CalComp

Trident Disk Drives

Models T-25, T-50 and T-80
OEM Reference Manual

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PREFACE

This document describes CalComp's Trident Disk Drives. The information contained in this document is intended as a reference for controller designers. Changes and updates to this information will be contained in errata sheets.

CONTENTS

ILLUSTRATIONS

SECTION 1
INTRODUCTION

PURPOSE

This manual contains the information necessary to interface a TRIDENT disk drive to a controller and ultimately to a computer system. Unless otherwise noted, all information is applicable to all members of the TRIDENT family.

RELATED DOCUMENTS

Companion CalComp documents on TRIDENT disk drives available from CalComp include:

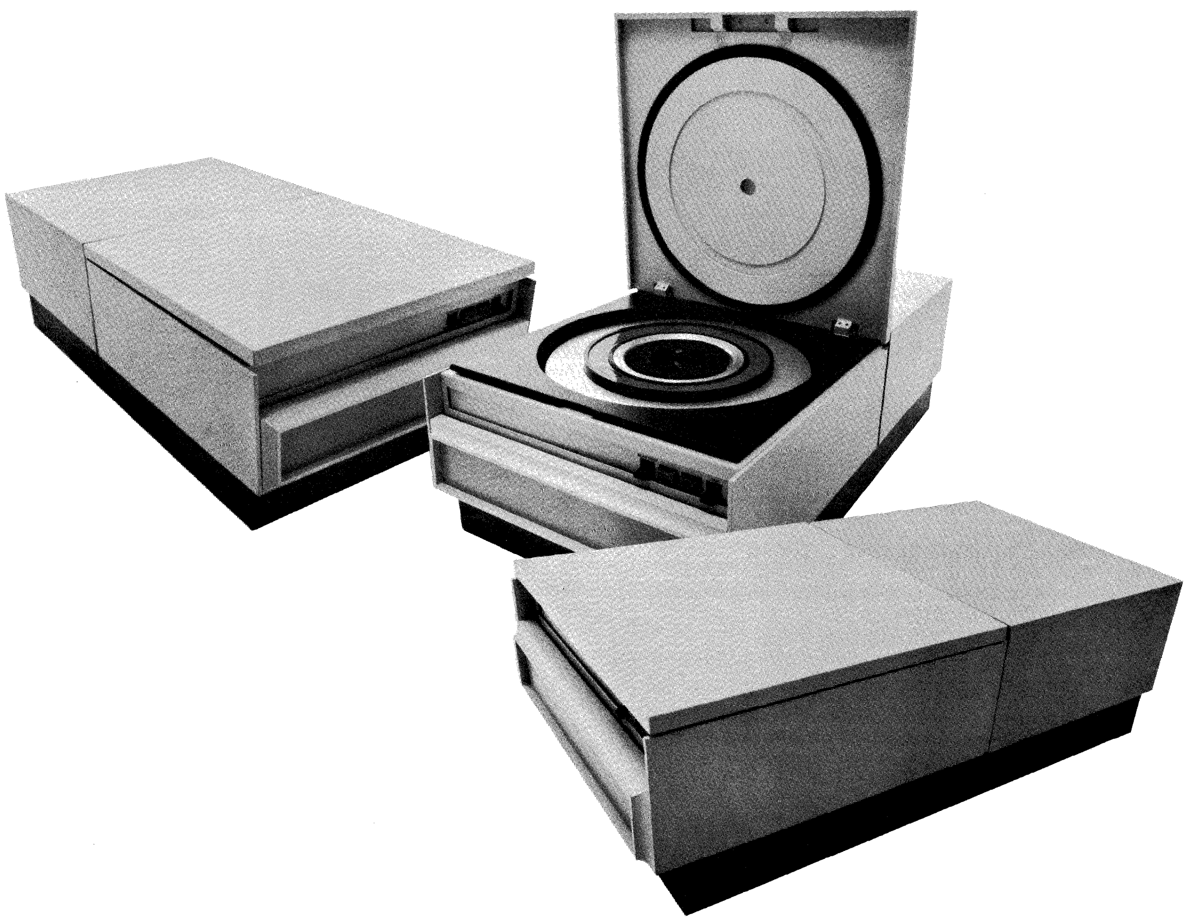
TRIDENT Theory of Operation Manual
TRIDENT Installation and Operation Manual
TRIDENT Maintenance Manual
TRIDENT Field Parts Catalog
T2000A Exerciser Technical Manual

GENERAL DESCRIPTION

The TRIDENT family of disk drives is a series of low cost, high density, modular disk storage units uniquely suited to the OEM's requirements. Using 3330 technology, they provide 25, 50 or 80 megabytes of storage in a 10½" high rack-mounted device.

Access time is a maximum of 6 ms track-to-track and 55 ms full stroke, with a data transfer rate of 806 or 1209 Kbytes per second.

TRIDENT contains many features which allow the systems designer to incorporate it into his system with a minimum of effort. Among these are a self-contained data separator, an attention interrupt, programmable sector length and a variable record length capability.



