is returned to the MiniPac cartridge and all drive motors are turned off. The logic remains active to either receive new DS commands, or perform logical addressing or logical seek commands.

Table 4-6 presents the addressing logic used in the Binary Address Mode. In this mode, only the four least significant DS lines (DS0 through DS3) are used. The DS4 line is ignored. With the US line activated or tied low in all drives, as many as 3 drives and 15 diskettes can be addressed. See Subsection 7.4 for the jumper plug configuration required for the drive to respond as either Drive 0, Drive 1, or Drive 2. The status of these jumper plugs is read upon power up. The user may also install jumper plugs in all drives to select diskettes as Drive 0 and use the US line, wired in a radial configuration, to address multiple drives.

DS LOGIC INPUT				DRIVE 2					DRIVE 1					DRIVE 0				
DS 3	DS 2	DS 1	DS 0	DISKETTE 4	3	2	1	0	DISKETTE 4	3	2	1	0	DISKETTE 4	3	2	1	0
F	F	F	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S
F	F	F	T	-	-	-	-	-	-	-	-	-	-	-	-	-	S	-
F	F	T	F	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-
F	F	T	T	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-
F	T	F	F	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-
F	T	F	T	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-
F	T	T	F	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-
F	T	T	T	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-
T	F	F	F	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-
T	F	F	T	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-
T	F	T	F	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-
T	F	T	T	-	-	-	S	-	-	-	-	-	-	-	-	-	-	-
T	T	F	F	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-
T	T	F	T	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-
T	T	T	F	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T	T	T	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE: - = Diskette not selected.
S = Diskette selected.
T = True = 0.0 to 0.4 VDC.
F = False = 2.5 to 5.25 VDC.

TABLE 4-6
Drive And Diskette Selection
Binary Address Mode

No action is taken for 100 seconds when the state of the four least significant DS lines change, so that no diskette is addressed in a drive. After 100 seconds the previously addressed diskette is returned to the MiniPac cartridge and all drive motors are turned off. The logic remains active to either receive new DS commands (which

would select a diskette in the drive), or to perform logical addressing or logical seek commands.

If the binary address lines are not latched by the disk controller between successive Read or Write operations to the same diskette, a disk change operation may begin causing a delay in following Read or Write operations. By deactivating the Head Load signal between successive Read and Write operations, the changing binary address lines are not acted upon to require a physical disk change operation. Employing the Head Load signal in this manner would speed subsequent Reads and Writes and also save the otherwise required latch hardware in the disk controller.

4.1.1.4 Side Select

The 5850 operates in two modes in response to the Side Select line depending on the installation of the Side Select Enable jumper plug which is read upon power up.

1) Side Select Enable - This mode emulates the two sided SA850 Maxi-Drive, with 77 tracks on each side (numbered 00 through 76). In this mode, the 5850 track addresses are interleaved on one side of the diskette, so that the outside data track is "side zero, track zero". Moving in toward the center of the diskette, the tracks are addressed "side one, track zero", "side zero, track one", "side one, track one", etc. A True on the Side Select line selects "side one" tracks, and a False selects "side zero" tracks.

2) Side Select Disable - The Side Select line is ignored and the 5850 responds to the Step and Direction Select lines as one would expect on a single sided drive which has 154 data tracks. See the following subsection for details on the Step and Direction Select lines.

See Subsection 7.5 for details on installation of the Side Select Enable jumper plug.

Some disk controllers, designed for use with the SA850 Maxi-Drive, deactivate the Side Select line between successive Reads or Writes to the same "side one" data track. A seek time improvement may be realized if the disk controller software is modified to maintain the Side Select line at the same level to eliminate the time required for the 5850 to seek between adjacent data tracks. The physical seek between adjacent data tracks resulting from changes in the Side Select input line may also be inhibited by deactivating the Head Load line between successive Writes and Reads. This action would gate off the Side Select input command between Read and Write operations the same as described in Subsection 4.1.1.3 with the DS lines in the binary address mode.

4.1.1.5 Direction Select

This interface line controls the direction of motion of the R/W heads when a Step pulse is received. An Inactive/False Direction Select signal defines the direction as "out" or a decrease in track address number. An Active/True signal defines the direction as "In" or an increase in track address number.

4.1.1.6 Step

This interface line is a control signal which causes the R/W head to seek, with the direction of motion defined by the Direction Select line. Access motion is initiated for each True to False transition of this line. Step pulses may be queued at any rate up to 500 usec. per Step pulse. Any change in the Direction Select line must be made

at least 100 nsec. before the trailing edge of the Step pulse. The Step pulse must be at least 250 nsec. wide. This line is gated by Unit Select (US).

4.1.1.7 Write Gate

Writing is enabled when the Write Gate signal is True. A False enables Read Data. The 5850 inhibits Read Data and Index pulses with the Not Busy signal during drive and diskette addressing and seek operations. Activating Write Gate during a seek operation results in a Fault output signal.

4.1.1.8 Write Data

This is the input line for data to be written on the diskette. Each False-to-True transition of this line causes the current through the R/W head to be reversed. The Write Gate line enables this signal.

4.1.1.9 Head Load

The Head Load signal has the following uses:

1) Gating of Drive Address and Side Select

2) Inactivity Sensing

3) Logical Addressing

4.1.1.9.1 Gating Of Drive Addressing

When some controllers provide binary drive and diskette addressing signals using the Binary Address Mode, they do not maintain the DS lines at constant levels between Read and Write operations to the same diskette. If these DS lines are not maintained in the same state, the diskettes are returned to the MiniPac cartridge, and new diskettes selected according to the state of the DS lines. This causes delays in subsequent selections of previous addressed diskettes because of the time required for them to be reselected from the MiniPac cartridge. To eliminate the need for additional latch hardware in the disk controller, the Head Load line may be deactivated between Read and Write operations to the same diskette, thus maintaining the previously addressed diskette in the drive (unless the period of inactivity between Read and Write operations is greater than 100 seconds).

4.1.1.9.2 Inactivity Sensing

The currently selected diskette is returned to the MiniPac cartridge and all drive motors are turned off if no physical selection occurs for more than 100 seconds. However, as long as DC power is applied to the drive and Ready is active at the 5850 output, logical seeks may be continued indefinitely with the Head load line inactive. In the absence of physical or logical track address changes, even after the motors are shut down (when no physical select occurs for 100 seconds), the drive stores the last track address and seeks to it automatically when the diskette is reselected, assuming the track address has not been modified through logical seeks or other operations occure with the optional Single Actuator Seek Mode installed.

4.1.1.9.3 Logical Addressing

Seek control, and drive and diskette addressing, as described in Subsections 4.1.1.2 through 4.1.1.6, are accomplished with the following lines:

1) Disk Select 0-4
2) Unit Select 0-3
3) Side Select
4) Direction Select
5) Step

With no Head Load Enable jumper installed, drive and diskette addressing and seek operations physically take place. If the Head Load Enable jumper plug is installed (see Subsection 7.6 for installation details), the Head Load line allows the user to have both physical and logical control over the 5850 seek as well as drive and diskette addressing functions.

Activating any of the drive and diskette addressing lines or seek control lines with the Head Load line active results in physically performing the operation. Activating any of the addressing or seek control lines with the Head Load line inactive results in the operation being performed logically but not physically.

An example of logical drive and diskette addressing and seek commands is as follows. Assume Diskette 1 was physically addressed, and data is being read from a selected data track. The Head Load line could then be deactivated and Diskette 3 logically addressed with a series of Step pulses applied with the proper control of the Direction Select line. These commands would logically seek a data track on Diskette 3 different from the last track addressed on that diskette. If the Head Load line is then activated, Diskette 1 will be returned to the MiniPac, Diskette 3 selected, clamped, its reference track found and the R/W head physically moved to the new track. Note, however, that before data may be written to Diskette 3, Index pulses or Read Data (or Not Busy) must be sensed at the output of the 5850.

4.1.1.10 Fault Reset/Eject/Recalibrate

Activating this line for a minimum of 500 usec. clears the Fault output line. (See Subsection 4.1.2.7 for a description of conditions which cause an active Fault output line.)

If this signal is activated when no diskette is selected and US is True, the drive will immediately eject the diskette into the MiniPac cartridge and turn off all drive motors. This is done by presenting a DS code with the DS0 through DS3 lines True in the Binary Addressing Mode.

If this signal is activated when a diskette is physically selected, it will cause a recalibration to be performed on the currently selected diskette. The R/W head will be positioned at the nominal location of the reference track, the algorithm to detect the inside edge of the reference track will be performed, and the R/W head returned to the previously addressed data track.

4.1.2 Output Lines

There are nine signal output lines from the 5850 drive. These output signals are listed below. The US line gates the Track 00 and Ready output signals.

1) Track 00	4) Read Data	7) Door Opened
2) Index	5) Write Protect	8) Fault
3) Ready	6) Two Sided	9) Not Busy

All output signals are valid 50 ms after power-up. (For timing of these output signals after initial power-up, see the following subsections.)

4.1.2.1 Track 00

This output signal is active when the R/W head is positioned with a Step pulse, either physically or logically, over track zero. With the Side Select Enable jumper plug installed, the track zero output signal is driven active whenever "track zero, side zero" or "track zero, side one" is physically or logically addressed. The following paragraphs detail the Track 00 response during different drive operations.

The Track 00 output signal is generated by the microprocessor, and becomes True in less than 500 usec. after the trailing edge of the Step pulse which causes the R/W head to seek to track zero. Note that Track 00 may become active before the R/W head is actually over track zero if the Step pulses are being queued at the maximum rate. Track 00 will be driven False within 500 usec. of a Step pulse which causes the drive to move the R/W head off track zero.

Since some controllers expect to see the Track 00 signal within 1 usec. of addressing a drive previously on track zero, the 5850 incorporates a slightly modified response to drive and diskette address commands to provide compatibility to these controller designs. To speed the Track 00 response when addrssing a new diskette, the 5850 does not activate the Track 00 signal when a different diskette is addressed if, when previously addressed, the R/W head was located on track zero. The rationale for this design is: Controllers are designed to recalibrate a drive when a drive previously on track zero is selected and the Track 00 signal does not go True. The recalibration is accomplished by issuing Step pulses to seek track zero. The 5850 responds with its Track 00 signal active after receiving one Step pulse toward track zero. The different occurences of this Track 00 recalibration are discussed below.

Upon power up with a diskette addressed in the drive, in both Standard and Binary Address Mode, the R/W head is physically positioned over track zero imediately after the reference track is detected. However, the Track 00 signal does not become True until after the first Step pulse is received to recalibrate the drive with a seek to track zero. Track 00 becomes False 500 usec. after a different diskette is selected within that drive, even if track zero was previously addressed on that diskette. The disk controller should then begin issuing Step pulses to seek track zero, and the Track 00 signal will become active in less than 500 usec. after the first Step pulse seeking track zero. In summary, Track 00 is activated or deactivated only in response to a Step pulse, and will be valid for the diskette addressed when the Step pulse occurred.

The Track 00 line is gated by Unit Select (US) and therefore is deactivated within 150 nsec. of US becoming False.

4.1.2.2 Index

The Index signal is activated once each revolution of the diskette (166.7 msec.), and is True for a 3.5 msec. period. This signal is shown in Figure 4-2.

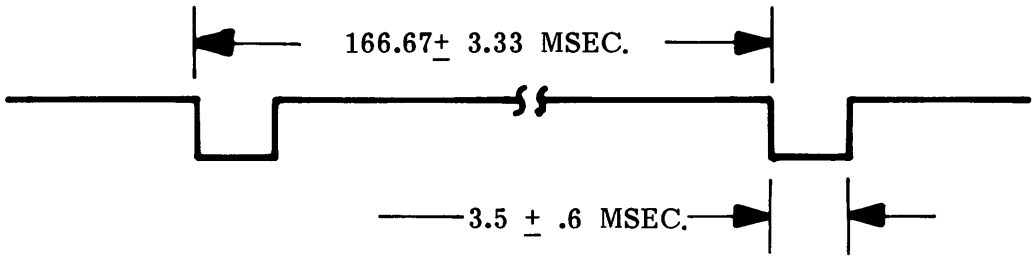


FIGURE 4-2
Index Pulse Timing

It should be noted that there are no Index pulses until the drive and diskette have been selected and the diskette is drawn into the drive, clamped, and the microprocessor positions the R/W head and all settling is complete. Appearance of Index pulses at the interface indicates the drive is ready for a Read or Write operation. If a diskette is addressed upon power up, approximately 5.0 seconds are required for Index pulses to appear at the interface. After a physical address request for a different diskette, approximately 2.0 seconds are required for Index pulses to appear at the interface. There are no Index pulses if the diskette selected is a Non-AMLYN diskette. There are no Index pulses during seek or "side change" operations.

4.1.2.3 Ready/Radial Ready

The Ready signal indicates physical and logical seeks, as well as drive and diskette addressing commands, may be received. Ready must be present before a Read or Write operation is attempted. The Ready output signal is driven active when the microprocessor completes its power up sequence, which requires approximately 50 msec. If either the Pac Articulator or Picker mechanism is jammed, say from some foreign object in the drive, Ready remains active and the microprocessor continues to try to drive the mechanism. (In this situation, the disk controller should inhibit Read and Write operations since no Index pulses, Read Data or Not Busy signals would be detected.)

In Binary Address Mode, Ready becomes inactive within 500 usec. after the DS lines are used to address another drive. Ready becomes active 500 usec. after the drive is reselected with the DS lines. Since Ready is gated with the US line, it is driven True within 150 nsec. of US becoming active. Likewise, Ready is deactivated within 150 nsec. of US becoming False.

Ready will be deactivated whenever the door is opened, or a diskette is addressed which is not physically present in the drive. Ready will again become active within 500 usec. of closing the door, or changing the current Disk Select address to any other address of a diskette in the addressed drive for a period of 500 usec. The status of physically present diskettes is not maintained by the microprocessor. After a different Disk Select address is presented to the drive for a 500 usec. period, changing the Disk Select address to any previously addressed diskette where the diskette is not physically present, the Ready signal will go active until the drive again detects the newly addressed diskette is not present.

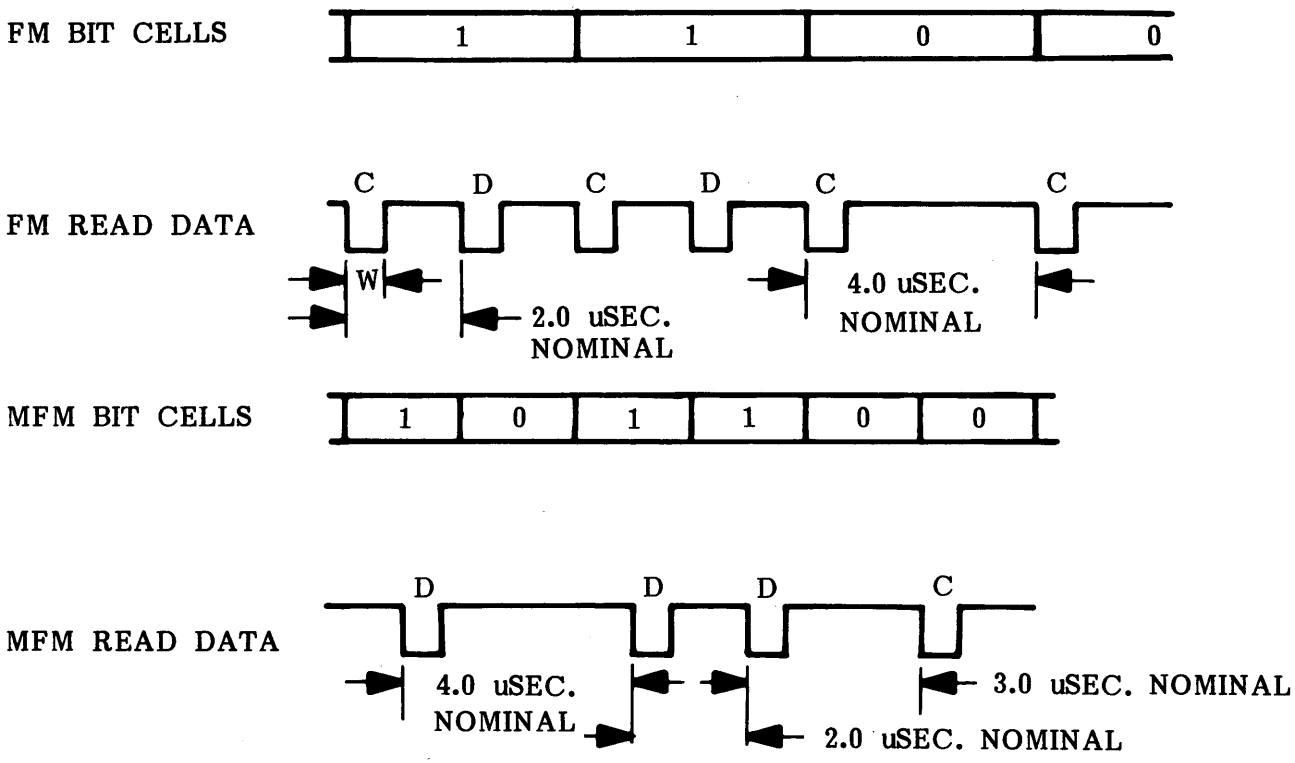
Ready is normally wired to connector P1, Pin 22. However, this trace may be cut and jumpered to another P1 connector pin in order to interface a system wired for Radial Ready. (See Subsection 7.7 for installation details.)

4.1.2.4 Read Data

This output line provides the recorded data detected by the drive electronics. It includes both clock and data bits. This output signal is inactive during physical seek as well as drive and diskette addressing operations. (See Figure 4-3 for the timing and bit shift tolerance with normal media variations.)

4.1.2.5 Write Protect

The Write Protect output line is driven active when the drive electronics sense the selection of a Write Protected diskette (with Write Protect notch and no Write Protect tab). If the disk controller attempts to Write to a Write Protected diskette, this action is inhibited and the Fault line is activated.



C = CLOCK BIT. MAY BE +400 NSEC. FROM ITS NOMINAL POSITION.
D = DATA BIT. MAY BE +200 NSEC. FROM ITS NOMINAL POSITION.
W = 200 ± 50 NSEC. (WIDTH OF ALL FM & MFM CLOCK & DATA BITS.)

FIGURE 4-3
FM And MFM Read Data Timing and Bit Shift Tolerance

An option exists in which the Write Protect function may be modified. This option may be useful in identifying special use diskettes. When a Write Protected diskette is detected with this option installed, the Write Protect signal is still driven active at the interface but the Fault line is not set and writing on the diskette is not inhibited. Attempts to write to a non-AMLYN diskettes are still inhibited, and the Fault signal is still set with this option installed. (To install this option, see Subsection 7.8.)

4.1.2.6 Two Sided

This line is grounded to cause the 5850 to appear to controllers as a SA850 Maxi-Drive which is continuously Reading Two Sided diskettes. This line can be cut at trace cut points near the I/O pin so it may be used for some other function.

4.1.2.7 Fault

This output signal is activated when a fault condition is encountered. The Fault signal remains True until the Fault Reset input signal is received. Normal drive operations may continue without resetting the Fault output signal. The following conditions generate a Fault signal:

1) Attempting to Write on a Write Protected diskette. An option exists where by cutting a trace, this condition does not create a Fault. (See Subsection 7.8 for the location of this trace cut.)

2) Attempting to Write while a diskette change or track seek is in process (no Index or Read data at the drive interface).

3) Attempting to write on a non-AMLYN diskette.

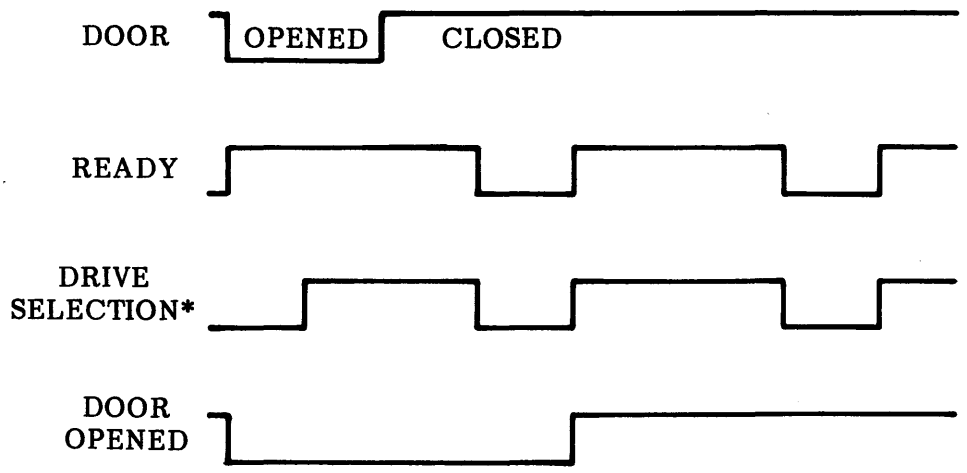
Attempts to seek data tracks outside track zero or inside track 153 are ignored and no Fault condition is set. (See Subsection 4.1.1.10 for details on clearing the Fault signal.)

4.1.2.8 Door Opened

The Door Opened signal may be used by the system to indicate a MiniPac cartridge or diskette change. (See Figure 4-4 for details of the Door Opened signal timing.) During the period the drive door is opened, the Ready signal is False. In addition, the microprocessor immediately moves the selected diskette back to the MiniPac cartridge. The Door Opened output signal is driven to a True state while the drive is selected and the door is opened. Once the door is closed, the Door Opened line continues to be driven to a True state as long as the drive is selected. Door Opened is returned to a False state at the end of the first Drive Selection after the door is closed. Remember, in Standard Address Mode this drive selection is accomplished by activating the US line. In Binary Address Mode, the drive selection is accomplished by control of the four least significant Disk Select lines (DS0 through DS3). (See Table 4-6).

4.1.2.9 Not Busy

Read or Write operations may be performed only when the Not Busy signal is active. This is the same signal used by the microprocessor to gate Read Data and Index during drive and diskette address changes and seek operations. Not Busy becomes active only after addressing a new drive or diskette, or seeking a new data track, and all settling associated with operations is complete.



* DRIVE SELECTION ACCOMPLISHED BY ACTIVATING UNIT SELECT IN STANDARD ADDRESS MODE, OR WITH DISK SELECT IN BINARY ADDRESS MODE.

FIGURE 4-4
Timing Of Door Opened Signal

4.1.3 Optional Drive I/O Signals

4.1.3.1 In Use

The front panel In Use LED is illuminated by either the microprocessor or a True state on the In Use signal line. This signal line may be connected to an unused I/O pin by performing a trace cut and jumper addition. (See Subsection 7.9 for details on installation of a jumper to an unused I/O connector pin to allow user control of the In Use LED.) The microprocessor illuminates the In Use LED whenever a physical access is performed (addressing the drive with the US, DS and Head Load lines).

4.1.3.2 Composite Sector/Index

See Subsection 7.10 for instructions on installation of a trace cut and jumper addition to output a Composite Sector/Index signal. With this jumper installed, the Composite Sector/Index signal is output from the Index/Segment sensor detecting these holes in a selected diskette. This signal is output even when a Non-AMLYN diskette is selected. This optional output signal does not match the standard output circuit. This signal is driven with a 74LS04 versus a 7438 or equivalent device. The 74LS04 is capable of sinking 14mA at the drive output. No mechanical alignment of the Index/Segment sensor is provided. Because of this, no attempt should be made to use a hard sector format by use of this line.

4.2 Power Interface

The AMLYN drive requires only DC power for operation. The maximum DC power requirements for a single drive are shown below in Table 4-7.

P5 PIN	DC VOLTAGE	TOLERANCE	CURRENT	MAX (p to p) RIPPLE
1	+12 VDC	±0.6 VDC	1.5 A Maximum* 1.1 A Typical	100 mv
2	+12 V Return	-	-	-
3	+5 V Return	-	-	-
4	+5 VDC	±0.25 VDC	1.1 A Maximum 1.0 A Typical	50 mv

*With spindle motor stalled.

TABLE 4-7
Maximum DC Power Requirements

See Table 4-8 for the DC power required by different operations occurring in a 5850 Drive.

OPERATIONS	+5V CURRENT	+12V CURRENT
DC POWER ON, NO MOTORS RUNNING	0.90A	0.15A
DC POWER ON, SPINDLE MOTOR RUNNING	0.95A	0.80A
DC POWER ON, SPINDLE MOTOR & TRACK FOLLOWING, OR TRACK SEEK CONTROL ON	1.00A	1.00A
DC POWER ON, PICKER MOTOR RUNNING	0.95A	1.25A
DC POWER ON, ARTICULATOR MOTOR RUNNING	0.95A	0.35A

TABLE 4-8
DC Power For Various Drive Operations

5.0 PHYSICAL INTERFACE

The electrical interface between the 5850 and the disk controller (or host system) is through two connectors; one for the signal interface (P1) and one for DC power (P5). This section describes the physical connectors used on the drive and the recommended interface connectors to be used with them. (See Figure 5-1 for the physical location of the connectors on the drive.)

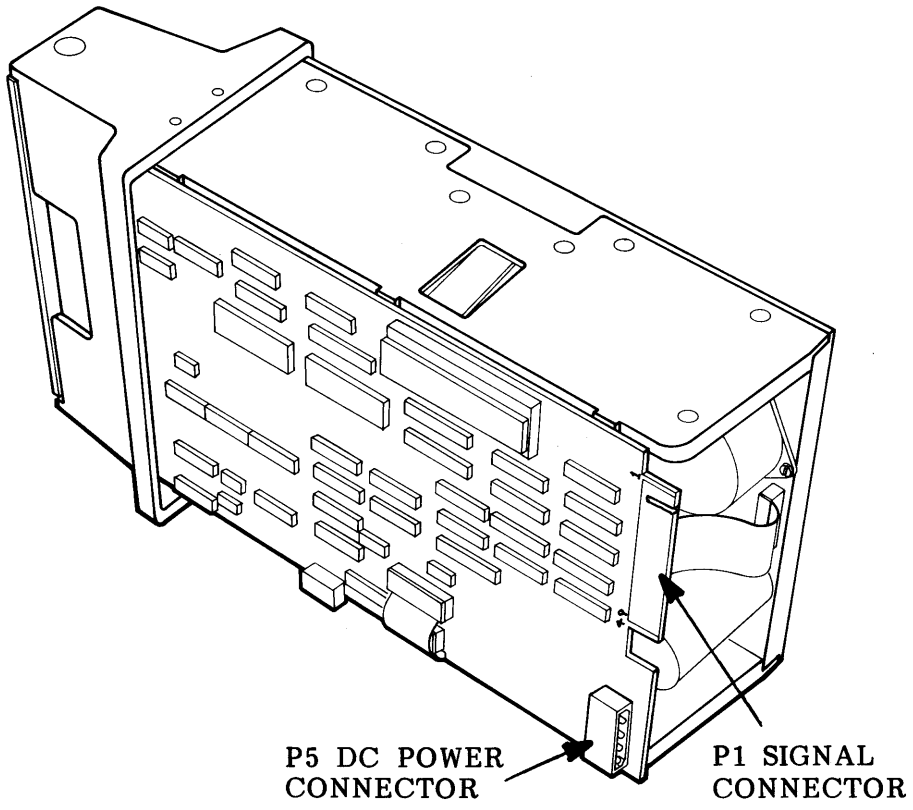


FIGURE 5-1
Physical Location Of Signal & DC Power Connectors

5.1 Signal Connector (P1/J1)

Connector P1 is a 50 pin printed circuit board (PCB) connector. The mechanical dimensions for this connector are shown in Figure 5-2. The pins are numbered 1 through 50 with the odd numbered pins on the component side of the PCB, and the even numbered pins on the non-component side. Pin 49 is located on the end of the PCB connector closest to the DC power connector. A key slot is provided between Pins 3 and 5 for optional connector keying. The recommended J1 mating connectors for signal connector P1 are listed below in Table 5-1.

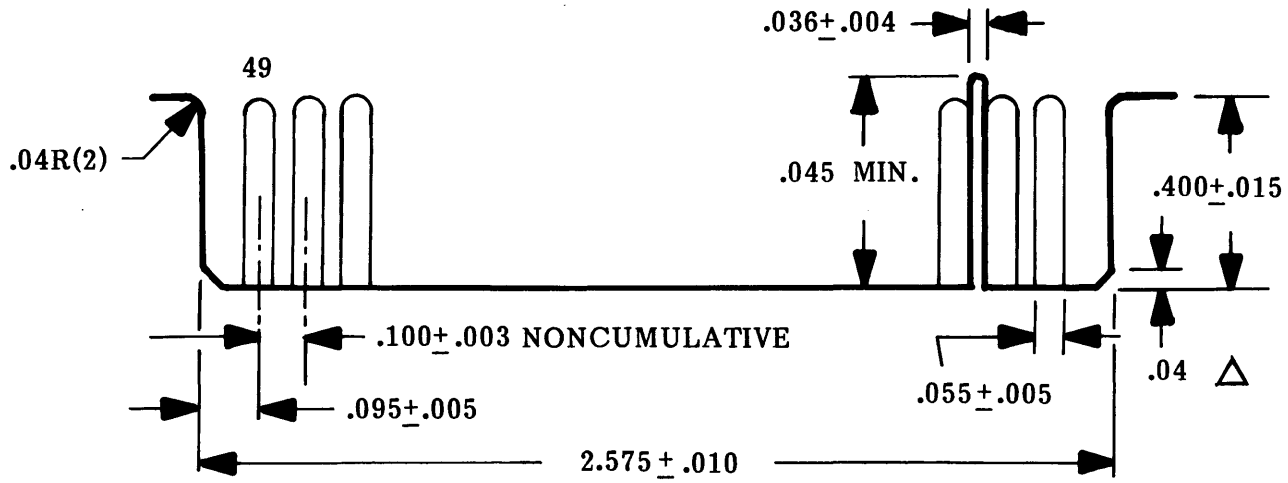


FIGURE 5-2
Drive Control Card P1 Connector Dimensions

TYPE OF CABLE	MANUFACTURER	CONNECTOR P/N	CONTACT P/N
Twisted Pair, #26 AWG (crimp or solder)	AMP	1-583717-1	583616-5 (crimp) 583854-3 (solder)
Twisted Pair, #26 AWG (solder term.)	VIKING	3VH25/IJN-5	NA
Flat Cable	3M "Scotchflex"	3415-0001	NA
	T&B Ansley	609-5015M	NA
	AMP	88373-1	NA

TABLE 5-1
Recommended J1 Connectors

5.2 DC Power Connector (P5/J5)

The DC power connector (P5) is mounted on the component side of the PCB. P5 is a four pin AMP Mate N Lock connector. The recommended mating connector is an assembly made up of a housing and four contact pins. The recommended housing is AMP P/N 1-480424-0. The recommended contact pin for solder tab termination with this housing is AMP P/N 60662-1. The recommended contact pin for crimp termination to 18 AWG wire is AMP P/N 60619-1. P5 pins are labeled on the component side of the PCB with Pin 4 located nearest the P1 signal connector. Figure 5-3 shows the P5 connector as seen from the back end of the 5850 drive.