TRIDENT Disk Drive Family

TRIDENT offers you a third generation replacement for 2314 type drives, expansion capability for cartridge disks and a viable alternative for 3340 disk drives.

FEATURES

PROGRAMMED HEAD OFFSET allows marginal data to be recovered.

INTEGRAL VFO eliminates all analog circuit design from the controller and synchronizes data recovery circuits to data on the pack.

TRACK FOLLOWING SERVO provides a track alignment reference in the pack, not the drive.

JUMPER SELECTED SECTOR LENGTHS are variable in one or two byte increments.

DYNAMIC SPINDLE BRAKE allows pack changes in less than one minute.

CONTAMINATION CONTROL SYSTEM has enclosed filtered air system for shroud, heads, carriage and linear motor.

SYMMETRICAL CARRIAGE AND WAY allows stresses to pass through the center of mass, eliminating pitch, roll and yaw forces.

RIGID ONE-PIECE DECK PLATE eliminates instability and resonance problems.

CERAMIC VOICE COIL MOTOR reduces external magnetic field and resultant crosstalk problems.

MODULAR CONSTRUCTION so that all major subassemblies are removable as an entity.

INDUSTRY STANDARD SPINDLE INTERFACE allows pack procurement from multiple vendor sources.

DESIGNED FOR EXPANSION, all components were selected to allow for greater capacity.

ADDRESS MARK GENERATION AND DETECTION allows use of variable length records which reduces sector overhead.

SECTION 2
SPECIFICATIONS

OPERATIONAL SPECIFICATIONS

	T-25	T-50	T-80
Bytes per track	13,440	13,440	20,160
Tracks per cylinder	5	5	5
Bytes per cylinder	67,200	67,200	100,800
Number of cylinders	408	815	815
Bytes per pack	27.4M	54.7M	82.1M
Single track positioning time	6 ms	6 ms	6 ms
Average positioning time	30 ms	30 ms	30 ms
Maximum positioning time	55 ms	55 ms	55 ms
Rotational speed	3600 RPM	3600 RPM	3600 RPM
Average latency time	8.3 ms	8.3 ms	8.3 ms
Recording density	4040 BPI	4040 BPI	6060 BPI
Track density	185 TPI	370 TPI	370 TPI
I/O Transfer rate	806 KByte	806 KByte	1209 KByte
I/O Signal levels		DTL/TTL compatible	
Recording code		modified frequency modulation	
Interface code (data)		non return to zero	
Positioning method		linear motor-track following servo	
Start time		20 seconds	
Stop time		20 seconds	

RELIABILITY

Mean Time Between Failures

MTBF is defined by the expression:

MTBF = Operating Hours / No. of Equipment Failures

Operating hours relate to the total "AC Power On" hours less any maintenance time. Equipment failures are defined as those failures requiring repairs, adjustments or replacements on an unscheduled basis, i.e., emergency maintenance required because of hardware failure or substandard performance. They exclude down-time or substandard performance due to operator error, adverse environment, power failure, controller failure, cable failure or other failures not caused by the drive.

TRIDENT's family of units has an expected useful life MTBF of 2500 hours, provided the proper preventive maintenance procedures are followed. To establish a meaningful MTBF, operating hours must be greater than 2500 hours and includes all sites where the drives are used.

Mean Time To Repair

MTTR is defined as the time for an adequately trained and competent serviceman to diagnose and correct a malfunction. TRIDENT disk drives are designed so that the MTTR is expected to be less than 1.5 manhours.

Preventive Maintenance Time

Routine scheduled preventive maintenance does not exceed one-half man hour per 1000 hours, based on procedures recommended by CalComp and performed by suitably trained and competent maintenance personnel.

Service Life

TRIDENT drives are designed and constructed to provide a useful life of 5 years before a factory overhaul or replacement is required. This allows also for repair or replacement of parts during the unit's lifetime.

Power Loss

Accidental loss of AC power does not result in any component failure. The drive will retract the heads from the disk pack to ensure that the recording surfaces are not damaged in the event of AC power loss.

DATA INTEGRITY

Errors attributed to operator mishandling of the data pack or errors in the pack which may be detected and flagged during initialization of the pack are not included in determining error rates.

Recoverable Errors

A recoverable error is one which may be corrected by no more than 3 attempts to read the record at zero offset and nominal strobe, and 2 attempts to read at each offset position with early, nominal and late strobes (19 reads). Any combination of Seek-Write, Seek-Read, Seek-Restore is allowed without limitation of combination and duty cycle. Data patterns and track position do not affect Data Error Rate performance. The Recoverable Read Error Rate for TRIDENT is less than one error in 10^{10} bits.

Non-Recoverable Read Error Rate

A non-recoverable error is one which remains after the 19 attempts (described above) to read the record in which the error is located. The Non-Recoverable Data Error Rate for TRIDENT is less than one error in 10^{13} bits.

Positioning Errors

The Positioning Error Rate is less than one error in 10^6 Seek executions.