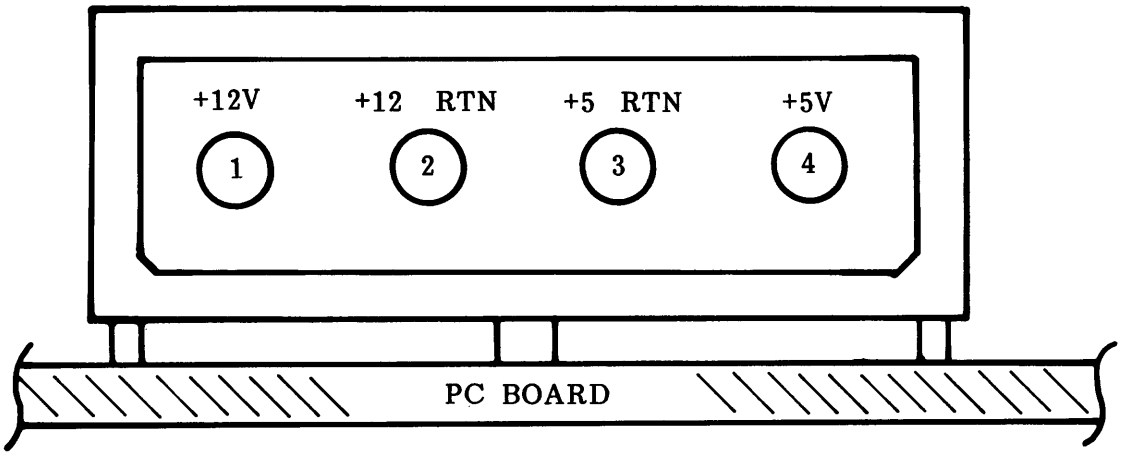


FIGURE 5-3
P5 DC Power Connector
As View From Back Of Drive

6.0 DRIVE PHYSICAL SPECIFICATIONS

This section describes the mechanical dimensions and mounting recommendations of the 5850 drive.

6.1 Drive Dimensions

See Figure 6-1 for the mechanical dimensions of the 5850 drive.

6.2 Mounting Recommendations

The drive is capable of being mounted in the following positions, with no mechanical adjustments.

1) On either side of the drive.

2) With the surface of the Drive Control card up.

3) With the drive door up.

6.3 Front Bezel Color

The drive front panel is manufactured with an injection molded ABS plastic impregnated with a black pigment.

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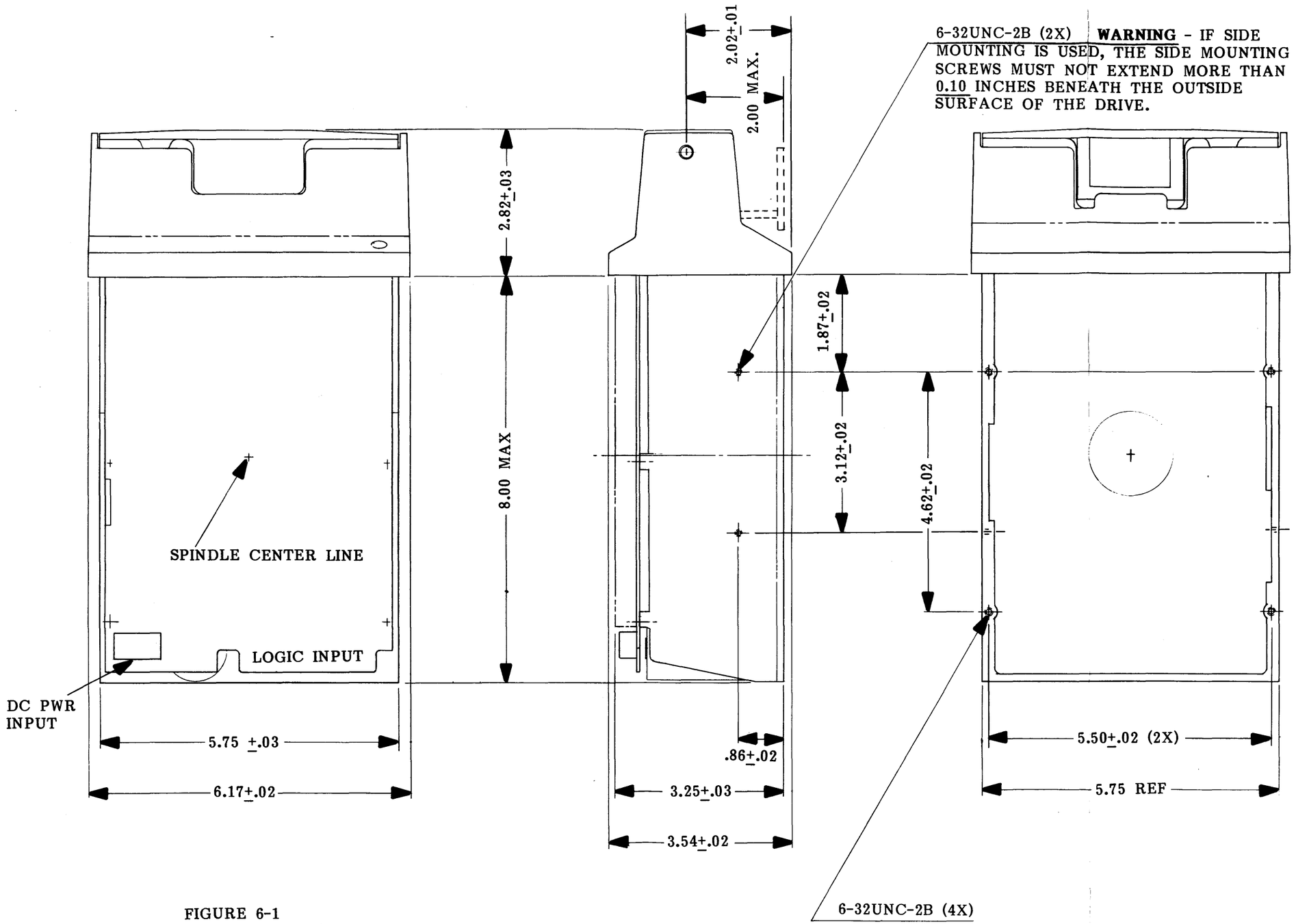

FIGURE 6-1
Model 5850 Drive Dimensions

7.0 CUSTOMER SELECTABLE OPTIONS

This section describes the customer selectable options available on the 5850 drive. These options are implemented with the cutting of traces and the installation of jumpers. All trace cut points are between pairs of jumpers pads to facilitate the addition of jumpers. Jumpers may be installed by soldering wires between jumper pads, installing jumper plugs between posts, or wire wraping jumpers between posts. The following subsections describe the use and selection of options in the Drive Control card for the model 5850 drive. See Figure 7-1 for the location of the jumper plug and jumper pad references discussed in the following subsections. Table 7-1 lists the location of jumper plugs as shipped on the Drive Control card.

Signal	Jumper Reference
No Unit Select	"H"
Standard Address Mode	"AF"*
Standard Address Mode	"AH"*
Head Load Enable	"AJ"*
Side Select Enable	"AK"*

TABLE 7-1
5850 Jumper Plugs As Shipped

***NOTE**

THE DRIVE'S POWER MUST BE TURNED OFF AND ON AFTER RECONFIGURING THE JUMPER PLUGS SHOWN ABOVE WITH AN "*", BECAUSE THE STATUS OF THESE JUMPER PLUGS IS READ UPON POWER UP.

7.1 Cross Comparison To SA850 Options

The following is a list of options available on the 5850 drive and a cross comparison to options available on SA850 Maxi-Drives.

Options	SA850	5850
Unit Select - Multiple Drive Addressing	Not Supported	Jumper Plug Selectable
Drive Select - 1 To 8 850 Drives Binary Address Mode	Trace Cuts And Jumper Change	Jumper Plug Selectable
Drive Select - 9 To 15 850 Drives Binary Address Mode	Not Supported	Jumper Plug Selectable

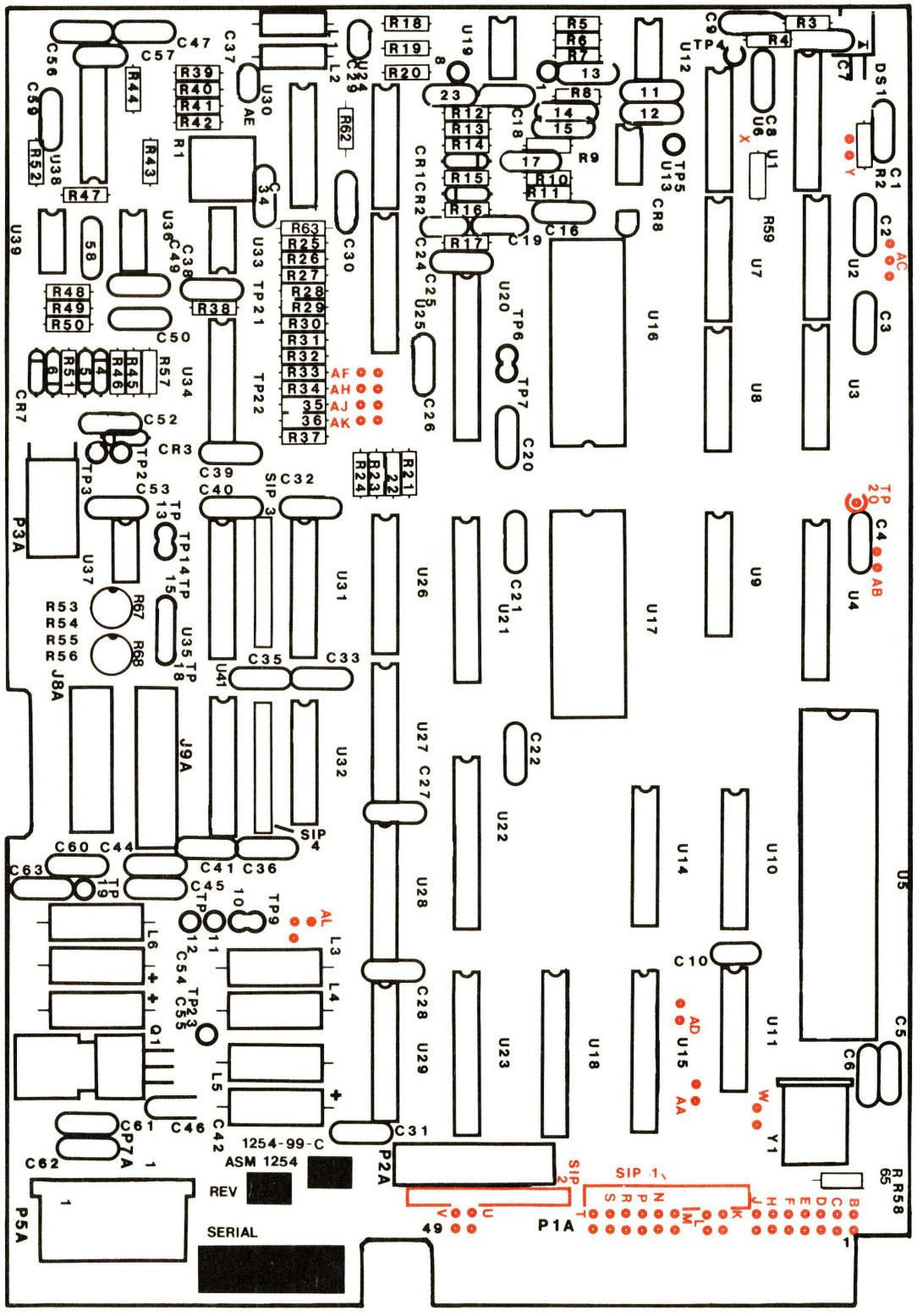

FIGURE 7-1
Drive Control Card Jumper Pad Locations

Options	SA850	5850
Side Select Enable	Not Supported	Jumper Plug Selectable
Side Select Using Direction Select	Jumper Change	Not Supported
Side Select Using Drive Select	Jumper Change	Not Supported
Logical/Physical Addressing	Not Supported	Implemented With Head Load Line
Select Drive Without Loading Heads Or Enabling Stepper Motor	Trace Cuts And Jumper Change	Similar Function Implemented With Head Load Line
Select Drive And Enable Stepper Without Loading Heads	Trace Cuts And Jumper Change	Similar Function Implemented With Head Load Line
Load Heads Without Selecting Drive Or Enabling Stepper	Trace Cuts And Jumper Change	Not Supported
Radial Ready	Trace Cuts And Jumper Change	Trace Cuts And Jumper Addition
Write Protect Optional Use	Trace Cut And Jumper Addition	Trace Cut
In Use (Activity LED)	Jumper Additions	Trace Cuts And Jumper Addition
Composite Sector/Index	Not Supported	Jumper Plug Selectable
Radial Sector/Index	Trace Cuts And Jumper Change	Not Supported
Sector Divider	Trace Cuts And Jumper Change	Not Supported
Disk/Pac Change	Jumper Addition	Standard Output
Door Lock Latch	Jumper Addition	Door Cannot Be Locked. Recommend Use of Door Opened Output Signal.

Options	SA5850	5850
Two Sided	Jumper Addition	Normally Grounded (Active). Cut Trace To Remove Optional Output.
Single Actuator Mode	Not Supported	Jumper Plug Selectable
Self Exercise Mode	Not Supported	Jumper Plug Selectable
Half Step Mode	Not Supported	Jumper Plug Selectable

7.2 Relocatable I/O Signals

Table 7-2 lists I/O signals which have either trace cut points with jumper pads, or installed jumper plugs, to facilitate routing other signals to or from these I/O pins. To route I/O signals to different I/O connector pins, either trace cuts can be made or jumper plugs removed and jumper wires installed between the Drive Control card logic and the jumper pad nearest the I/O connector pin. Figure 7-2 shows the typical input and output logic schematics for circuits with installed jumper plugs and trace cut points between jumper pads.

Pin	Signal	Jumper Pad Reference	Pin	Signal	Jumper Pad Reference
2	Unit Select 0	"C"	24	Disk Select 4	"N"
4	Unit Select 1	"D"	26	Disk Select 0	"P"
6	Unit Select 2	"E"	28	Disk Select 1	"R"
8	Unit Select 3	"F"	30	Disk Select 2	"S"
10	Two Sided	"J"	32	Disk Select 3	"T"
14	Side Select	"K"	48	Fault	"U"
16	Not Busy	"L"	50	Fault Reset	"V"
22	Ready	"W"			

TABLE 7-2
I/O Signals With Jumper Pads

7.3 Unit Select/Drive Address

A jumper pad area is used to route the four Unit Select input signals (USO through US3) to the microprocessor. Installing a jumper plug in the jumper pad areas labeled "C", "D", "E", and "F", allows a drive to be selected as Drive 0, Drive 1, Drive 2, or Drive 3 respectively. Installing a jumper plug in the jumper pad area labeled "H" enables the drive at all times. A jumper plug should be installed at "H" when the drive is always selected or up to three drives are to be addressed using the Binary Address Mode (see Table 4-6 for details). See Figure 7-3 for the schematic of the US jumper pad area.

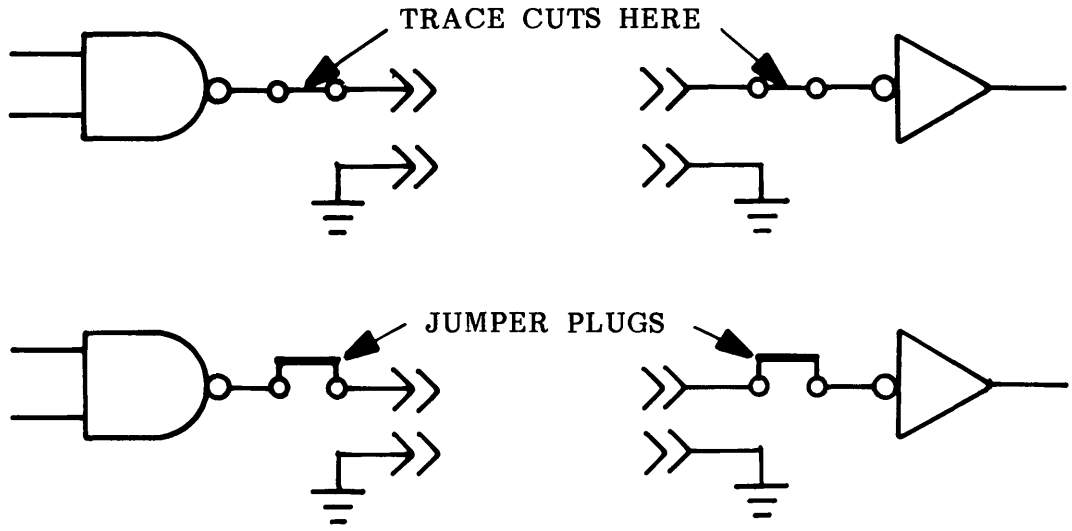

FIGURE 7-2
Typical I/O Circuits With Jumper Pads

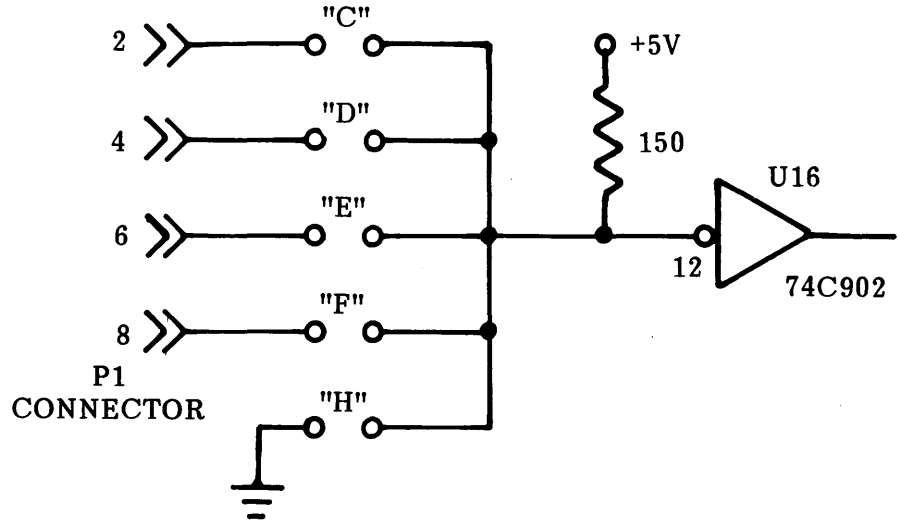

FIGURE 7-3
Unit Select Jumper Pad Schematic

7.4 Address Mode Selection

The selections of Address Modes is implemented by the microprocessor reading the status of the installation of two jumper plugs on power up. The schematic of the circuit which reads this status is shown in Figure 7-4. The installation of jumper plugs in the jumper pad areas marked "AF" and "AH" allows selection of either the Standard Address Mode or the Binary Address Mode, as summarized in Table 7-3. Three possible selections are available in the Binary Address Mode so that the 5850 Drive responds as either Drive 0, Drive 1, or Drive 2 as depicted in Table 4-6. Note, radial addressing may be implemented whereby multiple Unit Select lines from a disk controller may be wired to the individual US lines on separate drives. With no jumper plugs installed in "AF" and "AH" all drives respond as Drive 0 in the Binary Address Mode. The individual US line may then be activated to address a drive. This same technique may be used to address multiple drives in a radial configuration with jumper plugs installed in "AF" and "AH" to select diskettes in Standard Address Mode. Note that when selecting different drives using US, Ready will be valid within 500 nsec. of activating US, but when using the DS lines in Binary Address Mode to select drives, 500 usec. must be allowed.

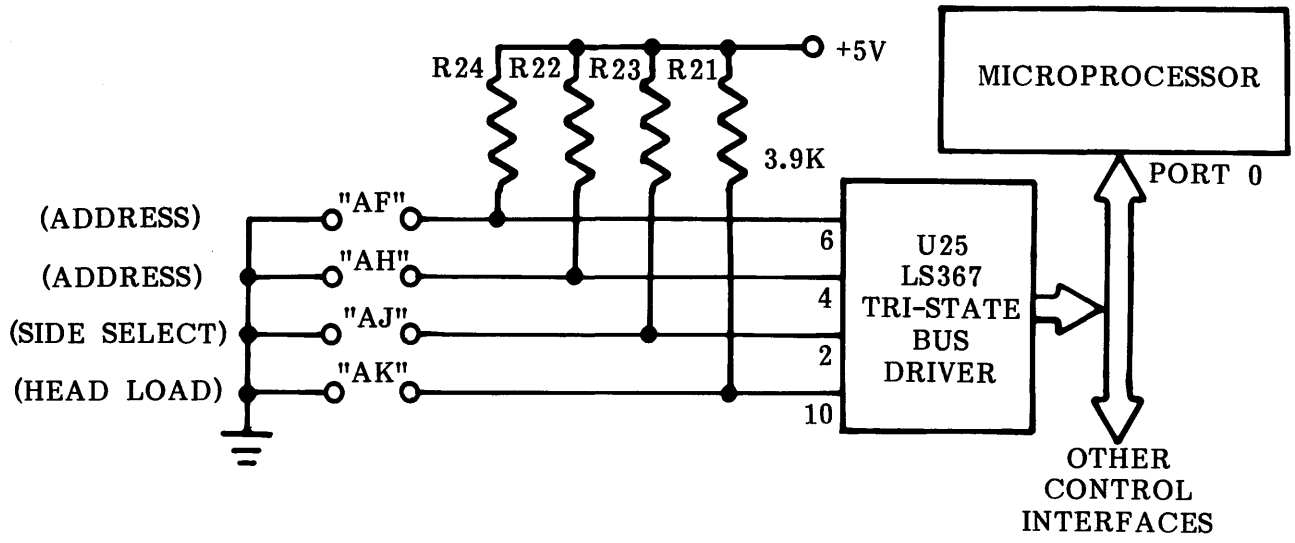

FIGURE 7-4
Jumper Pad Schematic
Address Mode Select, Side Select Enable and Head Load Enable

ADDRESS MODE	"AH" JUMPER	"AF" JUMPER
Binary Address Mode - Drive 0	Open	Open
Binary Address Mode - Drive 1	Open	Jumpered
Binary Address Mode - Drive 2	Jumpered	Open
Standard Address Mode	Jumpered	Jumpered

TABLE 7-3
Address Mode Selection Jumpers

7.5 Side Select Enable

The Side Select Enable function is implemented so the microprocessor reads the status of a jumper plug installation upon power-up. The schematic for the circuit that reads this status is shown in Figure 7-4. Installing a jumper plug in the jumper pad area marked "AK" enables the 5850 drive to respond to the Side Select signal as a two sided drive. The 5850 drive responds as single sided drive with 154 data tracks with no jumper plug.

7.6 Head Load Enable

The Head Load Enable function is implemented with the microprocessor reading the status of a jumper plug installation upon power-up. The schematic for the circuit that reads this status is shown in Figure 7-4. Installing a jumper plug in the jumper pad area marked "AJ", enables logical addressing of diskettes. With no jumper plug, all diskette addressing, and all seeks are physically performed. Note that in Binary Address Mode, the four least significant Disk Select lines (DS0 through DS4) must be latched by the host controller while the Head Load signal is active. Whenever the DS0 through DS4 lines change, the previously addressed diskette is returned to the MiniPac cartridge and a new diskette is selected.

7.7 Radial Ready

Two changes must be made to the Drive Control card to implement Radial Ready. Details of the changes to the circuitry are shown on the schematic in Figure 7-5. To route the Ready output signal from I/O Pin 22 to and alternate I/O pin for use as Radial Ready, cut the trace between the jumper pads marked "AA" and add a jumper from the "AA" jumper pad farthest from the I/O connector, to the new I/O pin jumper pad. In addition, the trace between the jumper pads labeled "W" must be cut to continuously enable the Ready output signal so it will not be gated by Unit Select.

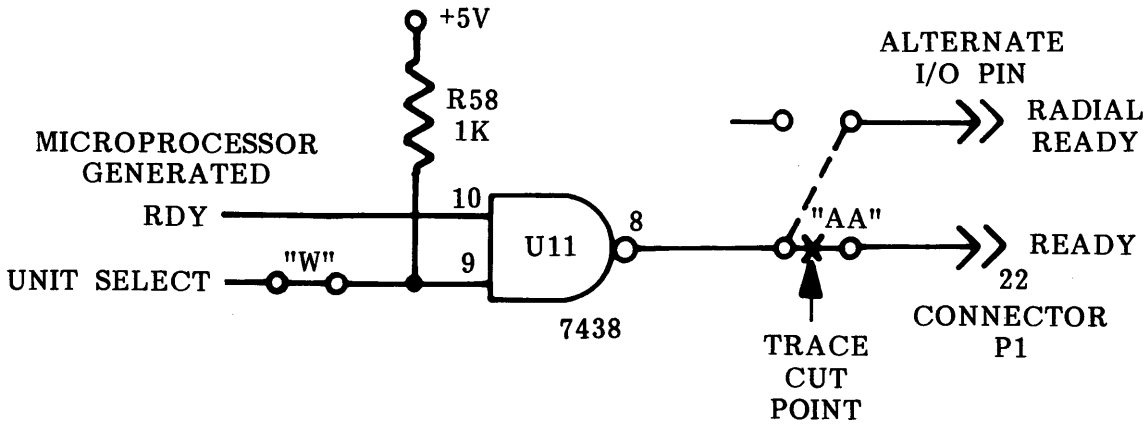

FIGURE 7-5
Radial Ready Circuit Modification Schematic

7.8 Write Protect Disable

The 5850 is shipped with the drive's Write Protect logic enabled as shown in the schematic in Figure 7-6. The Write Protect output signal is activated when a Write Protected diskette is detected. Write operations are inhibited, and the Fault line is activated if an attempt is made to Write to the diskette. When the trace cuts are made in the jumper pad group marked "AC" and "AL", and jumper plugs are installed in these two jumper pad groups, the Write Protect logic is disabled. Write operations may be made on the Write Protected diskette and the Fault line is not activated in this mode. This disabled Write Protect function may be useful when identifying special use diskettes.

To perform these changes in the "AC" and "AL" jumper pad groups, the trace must be cut between the two connected jumper pads in each group. Jumper plugs must be installed between the two previously unconnected jumper pads. In the "AC" jumper pad group, the jumper plug must be installed between the two jumper pads nearest the "C2" reference designator. In the "AL" jumper pad group, the jumper plug must be installed between the two jumper pads nearest TP9. (See Figure 7-7 for the actual layout of the "AC" and "AL" jumper pad groups.

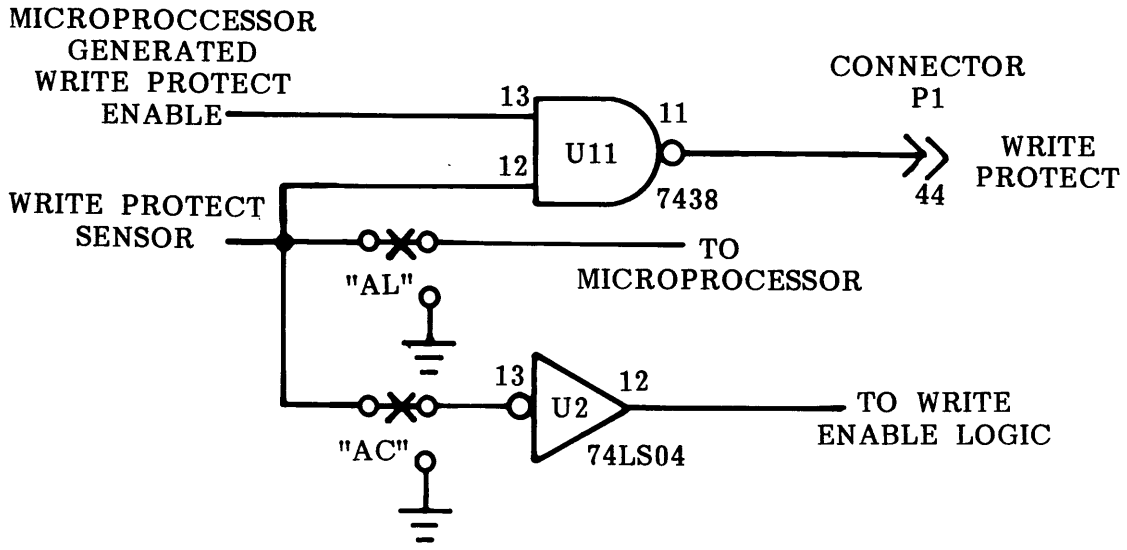

FIGURE 7-6
Write Protect Circuitry Schematic

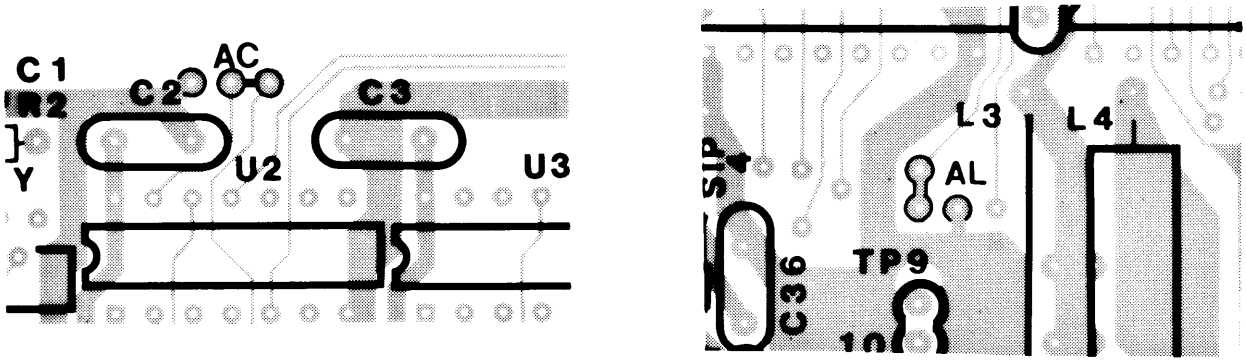

FIGURE 7-7
"AC" And "AL" Jumper Pad Groups

7.9 In Use

In order to remotely control the In Use LED, cut the trace between the jumper pads marked "AB" and add a jumper from an otherwise unused I/O pin jumper pad to the "AB" jumper pad furthest from the I/O connector. See Figure 7-8 for the schematic of the In Use circuitry.