MEDIA

Only media from an approved CalComp vendor may be used to determine reliability and integrity numbers. A list of approved vendors may be obtained from any CalComp office.

SECTION 3
FORMAT REQUIREMENTS

GENERAL

To ensure interchangeability between like disk drives and guarantee proper operation over the entire temperature range, any disk drive must have a preamble and postamble associated with each record. These overhead fields provide compensation for mechanical tolerance, amplifier switching times, VFO capture time and allow for synchronization patterns. The size of each of these fields is dependent upon the tolerances, the bit packing density, and the rotational speed of the drive.

TRIDENT offers the user a choice of formatting schemes. Either electronic sectoring or address mark sectoring may be used for fixed length records. Address mark sectoring must be used for variable length records.

ELECTRONIC SECTORING

Electronic sectoring derives the sector and index pulses from the dibits recorded on the servo track. The index pulse occurs once per revolution and is available on the IIDX line in the bussed cable. The number of sector pulses is variable from 1 to 4096. They are available on the ISECTOR line in the bussed cable. In addition, there is an ungated composite sector index pulse (ICOMPSECIDX) which may be used for Rotational Positioning Sensing if needed.

Figure 3-1, format I illustrates the component parts of this format. Figure 3-2 shows the minimum size of each area.

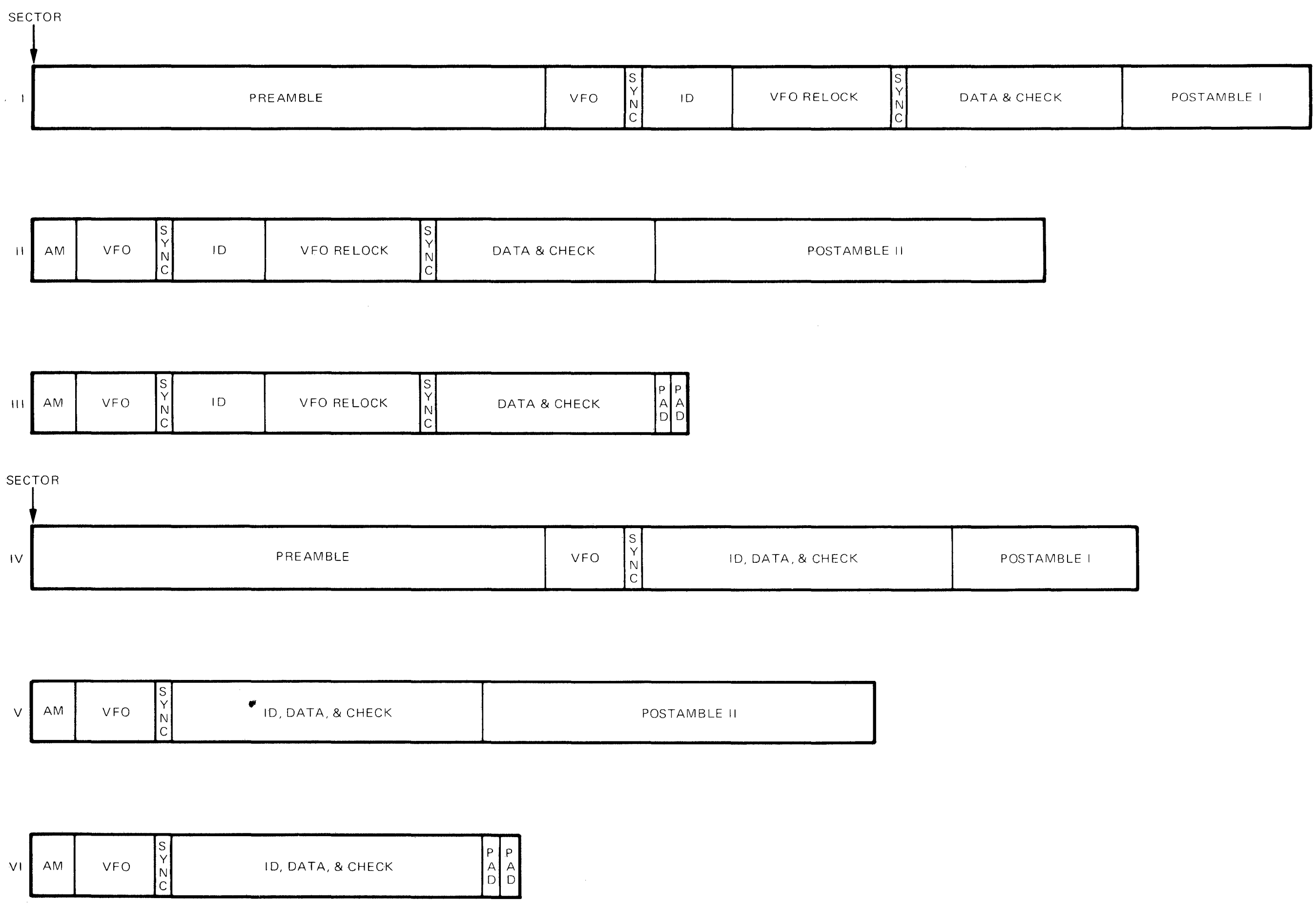


Figure 3-1. Sector Formats

The formula for the maximum number of sectors per track for a given sector size is as follows:

$$n_{max} = \frac{\text{Track Length}}{L_{OH} + L_{ID} + L_D}$$

where

n_{max}	=	maximum number of sectors
Track Length	=	13440 for the T-25 and T-50
	=	20160 for the T-80
L_{OH}	=	length of overhead field
L_{ID}	=	length of header field
L_D	=	length of data field

L_{OH} is 62 bytes for the T-25 and T-50 and is 86 bytes for the T-80. L_{ID} is a system design parameter. It typically contains the cylinder, track and sector address, flags and a check character. L_D is also a system parameter and contains both the data field and check character field. Once L_{ID} and L_D are decided upon, they are added to the appropriate L_{OH} to determine the total byte count of each sector. This number is then strapped into the sector jumper plugs as outlined in the TRIDENT Installation and Operation Manual.

Field	Contents	T-25/T-50 Length (Bytes)	T-80 Length (Bytes)
Preamble	Zero's	33	43
VFO	Zero's	5	8
Sync	One's	1	1
ID	Optional	Optional	Optional
VFO Relock	Zero's	10	15
Sync	One's	1	1
Data & Check	Optional	Optional	Optional
Postamble I	Zero's	12	18
Address Mark	Blank	3	3
Postamble II	Zero's	25	37
Pad	Zero's	1	1

Figure 3-2. Minimum Format Lengths

ADDRESS MARK SECTORING

Address Mark Sectoring derives its reference from special patterns recorded on the data track. Since the tolerances between the servo head and the data heads are eliminated, the overhead is reduced and the net system capacity increases.

TRIDENT contains the necessary logic to generate and detect address marks. An I/O command generates the address marks. Another I/O command causes the drive to search for address marks. When one is detected, the Address Mark Detected signal is generated.

Although the sector pulses from the servo surfaces are not used, it is often desirable to use the index marker to gain initial orientation. The index pulse is also a convenient means of denoting the end of a track in a multi-track read or write operation and can initiate the head advance signal to continue the operation.

When the index mark is used, it is necessary to write a track header record at the beginning of each track. This header record allows for the tolerance between the index pulse on the servo surface and the head on the data disk. It's format is shown in Figure 3-3.

Field	Contents	T-25/T-50 Length (Bytes)	T-80 Length (Bytes)
Preamble	Zero's	38	57
Sync	One's	1	1
Track ID	Optional	Optional	Optional
Pad	Zero's	1	1

Figure 3-3. Track Preamble Format

Address Mark sectoring is illustrated by Figure 3-1, format II.

The formula for the maximum number of sectors per track for a given record size using Address Marks is:

$$n_{max} = \frac{\text{Track Length} - (\text{Track Overhead} + \text{Track ID})}{L_{OH} + L_{ID} + L_D}$$

n_{max}	=	Maximum Number of Sectors
Track Length	=	13440 for the T-25 and T-50
	=	20160 for the T-80
Track Overhead	=	41 for the T-25 and T50
	=	59 for the T-80
Track ID	=	length of Track ID Field
L_{OH}	=	Length of Sector Overhead Field
L_{ID}	=	Length of Sector ID Field
L_D	=	Length of Sector Data

L_{OH} is 45 bytes for the T-25 and T-50 and is 65 bytes for the T-80. L_{ID} and L_D are as previously stated.

If the system design is such that adjacent records are never processed consecutively, further economy can be achieved.

Format III in Figure 3-1 shows that the postamble necessary for the read amplifier recovery may be replaced with a two byte pad if it is not necessary to detect the next address mark. In this case, L_{OH} is reduced to 22 bytes for the T-25 and T-50 and is 30 bytes for the T-80.

Some system applications call for the rewriting of the sector ID every time the data field is updated. If this is the case, the ID field can be considered as part of the data field and the VFO relock and second Sync fields may be eliminated. Formats IV, V, and VI illustrate this and are the respective analogs of Formats, I, II, and III.