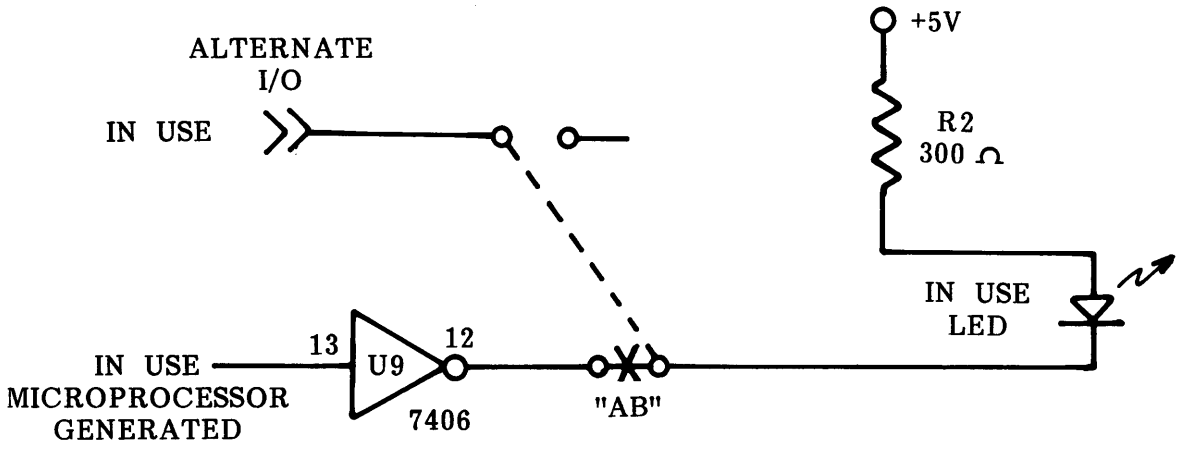

FIGURE 7-8
In Use Circuitry Schematic

7.10 Composite Sector/Index

An option is available to output a Composite Sector/Index signal (as depicted in the schematic in Figure 7-9). To output Composite Sector/Index, add a jumper from the test point labeled TP20, to an otherwise unused I/O pin jumper pad. To output Composite Sector/Index on the standard Index I/O pin (P1 Pin 20) the trace between jumper pads labeled "AD" must be cut and a jumper wire installed between TP20 and the "AD" jumper pad nearest the I/O connector. Note, the optional Composite Sector/Index output signal is not driven by a standard output circuit. This signal is driven with a 74LS04 versus a 7438 or equivalent device. The 74LS04 is capable of sinking 14 mA at the drive output. No mechanical alignment if the Index/Segment sensor is provided. Because of this, no attempt should be made to use a hard sector format by use of this line.

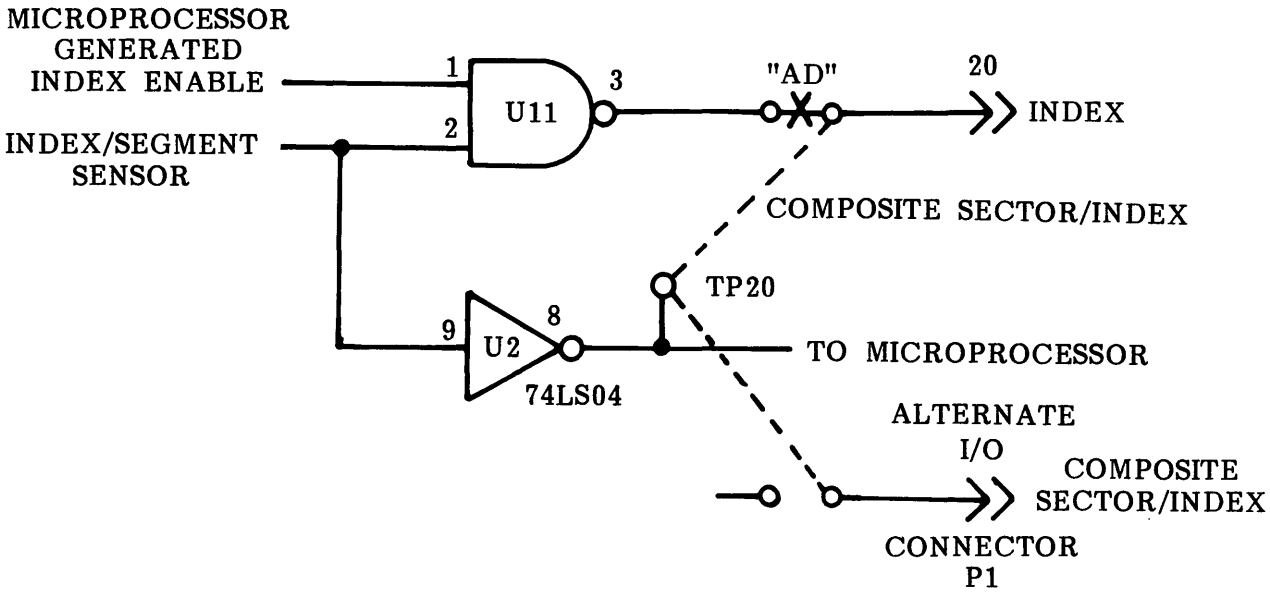

FIGURE 7-9
Composite Sector/Index Circuitry

7.11 Single Actuator Step Mode

The Single Actuator Step Mode is enabled with the installation of a jumper plug between the "Y" jumper pads. This jumper pad circuit is interfaced directly to the microprocessor and needs no pull up resistor when the jumper plug is removed. (The schematic for this circuit is shown in Figure 7-10.) With the "Y" jumper plug installed, each Step pulse causes an increase or decrease in track address on all diskettes within the drive. With no jumper plug, Step pulses cause an increase or decrease in the track address of the selected diskette only.

7.12 Self Exercise Mode

The Self Exercise Mode is enabled with the installation of a jumper plug between the "M" jumper pads. (This jumper pad circuit is shown in Figure 7-11.) With the jumper plug installed, all drive inputs are ignored, and all drive outputs are held inactive. The exercise routine selects each diskette in sequence and performs a seek from track zero to track 153 and back to track zero. No jumper plug at "M" enables normal drive operations.

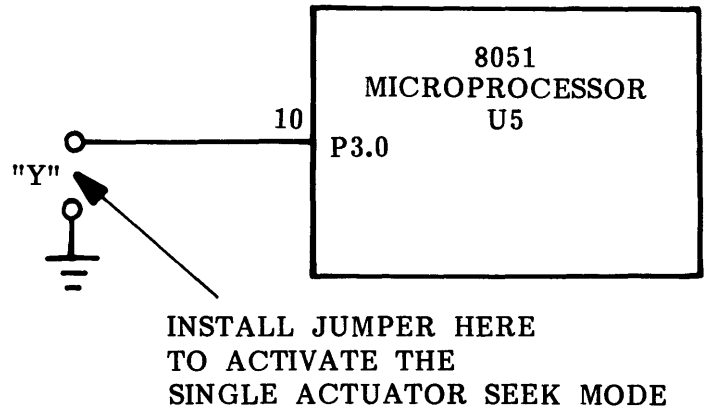

FIGURE 7-10
Single Actuator Mode Jumper Pad Circuit

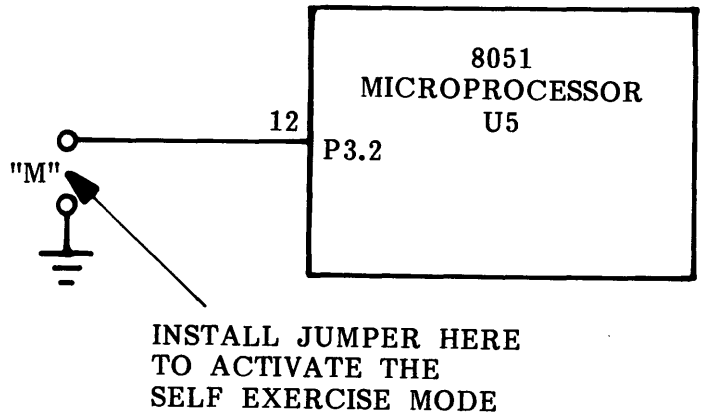

FIGURE 7-11
Self Exercise Mode Jumper Pad Circuit

8.0 OPERATION PROCEDURES

The AMLYN drive is designed for ease of customer use in numerous applications. The following section describes the handling of the diskettes and MiniPac cartridge.

8.1 Diskette Usage

The drive uses 5.25 inch flexible diskettes enclosed in a standard size plastic jacket. The diskette jacket differs in three ways when compared to a standard 5.25 inch diskette jacket. See Figure 2-3 for locations of the following changes and additions.

1) A cutout is added for the Picker mechanism to allow it to remove the diskette from the MiniPac cartridge.

2) The Write Protect notch is moved to the edge of the diskette nearest the R/W access opening.

3) A "V" notch is added on the edge of the diskette jacket to act as a detent for holding the diskette in the MiniPac cartridge.

Request the latest copy of AMLYN Technical Bulletin TB-005 from the AMLYN Product Marketing Department (408/275-8616) for the current status of suppliers of AMLYN media and MiniPac cartridges.

Five diskettes may be loaded into a MiniPac cartridge for use in the drive. Figure 8-1 shows the proper method for loading diskettes in the MiniPac cartridge. The manufacturer's label on the Diskette should be up if the Insert Arrow on the MiniPac cartridge is up. Diskettes may also be removed and replaced while the MiniPac cartridge is in the drive as shown in Figure 8-2.

CAUTION

CENTER REINFORCING RINGS MUST NOT BE USED ON THE DISKETTES. THE CLAMPING MECHANISM IS DESIGNED TO CLAMP ONLY STANDARD 0.003 INCH MEDIA.

8.2 MiniPac Cartridge Usage

The MiniPac cartridge may be loaded into the drive by simply opening the door and inserting the MiniPac cartridge with the Insert Arrow facing into the drive. (See Figure 8-3.) The insert arrow side of the MiniPac cartridge must be oriented away from the opened door. For example, if the drive is mounted horizontally, so that the door swings down, the surface of the MiniPac cartridge with the insert arrow must be on top. The MiniPac cartridge is keyed to protect against improper insertion. Forcing the MiniPac cartridge into the drive in the wrong orientation could damage either the cartridge or the drive. After the MiniPac cartridge is inserted, close the door. The MiniPac cartridge may be inserted with the drive's power On or Off.

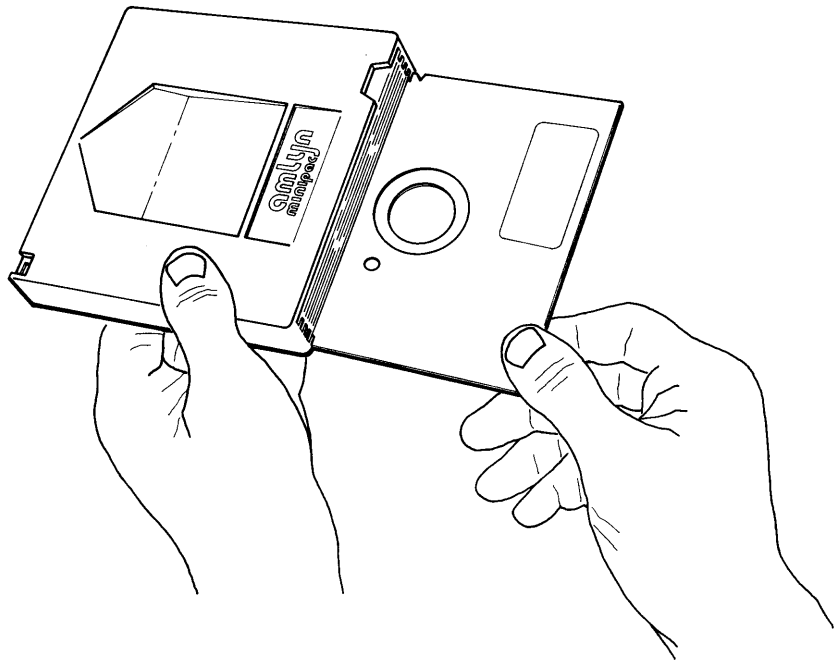

FIGURE 8-1
Loading Diskettes Into The MiniPac Cartridge

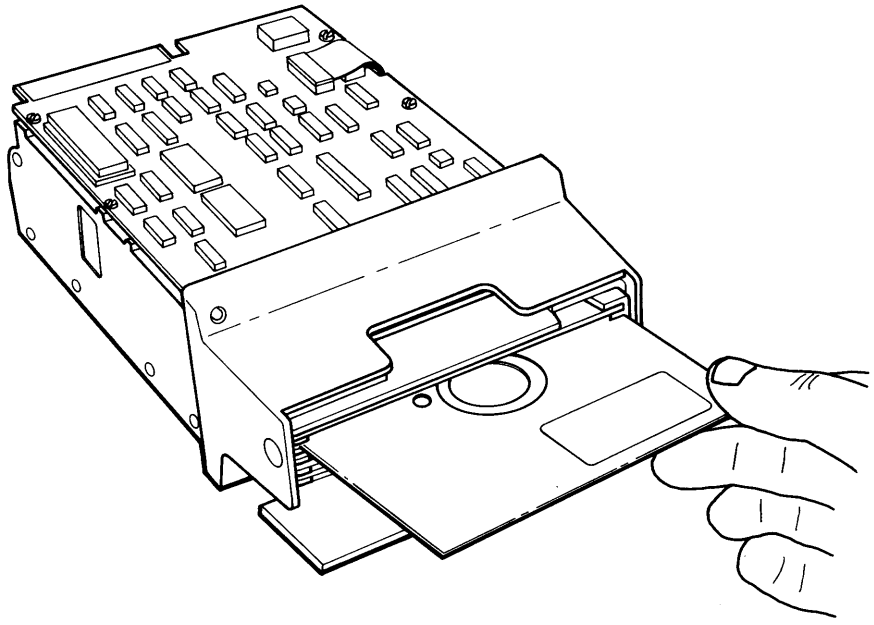

FIGURE 8-2
Loading Diskettes Into The Drive

WARNING

THE MINIPAC CARTRIDGE IS KEYED TO PROTECT AGAINST IMPROPER INSERTION. FORCING AN INCORRECTLY ORIENTED CARTRIDGE INTO THE DRIVE MAY DAMAGE THE CARTRIDGE AND/OR THE DRIVE.