SECTION 4
INTERFACE SIGNALS

RADIAL CABLE

Signal Name	Mnemonic	Input/Output	Description
Select	ISELECT/	I	A low level on this line selects this drive when the terminator is present and the drive is not degated.
Selected	ISELECTED/	O	When low, this signal indicates the drive is selected. It goes low within 200 ns of Select.
Sequence	ISEQUENCE/	I	A low level on this signal initiates the sequence cycle. If the START switch is on, this signal will control the spin motor. It should be removed at least one second before controller DC is removed.
Attention	IATTN/	O	When low, the drive has an interrupt active. It will become active at the completion of a "First Seek", "Rezero", "Seek", "Seek Incomplete", or when an emergency retract occurs. Attention is reset by a read command.
DC Ground	none	—	This wire is the DC Ground Reference for the drive.
Composite Sector/ Index	ICOMPSECIDX/	O	This line transmits negative going pulses at both sector and index times. The sector pulses are $1.24 \pm .24$ μs wide and the index pulses are 4 ± 1 μs wide. This signal is not gated with select. It is intended to be used as an input for rotational position sensing circuits. (See Figure 4-1).
Termination Power	ICNTLRP5	I	This line is used to terminate "SELECTED", "ATTENTION" and "COMPOSITE SECTOR/ INDEX" in each drive. It is also used to terminate the bussed interface in the last unit. The current required is 150 ma per drive plus 1.25A for the bussed interface, worst case.
Data	R/W DATA	I/O	When writing, the NRZ write data is transmitted on this line. When reading, the NRZ read data is carried on this line.
Clock	R/W CLOCK	O	When writing, this line transmits the write clock which is used to strobe data from the controller. The data shall change only at the rising edge of the square wave (measured at the controller). When reading, this line carries the read clock. It also is a square wave. Data will change within 10 nsec of the falling edge of the clock (measured at the drive). (See Figure 4-2).

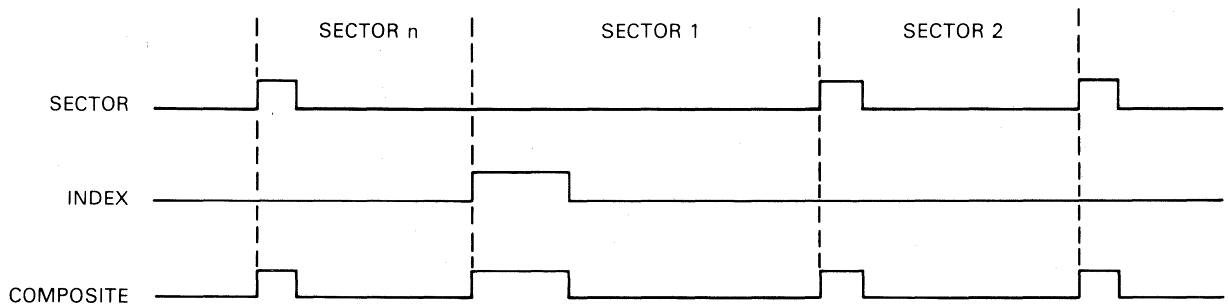


Figure 4-1. Composite Sector/Index Signal

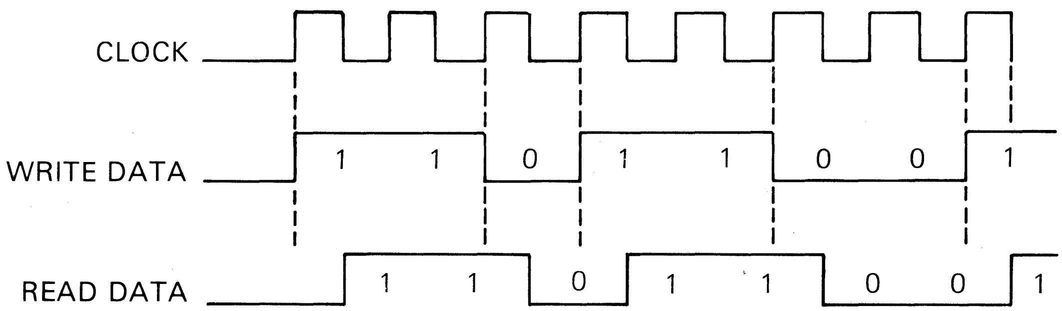


Figure 4-2. Read/Write Timing

BUSSED CABLE

Signal Name	Mnemonic	Input/Output	Description
Bus 0→Bus 9	IBUS 0/→IBUS 9/	I	The 10 bus lines are interpreted according to the current tag. The drive must be selected at least 200 ns before any bus lines are active. The bus lines must be active at least 200 ns before the tag line and 200 ns after the tag line.
End of Cylinder	IEOC/	O	This line when low indicates the contents of the head address register are greater than four.
Offset	IOFFSET/	O	This line when low indicates that the heads are offset.
Ready	IRDY/	O	This line is low when the heads are loaded and not moving.
Online	IONLINE/	O	This line is low when the heads are loaded.
Index	IIDX/	O	This line indicates the beginning of a track. It is a 4 ± 1 μsec low going pulse.
Read Only	IRDONLY/	O	This line when low indicates the read only switch is in the read only position. No write command will be executed. It changes state only when the drive is not selected.