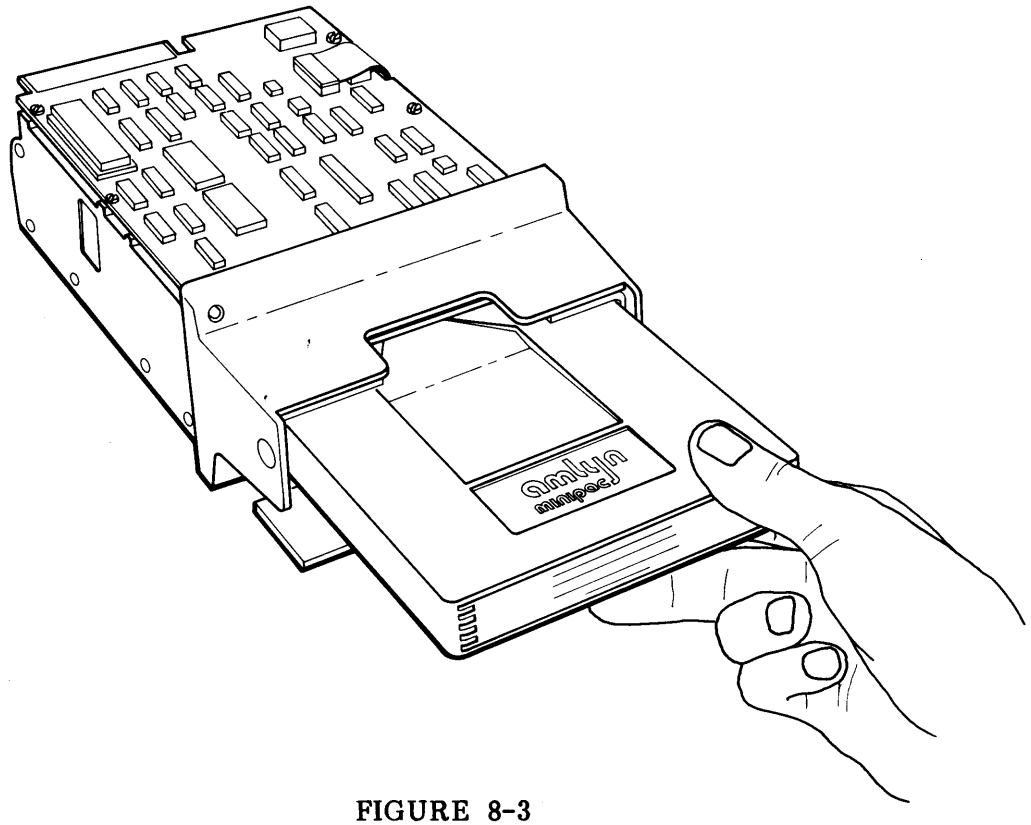

FIGURE 8-3
Loading MiniPac Cartridge Into The Drive

The MiniPac cartridge should be stored in its protective envelope when removed from the drive. The following additional precautions should be observed when handling the MiniPac cartridge and diskettes.

1) Keep the MiniPac cartridge away from magnetic fields and ferromagnetic materials that may become magnetized.

2) Replace the protective storage envelope if it becomes soiled or worn.

3) Specifically keep ashes and smoking material away from the MiniPac cartridge and Diskettes. Contamination from a cigarette ash will damage both the diskette and the R/W head.

4) Do not expose the MiniPac cartridge or diskette to heat or sunlight.

5) Do not touch or attempt to clean the disk surface. Abrasions may cause stored data to be lost.

6) If individual diskettes are removed from the MiniPac cartridge, they should be stored in their protective envelope.

7) Do not subject the MiniPac cartridge to temperatures outside the range of -40° to 125°F (-40° to 51°C).

8.3 Head Cleaning Diskettes

WARNING

DO NOT USE HEAD CLEANING DISKETTES IN THE DRIVE. THE ABRASIVENESS OF THESE DISKETTES IS VERY DAMAGING TO THE R/W HEAD.

USE OF ANY HEAD CLEANING DISKETTES WILL VOID THE DRIVE WARRANTY.

8.4 Write Protect Tabs

Figure 8-4 shows the installation of a Write Protect tab on the Diskette. Data may be written to the diskette when this tab is removed. When the tab is in place, data may only be read from the diskettes.

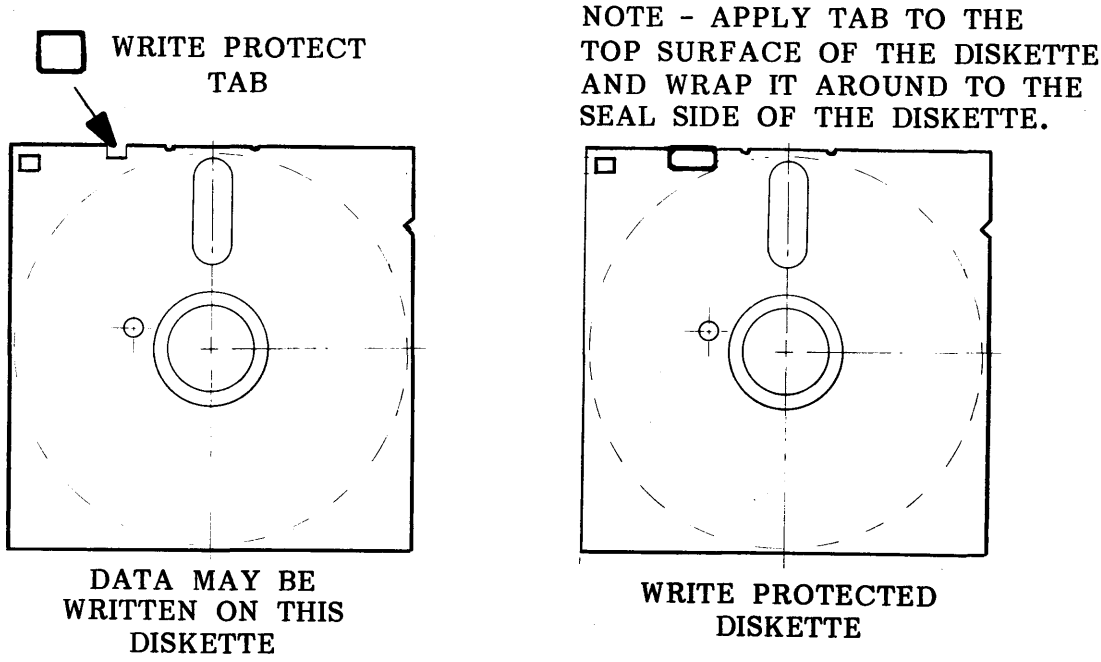

FIGURE 8-4
Installation of Write Protect Tab on AMLYN Diskette

9.0 MODEL A506

9.1 A506 Adapter Card

The A506 drive is implemented by adding an A506 Adapter card to a standard 5850 drive.* This card routes the 5850 interface signals from the 50 pin Drive Control card P1 connector to the two connector interface matching the ST506, or equivalent, micro-Winchester drive. The A506 Adapter card also contains circuitry to convert the 5850 Read Data and Write Data signals from TTL levels to differential (RS422) levels.

The A506 drive has been designed to easily interface host controllers which may operate with both the A506 and the ST506 or equivalent 5.25 inch Winchester disk drive. (For additional details on the compatibility of the A506 and ST506, see Subsection 1.8.)

9.2 A506 Functional Characteristics

The A506 has the same functional characteristics as the 5850 except there is an additional printed circuit card; the A506 Adapter card. This card contains the following:

1) Level translation circuits for Read Data and Write Data.

2) Termination resistors for drive control signals.

3) Jumper pad areas to incorporate control options.

9.3 A506 Functional Operations

The A506 functions in the same way as the 5850 except there is no Side Select control.

9.4 A506 Electrical Interface

The A506's electrical interface is the same as the 5850 except as noted below.

9.4.1 Signal Interface

The A506 has three types of interface signals:

1) Control - TTL level.

2) Data - Differential (RS422) level.

3) Power - Uses same 5850 DC Power connector.

The A506 control signals utilize the 5850 TTL line drivers and receivers but incorporate a slightly different termination technique to match that of the ST506 interface. The recommended A506 TTL interface circuit is shown in Figure 9-1.

*To convert a drive purchased as a 5850 to an A506, order an A506 Adapter Card Kit, AMLYN P/N 1434-80.

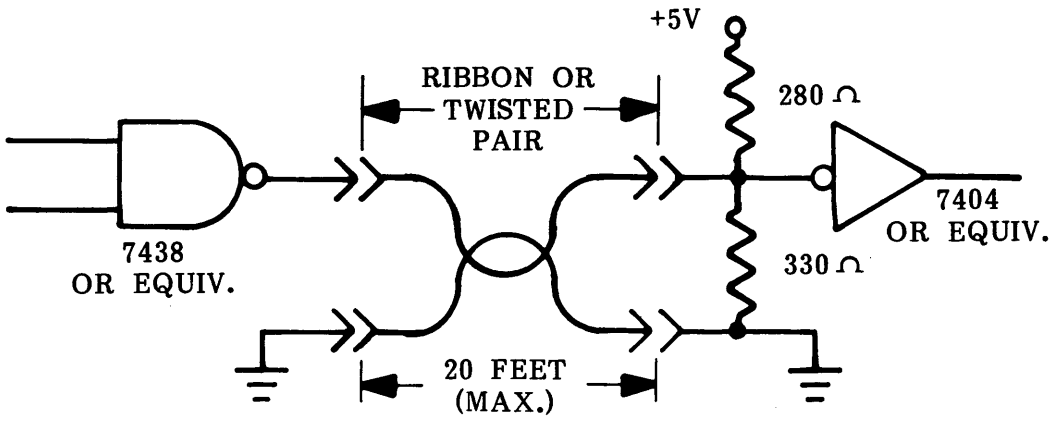

FIGURE 9-1
Recommended TTL Interface Circuit

The data transfer lines are differential level signals and must not be multiplexed. The recommended interface circuit for the Read Data and Write Data signals is shown in Figure 9-2. The shielded twisted pair depicted in this figure is compatible with the ST506, or equivalent interface, and will handle the 5 megabit Winchester data rate. Since the A506 data rate is 500 kilobits, lower cost interface cable such as unshielded flat cable may be used.

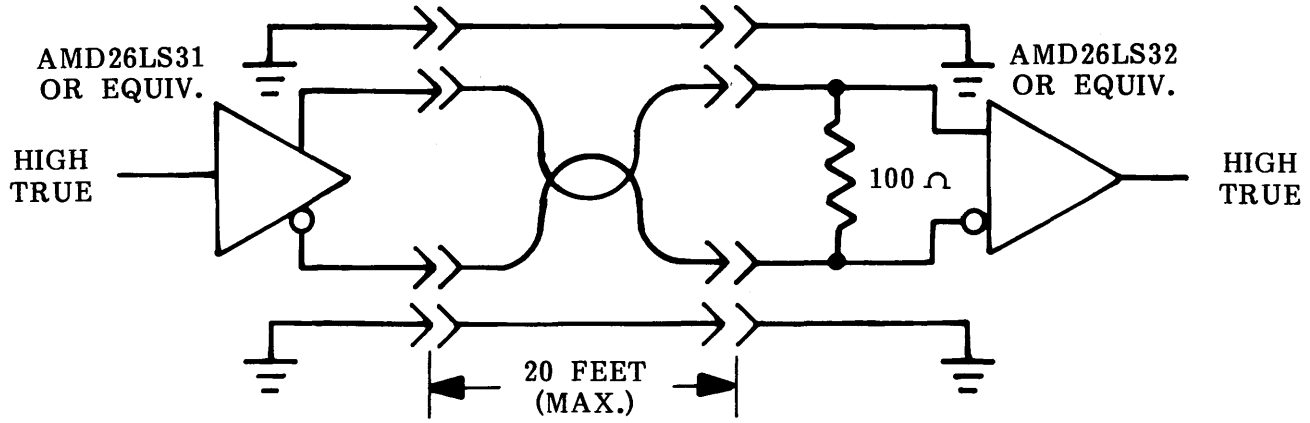

FIGURE 9-2
Recommended RS422 Interface Circuit

The A506 signal interface is via two interface connectors; P1/J1 and P2/J2. Tables 9-1 and 9-2 should be used as a reference for all interface connections. The signals listed in Table 9-3 have trace cut points and jumper pads to facilitate changes to these signals. (Details on installing changes to A506 interface signals are discussed in Subsection 9.7.)

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
1	2	Head Load*
3	4	Disk Select 2
5	6	Write Gate
7	8	Not Busy
9	10	Track 00
11	12	Fault
13	14	Disk Select 0
15	16	Reserved (Tied to P2, Pin 7)
17	18	Disk Select 1
19	20	Index
21	22	Ready
23	24	Step
25	26	Unit Select 0
27	28	Unit Select 1
29	30	Unit Select 2
31	32	Unit Select 3
33	34	Direction Select

*An option exists to output Head Load on P2, Pin 3.

TABLE 9-1
A506 Adapter Card Pin Assignment
Connector P1

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
2	1	Drive Selected
4	3	Reserved (Optional Head Load)
6	5	Write Protect
8	7	Reserved (Tied to P1, Pin 16)
	9	Door Opened
	10	Fault Reset
12	11	Gnd
	13	+Write Data
	14	-Write Data
16	15	Gnd
	17	+Read Data
	18	-Read Data
20	19	Gnd

TABLE 9-2
A506 Adapter Card Pin Assignment
Connector P2

Connector	Pin	Signal	Jumper Pad Reference
P1	2	Head Load	"A"
P1	12	Fault	"B"
P1	16	Reserved	"C"
P1	26	Unit Select 0	"D"
P1	28	Unit Select 1	"E"
P1	30	Unit Select 2	"F"
P1	32	Unit Select 3	"G"
P2	3	Optional Head Load	"H"
P2	5	Write Protect	"J"
P2	7	Reserved	"K"
P2	9	Door Opened	"L"
P2	10	Fault Reset	"M"

TABLE 9-3
I/O Signals With Jumper Pads

Differences in the A506 interface signals, as compared to the 5850, are described in the following subsections.

9.4.1.1 Input Control Line Termination

The A506 Adapter card is provided with a removable resistor Dual Inline Pack (DIP) in location U1. This resistor DIP must be removed from all except the last drive (A506 or ST506) on the control bus for proper drive operation. In addition, the 5850 termination resistors (SIP1 and SIP2) must be removed from the Drive Control card. External termination may also be used on the control bus which connects multiple drives. The external termination must be a 220 ohm resistor pulled up to +5V and a 330 ohm resistor tied to ground (1/8 watt minimum). The signals listed in Table 9-4 require termination resistors.

Connector	Pin	Signal Name
P1	2	Head Load*
P1	4	Disk Select 2
P1	6	Write Gate
P1	14	Disk Select 0
P1	18	Disk Select 1
P1	24	Step
P1	34	Direction Select
P2	3	Optional Head Load*
P2	10	Fault Reset*

* Additional on board termination resistors are available for the Head Load and Fault Reset signals with the installation of jumper plugs.

TABLE 9-4
A506 Input Signals Requiring Termination

WARNING

INTERFACE SIGNAL LEVELS WILL NOT BE CORRECT IF MULTIPLE DRIVES (A506 AND ST506, OR EQUIVALENT) ARE CONNECTED WITH EACH HAVING A TERMINATION RESISTOR PACK INSTALLED, OR THE 5850 TERMINATION RESISTORS ARE NOT REMOVED FROM THE DRIVE CONTROL CARD. DAMAGE MAY RESULT TO THE HOST LINE DRIVER CIRCUITS IF CONNECTED TO MORE THAN TWO SETS OF TERMINATION RESISTORS.

9.4.1.2 Unit Select (US)

Four Unit Select lines (US0 through US3) are available to enable the A506 interface. The installation of jumper plugs (as described in Subsection 9.7) enables a drive by activating a US line. When the drive receives a True Unit Select signal, it enables the Read Data output line driver.

9.4.1.3 Disk Select (DS)

Three Disk Select lines (DS0 through DS2) are available to select the five diskettes with a binary addressing technique. The 5850 Binary Address Mode is used with Drive 0 enabled. (To set up the jumper plugs to select Drive 0, see Subsection 7.2). Table 9-5 presents the addressing logic used to select the five diskettes.

LOGIC INPUT			DRIVE 0				
DS 2	DS 1	DS 0	DISKETTE 4	3	2	1	0
F	F	F	-	-	-	-	S
F	F	T	-	-	-	S	-
F	T	F	-	-	S	-	-
F	T	T	-	S	-	-	-
T	F	F	S	-	-	-	-
T	F	T	-	-	-	-	-
T	T	F	-	-	-	-	-
T	T	T	-	-	-	-	-

NOTE:
- \- = Diskette not selected.
- S = Diskette selected.
- T = True = 0.0 to 0.4 VDC.
- F = False = 2.5 to 5.25 VDC.

TABLE 9-5
A506 Diskette Selection

9.4.1.4 Other Input Control Signals

The following input control signals are passed directly through the A506 Adapter card. Their operation is described in the appropriate subsection in Section 4.

1) Head Load
2) Write Gate
3) Step
4) Direction Select
5) Fault Reset

9.4.2 Output Control Signals

9.4.2.1 Drive Selected

The Drive Selected signal is a special output signal on the A506 interface which is activated upon receiving a True Unit Select input signal. This signal is returned over the radial data interface connector (P2/J2) and is used by the host controller as a status indicating the selection of the drive.

9.4.2.2 Other Output Control Signals

The following output control signals are passed directly through the A506 Adapter card from the 5850 interface. Their operation is described in the appropriate subsection in Section 4.

1) Not Busy
2) Track 00
3) Fault
4) Index
5) Ready
6) Door Opened
7) Write Protected

9.4.2.3 Reserved Signal Lines

Connector P1, Pin 16 is wired directly to Connector P2, Pin 7. The continuity may be monitored between these two connector pins to determine whether both connectors are plugged into the drive in the connect direction. These two pins are referred to as Reserved signals since, in the future, they may be used for different functions.

9.4.3 Data Transfer Lines

Read Data and Write Data are differential (RS422) level signals and must not be multiplexed. These lines are interfaced on the P2 connector of the A506 Adapter card.

9.4.3.1 Write Data

This input signal defines the data transitions to be written on a track. Transitions of +Write Data (P2, Pin 13) going more positive than -Write Data (P2, Pin 14) causes a flux reversal if Write Gate is active. When performing a Read Operation, +Write Data must be more negative than -Write Data. There is no Reduce Write Current signal on the A506 interface because the on board microprocessor calculates when this compensation is required and applies it.

9.4.3.2 Read Data

Transitions of +Read Data (P2, Pin 17) going more positive than -Read Data (P2, Pin 18) represents a flux reversal on the Selected data track.

9.5 A506 Physical Interface

The electrical interface between the drive and the host system is implemented with three connectors, two for the signal interface (P1 and P2 on the A506 Adapter card), and one for DC power (P5 on the 5850 Drive Control card). See Figure 9-3 for the physical location of these three connectors on the drive.

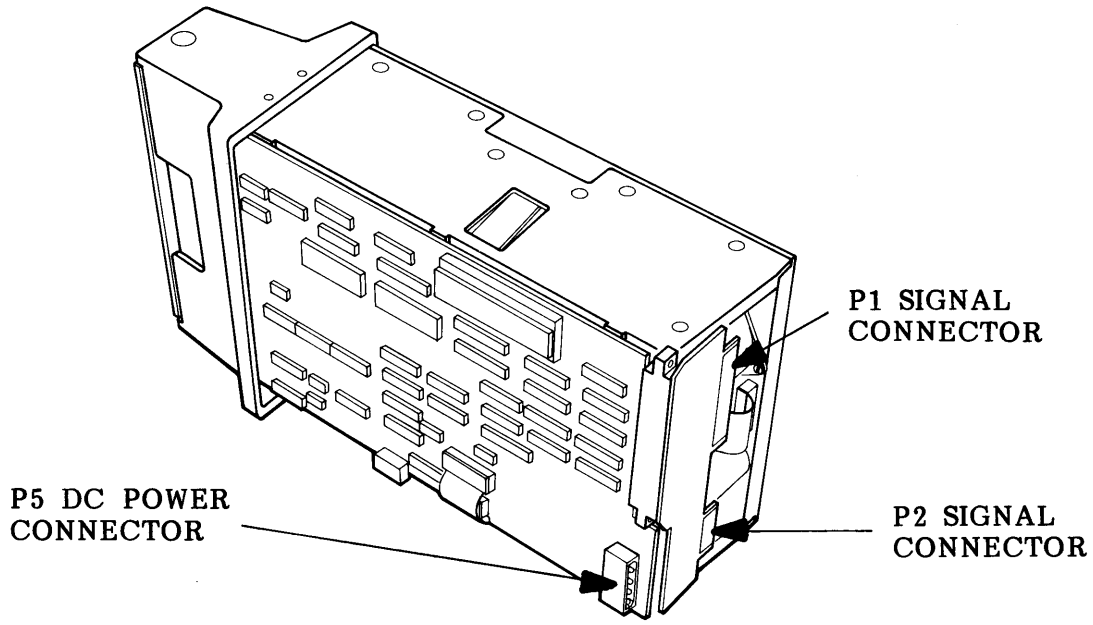

FIGURE 9-3
A506 Adapter Card

Figure 9-3 also shows the installation of the A506 Adapter card to the drive. A jumper must be added on the Drive Control card to provide +5 VDC power to the A506 Adapter card over P1, Pin 1 to power this assembly. In addition, there are other jumper plug set up requirements on the Drive Control card for operation with the A506 Adapter card. (See Subsection 9.7.1 for details on these jumper plug set up requirements.)

WARNING

INSTALLATION OF THE JUMPER PLUG TO PROVIDE +5V POWER TO THE A506 ADAPTER CARD, AND SUBSEQUENT DRIVE OPERATION WITH THE 50 PIN SA850 TYPE INTERFACE CONNECTOR WILL SHORT THE HOST +5V TO GROUND.

Figures 9-4 and 9-5 show the physical dimensions of the A506 Adapter card output connectors P1 and P2 respectively. The following flat cable mating connectors are recommended:

1) P1 Connector (34 Pin) - AMP P/N 88373-3 or T&B Ansley P/N 609-3415M
2) P2 Connector (20 Pin) - AMP P/N 88373-6 or T&B Ansley P/N 609-2015M

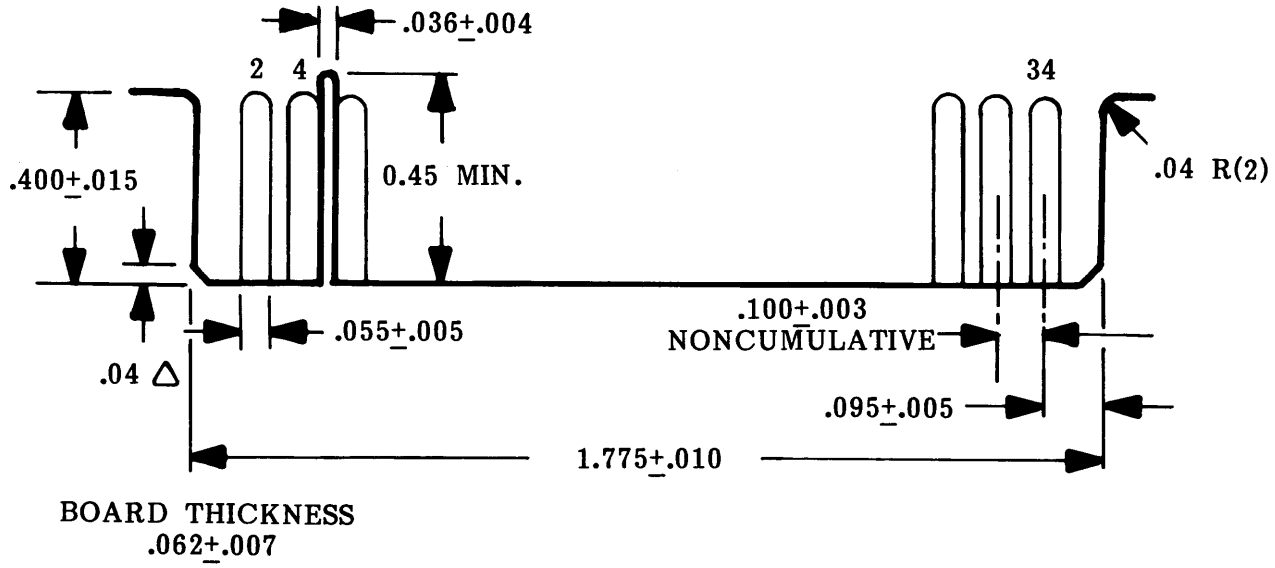

FIGURE 9-4
P1 Connector Dimensions
A506 Adapter Card

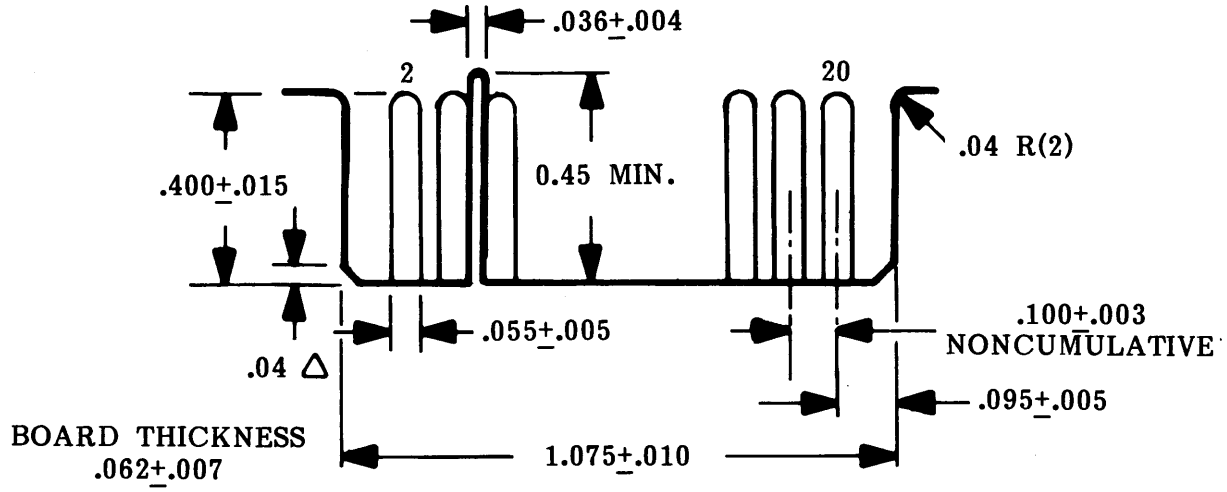

FIGURE 9-5
P2 Connector Dimensions
A506 Adapter Card

9.6 A506 Physical Specifications

Figure 9-6 shows a side view of the back of the 5850 drive with the A506 Adapter card installed. The A506 Adapter card extends 0.11 inches beyond the 8 inch depth of a standard mini-floppy drive, therefore some applications may require remote mounting of this assembly. (See Technical Bulletin TB-006 for details on installing this assembly remotely from the 5850 drive.)

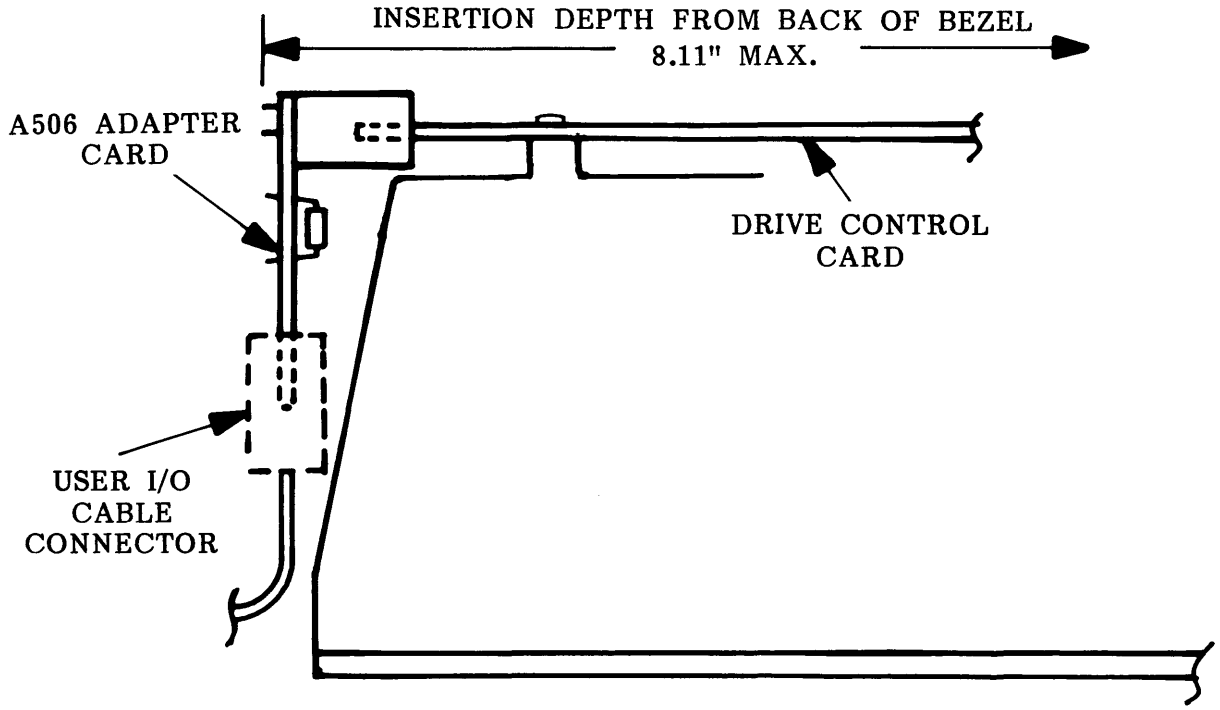

FIGURE 9-6
Side View Of A506 Adapter Card
Installed On 5850 Drive

9.7 Installation of Options

Options for the A506 may be categorized into three groups.