Signal Name	Mnemonic	Input/Output	Description
Seek Incomplete	ISKINC/	O	This line goes low if the last motion command (seek, rezero, first seek) is not completed within .7 sec. ±.2 sec. It is reset by a Rezero command or by manually restarting the drive.
Set Cylinder Tag	ISETCYLTAG/	I	When this line is low, the bus lines are decoded as the next cylinder address. The trailing edge of ISETCYLTAG is the command to move the heads to the new address. ISETCYLTAG must not be issued if the drive is not ready or offset is active. If a device check occurs when ISETCYL-TAG is issued, a rezero must be issued to reset Device Check.
Set Head Tag	ISETHDTAG/	I	When this line is low, the data bus is interpreted as Head Address and/or Offset Command. It must not be issued if the drive is not ready. If an Offset Command is issued, the drive will be not ready for 2 ms at the trailing edge of ISETHDTAG.
Control Tag	ICONTROLTAG/	I	When this line is low, control information is on the Bus. (See Table 4-1)

NOTE

The tag lines must be active for at least 800 ns. There shall only be one tag line active at any given time. 400 ns must separate tag signals.

Signal Name	Mnemonic	Input/Output	Description
Sector	ISECTOR/	O	This line generates a 1.24 ±.24 μs low going pulse at the beginning of each sector.
Device Check	IDEVCK/	O	When low, this line indicates that at least one of the error conditions in the drive is active. All error conditions in the drive are latched for fault isolation. The error conditions are as follows: a. SETCYLTAG, SETHDTAG or write and not ready. b. An illegal cylinder address. c. Offset active and SETCYLTAG. d. Offset active and write. e. Read only and write. f. Writing and no write current or no transitions detected. g. Write and the servo detects the heads are offtrack. h. Write current and not writing. i Reading or writing with no head selected or multiple heads selected. This line is reset by the Device Check Reset command except for conditions b & c. These conditions are reset only by a Rezero command.

Signal Name	Mnemonic	Input/Output	Description

NOTE

The preceding 9 output signals are gated with select and will be active within 200 ns of the leading edge of select.

Terminator In	ITERIN/	I	This line is low when all of the cables between this drive and the terminator are present and the terminator is present.
Address Mark Detected	IADDMKDET/	O	When an address mark is detected, a 17 μs low going pulse appears on this line.

BUS INTERPRETATION

The bus lines are interpreted according to Table 4-1.

Table 4-1. Bus Definitions

	SETCYLTAG	SETHEADTAG	CONTROLTAG
Bus 0	CAR512		Strobe late
Bus 1	CAR256		Strobe early
Bus 2	CAR128	OFFSET	Write
Bus 3	CAR064	OSFWD	Read
Bus 4	CAR032		ADDMK
Bus 5	CAR016	Reserved*	HAR*R
Bus 6	CAR008	Reserved*	DEVCKRST
Bus 7	CAR004	HAR 4	HDSEL
Bus 8	CAR002	HAR 2	REZERO
Bus 9	CAR001	HAR 1	HDADV

Set Cylinder Tag

Bus lines 0-9 are defined as cylinder address. Bus 9 is the LSB.

Set Head Tag

Bus lines 7-9 are defined as head address. Bus 9 is the LSB. Bus 2 is the offset command. It may be issued during a Read operation to recover marginal data. If Bus 3 is also active when Offset is commanded, Offset will be in the forward direction (toward the spindle). If Bus 3 is not active Offset will be in the reverse direction. Offset is reset by issuing this command with Bus 2 inactive or by a Rezero command.

* Reserved for compatibility with other models

Control Tag

Bus 9	Head Advance	This bit will advance the head address by one.
Bus 8	Rezero	This bit will reposition the heads to cylinder zero if the heads are loaded on the disk. Rezero will reset "seek incomplete" or the error condition caused by an illegal cylinder address or offset and SETCYLTAG. Rezero will also reset the head address register to "ZERO" and reset offset.
Bus 7	Head Select	This bit turns on the head selection circuits. This bit must be on at least 20 μsec before Read or Write is active.
Bus 6	Device Check Reset	This bit will reset all error condition in the drive which do not have active inputs.
Bus 5	Reset Head Register	This bit will reset the head address register to zero.
Bus 4	Address Mark	This bit tells the drive, when reading, to enable the address mark detector or, when writing, to write an address mark.
Bus 3	Read	This bit will turn on the read circuits and reset all interrupts.
Bus 2	Write	This bit turns on the write circuits.
Bus 1	Strobe early	This bit will advance the data strobe.
Bus 0	Strobe late	This bit will retard the data strobe.

SECTION 5
INTERFACE DESCRIPTION

GENERAL

The controller interface functions may be divided into five areas:

Power Sequencing
Positioning
Data Handling
Error Correction
Diagnostic Aids

POWER SEQUENCING

The Power On and Power Off sequences are illustrated in Figure 5-1. The SEQUENCE signal affords the controller the opportunity to control the sequencing of each drive in a multiple drive system. If the controller does not use this signal, the spindle should be controlled by the Start/Stop switch on the front panel rather than the system power switch. When the Power On sequence is complete, the heads are positioned at cylinder zero and any command may be given once the drive is ready. Power should not be removed until one second after the Sequence signal is removed or the front panel switch is placed in the Stop position. In the event of a power failure, writing is inhibited and the heads are retracted before the media slows down.

POSITIONING

The positioning logic moves the heads to the desired cylinder and selects the proper track. The sequence is illustrated in Figure 5-2. During the time that the actuator is moving, the READY signal goes false. At the end of a seek, READY becomes true and ATTENTION is set. ATTENTION is then reset by the next READ command.

If the seek is not finished in 700 $\pm$ 200 milliseconds, the Seek Incomplete flag is set. If an illegal cylinder address is given or the offset is active during a seek initialization, Device Check is set. If either of these conditions occur, a Rezero command must be given to clear the fault and re-establish a reference point.

DATA HANDLING

Before writing on a new pack, the pack must be formatted. A format from Section III must be selected and the sector size decided upon. Figures 5-3, 5-4, and 5-5 illustrate this procedure. Figures 5-6 through 5-14 illustrate reading and writing using both electronic and address mark sectoring.

ERROR CORRECTION

Two methods for recovering temporary errors are provided. The heads may be positioned slightly off-track in either direction and the data may be strobed early or late. Once an error is detected, two additional attempts should be made to read the record at zero offset and nominal strobe. The strobe should then be varied at zero offset and at each offset position. Figure 5-8 illustrates this sequence and the number of repetitions at each point. If the error cannot be corrected by this procedure, it is considered a permanent error.

DEVICE CHECK

The following conditions are illegal and will set the device check flag:

Set cylinder tag while not ready
Set head tag while not ready
Writing while not ready
Writing with offset active
Writing with Read Only active
Writing and off track for any reason
Writing and no heads or multiple heads selected
Writing and no current transitions detected
Writing and write current incorrect
Write current and not writing
Offset and set cylinder tag
Illegal cylinder address

All but the last two are reset by Device check Reset. They are reset by Rezero only. Rezero also resets the first condition.

RECOVERY TIMES

a) Head select must be active at least 20 μs before read and 5 μs before write.
b) Switching between heads or switching from write to read, good data will be present at the interface within 20 μsec.
c) Switching from not reading to reading, good data will be at the interface within 300 ns.
d) Switching from not writing or reading to writing, good data will be written within 300 ns.
e) "Head Select" bit must be active 30 μs before "Address Mark" bit.