1) Jumper plug set up for 5850 operation as an A506.

2) Customer selectable options for the A506.

3) Implementation of ST506 options.

These three groups are covered in the following subsections. Figure 9-7 shows the component and jumper pad locations discussed in the following subsections. Tables 9-6 and 9-7 list the location of jumper plugs as shipped on the Drive Control card and A506 Adapter card respectively.

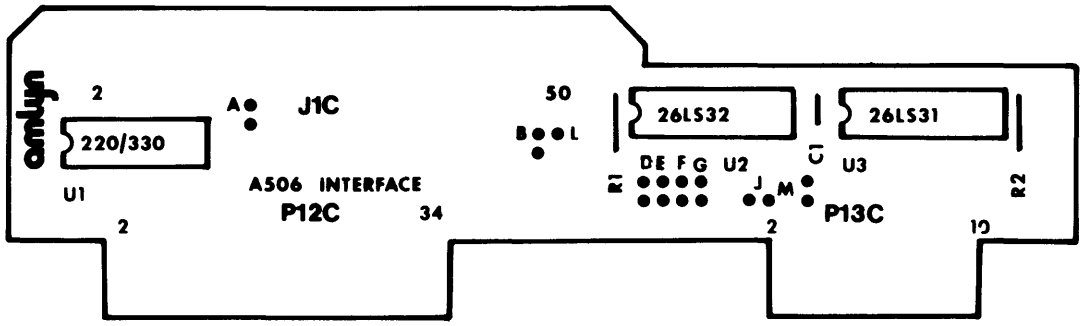

FIGURE 9-7
A506 Adapter Card
Component Location For A506 Options

Signal	Jumper Plug Installed At
DC Power Jumper	"B"
Unit Select 0	"C"

TABLE 9-6
A506 Jumper Plugs As Shipped On
Drive Control Card

Signal	Jumper Plug Installed At
Fault	"B"
Unit Select 0	"D"

TABLE 9-7
A506 Jumper Plugs As Shipped On
A506 Adapter Card

9.7.1 5850 Set Up For A506 Operation

The following modifications and jumper plug set ups must be made on the 5850 Drive Control card prior to the drive's operation as an A506. (For locations of these changes, see Figure 7-1.)

1) Removal of the two control bus termination resistor packs in locations SIP1 and SIP2.

2) Removal of jumper plugs in locations "AF" and "AH" so the drive operates in the Binary Address Mode as Drive 0. (See Tables 4-5, 7-3 and Figure 7-4 for reference.)

3) Install a Unit Select jumper plug in location "C". With this jumper plug in place, the A506 Adapter card enables the Drive Control card over the US0 input line (P1, Pin 2). (See Figure 7-3 for the Unit Select circuit schematic.)

4) Install a jumper plug in location "B" to provide power to the A506 Adapter card over P1, Pin 1. (See Figure 9-8 for schematic of this circuit.)

5) Removal of jumper plug in location "AK" so the drive operates as a single sided drive with 154 data tracks.

6) Removal of jumper plug in location "AJ" so the drive operates with the Head Load function disabled. Signals on the Head Load input line are ignored. The DS lines must be latched by the controller between Read and Write operations or the diskettes will be changed according to the state of the DS lines.

WARNING

INSTALLATION OF A JUMPER PLUG IN DRIVE CONTROL CARD JUMPER PAD LOCATION "B" AND SUBSEQUENT DRIVE OPERATION WITH THE 50 PIN SA850 TYPE INTERFACE CONNECTOR, WILL SHORT THE HOST +5V TO GROUND.

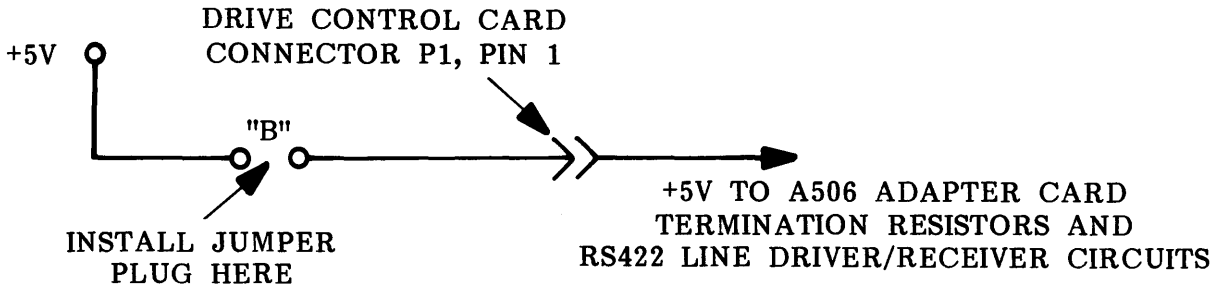

FIGURE 9-8
A506 Power Jumper Circuit Schematic

9.7.2 A506 Customer Selectable Options

Several signals on the A506 Adapter card have trace cut points or pads for jumper plugs so they may be modified. Details on these signals are covered in the following subsections.

9.7.2.1 Unit Select

A jumper pad area is provided on the A506 Adapter card to route one of the four Unit Select inputs (US0 through US3) to the US0 input on the Drive Control card. Installing a jumper plug between one of the four jumper pad pairs labeled "D", "E", "F" and "G", allows the drive to be selected as Drive 0, Drive 1, Drive 2, or Drive 3 respectively. (See Figure 9-9 for details on the Unit Select input circuit.)

9.7.2.2 Fault

The A506 Adapter card is shipped with a jumper plug installed between the jumper plug pads "B". Removing this jumper plug disconnects the Fault output signal from connector P1, Pin 12 and allows this connector to be used for other uses.

9.7.2.3 Reserved

P1, Pin 16 is connected to P2, Pin 7 and are refered to as Reserved signals. Trace cut points are available between jumper pads near each of these I/O pins to allow trace cuts to be made and the I/O pins to be used for other purposes. A trace cut may be made at "C" to free P1, Pin 16, and "K" to free P2, Pin 7.

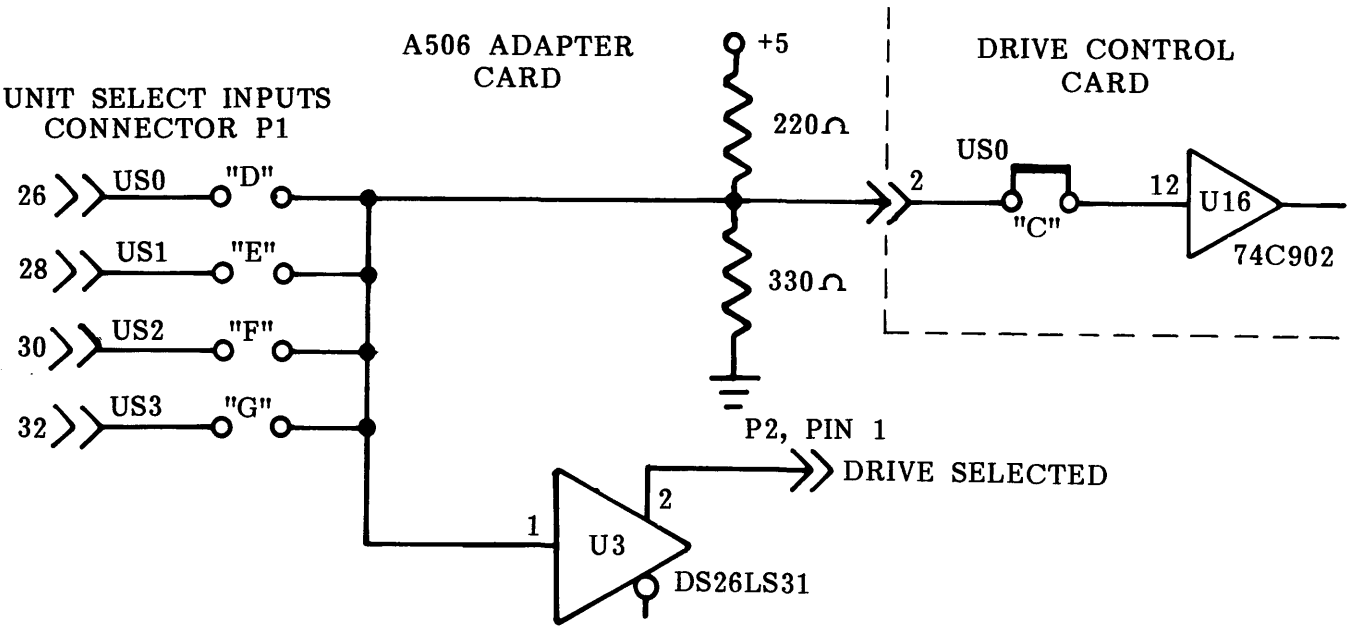

FIGURE 9-9
Unit Select Input Schematic

9.7.2.4 Head Load

The A506 is shipped with the Head Load feature disabled to be compatible with the ST506. The following changes must be made to install the Head Load function. A jumper plug must be installed at the Drive Control card jumper pad pair labeled "AJ" to enable the drive to respond to the Head Load input signals. Jumper plug pads are available to input the Head Load signal on either P1, Pin 2 or P2, Pin 3 of the A506 Adapter card. A jumper plug may be installed between jumper pads "A" to input Head Load on P1, Pin 2, or between jumper pads "H" to input the Head Load signal on P2, Pin 3. Note, the ST506 uses P1, Pin 2 for the Reduced Write Current input signal which is not required on the A506. P2, Pin 3 on the ST506 is referred to as Reserved and is currently not used. Termination resistors are available for this signal on the A506 Adapter card by installing a jumper plug between the "N" jumper pads. (See Figure 9-10 for details on the Head Load input circuit.)

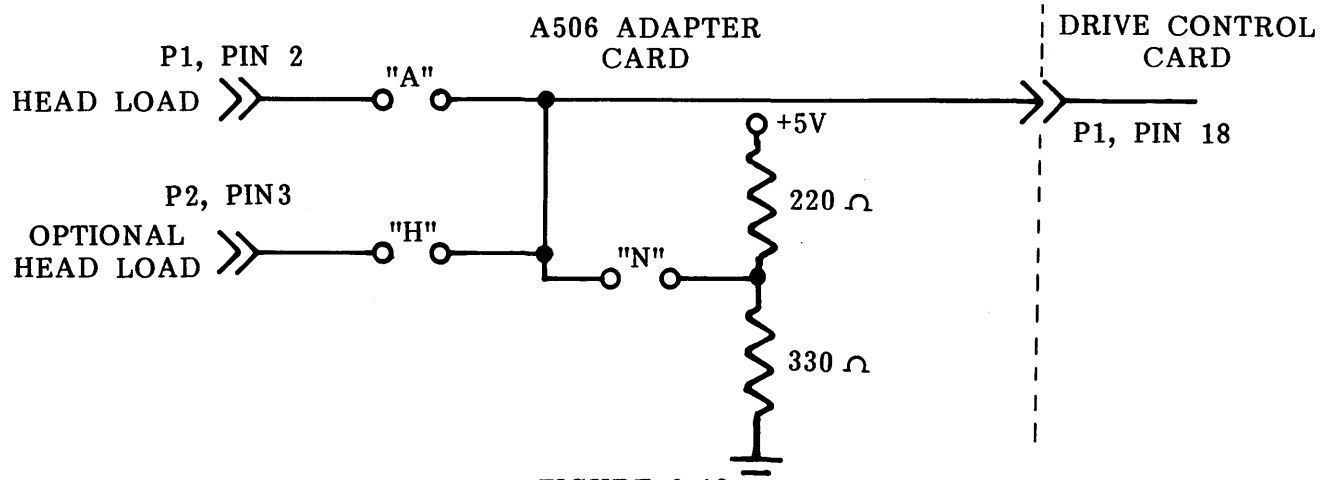

FIGURE 9-10
Head Load Input Schematic

9.7.2.5 Write Protect

The Write Protect output signal on the A506 Adapter card has trace cut points between jumper plug pads "J" to allow this signal to be disconnected from the output connector. This allows the P2, Pin 9 output pin to be used for other purposes.

9.7.2.6 Door Opened

The Door Opened output signal on the A506 Adapter card has trace cut points between jumper plug pads "M" to allow this signal to be disconnected from the output connector (P2, Pin 9) and thereby use this output pin for some other use.

9.7.2.7 Fault Reset

The A506 Adapter card inputs the optional Fault Reset input signal on P2, Pin 10. Installing a jumper plug between the "L" jumper pads connect this signal to the drive logic. Termination resistors are available for this signal on the A506 adapter card by installing a jumper plug between the "P" jumper pads.

9.7.3 A506 Customer Selectable Options

The ST506 has three customer selectable options as listed below:

1) "R" Radial Option

2) "D" Defeat Recal Option

3) "H" Half Step Option

9.7.3.1 Radial Option

The "R" option is not implemented on the A506 interface. On the ST506, this option maintains all outputs active and illuminates the In Use LED when the drive is selected.

9.7.3.2 Defeat Recal Option

This option defeats the automatic recalibration of the R/W heads on the ST506 to speed up the power up sequence. This option is not offered on the A506 since the power up sequence is much faster.

9.7.3.3 Half Step Option

The ST506 takes each step pulse received, at a 3 msec. rate, and generates a second Step pulse to the stepper motor (which actually requires 2 steps between tracks). The installation of this option on the ST506 disables the generation of the second Step pulse and requires the host to generate 2 Step pulses per data track movement. This allows the host controller to slew the (double) Step pulse rate, accelerating and decelerating the R/W head during long seeks. This slewed step rate is handled automatically by the A506 microprocessor. By installing a jumper between the "X" jumper pad and U6 Pin 7 (Ground) on the Drive Control card the drive will also operates in Half Step Mode whereby two Step pulses are required for each increment or decrement in track address.

READER COMMENTS

The following postage paid form is provided for reader comments. For additional copies of this form, please call AMLYN Product Marketing (408) 275-8616, or send your comments to:

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San Jose, CA 95112

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