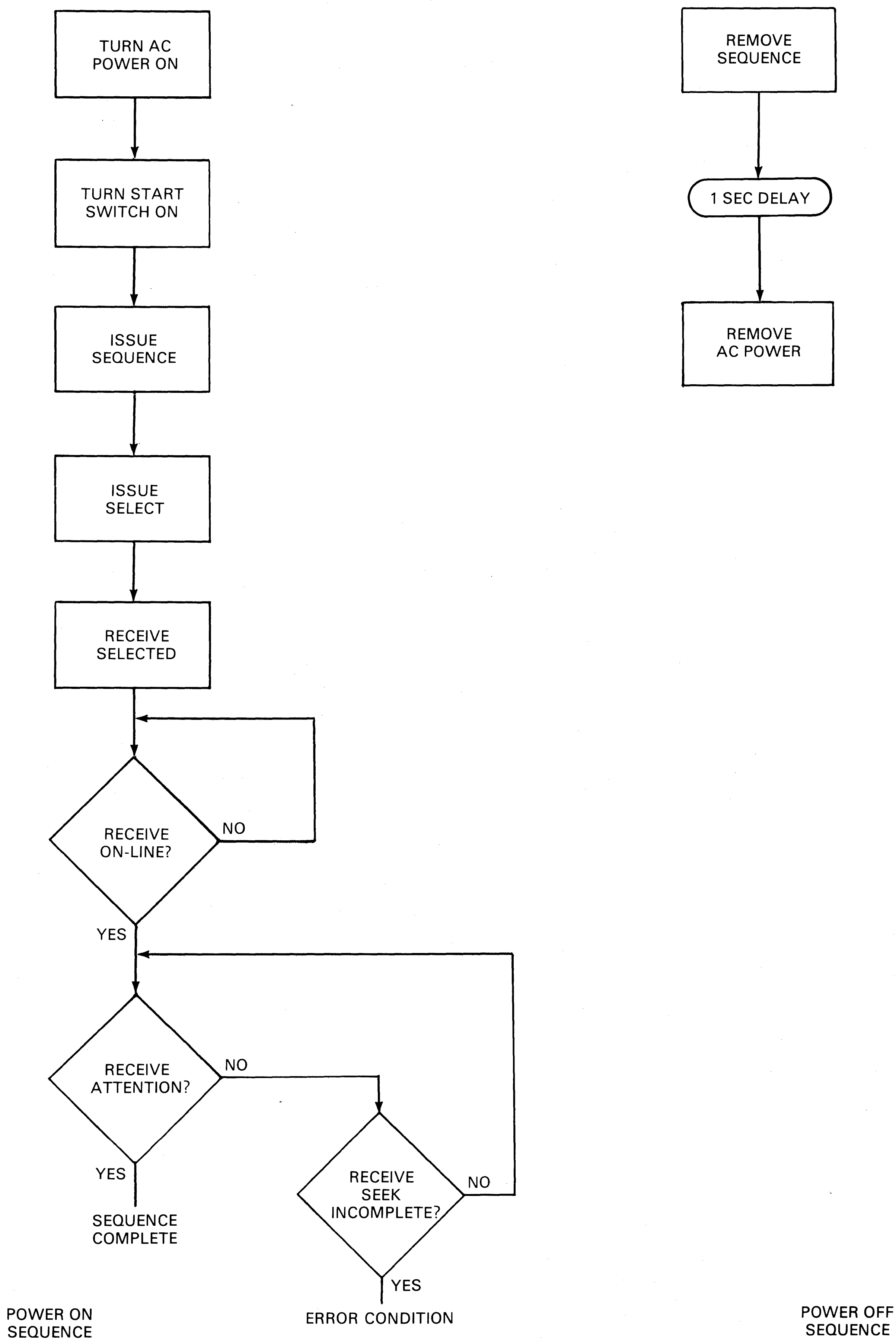


Figure 5-1. Power Sequence

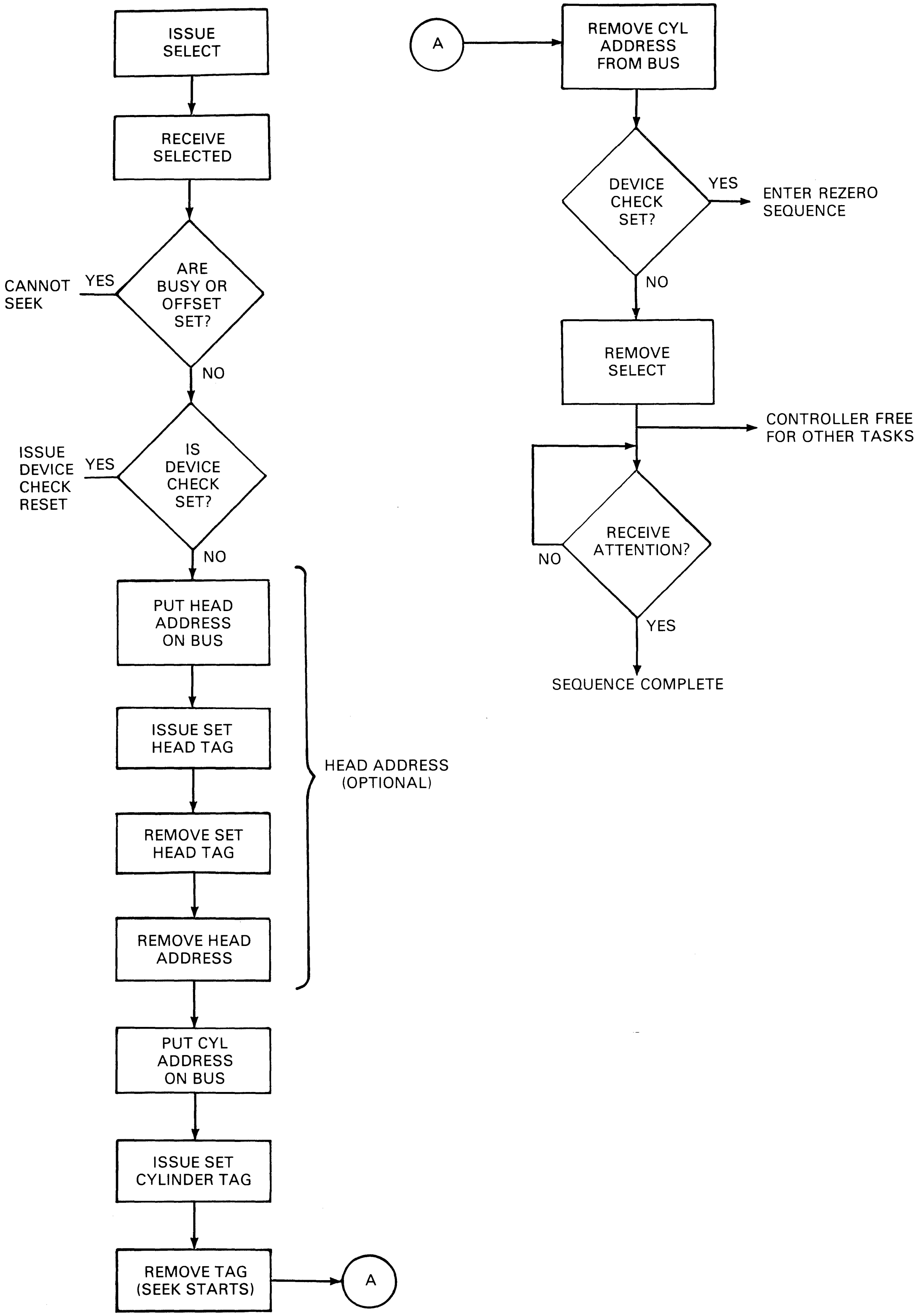


Figure 5-2. Seek Sequence

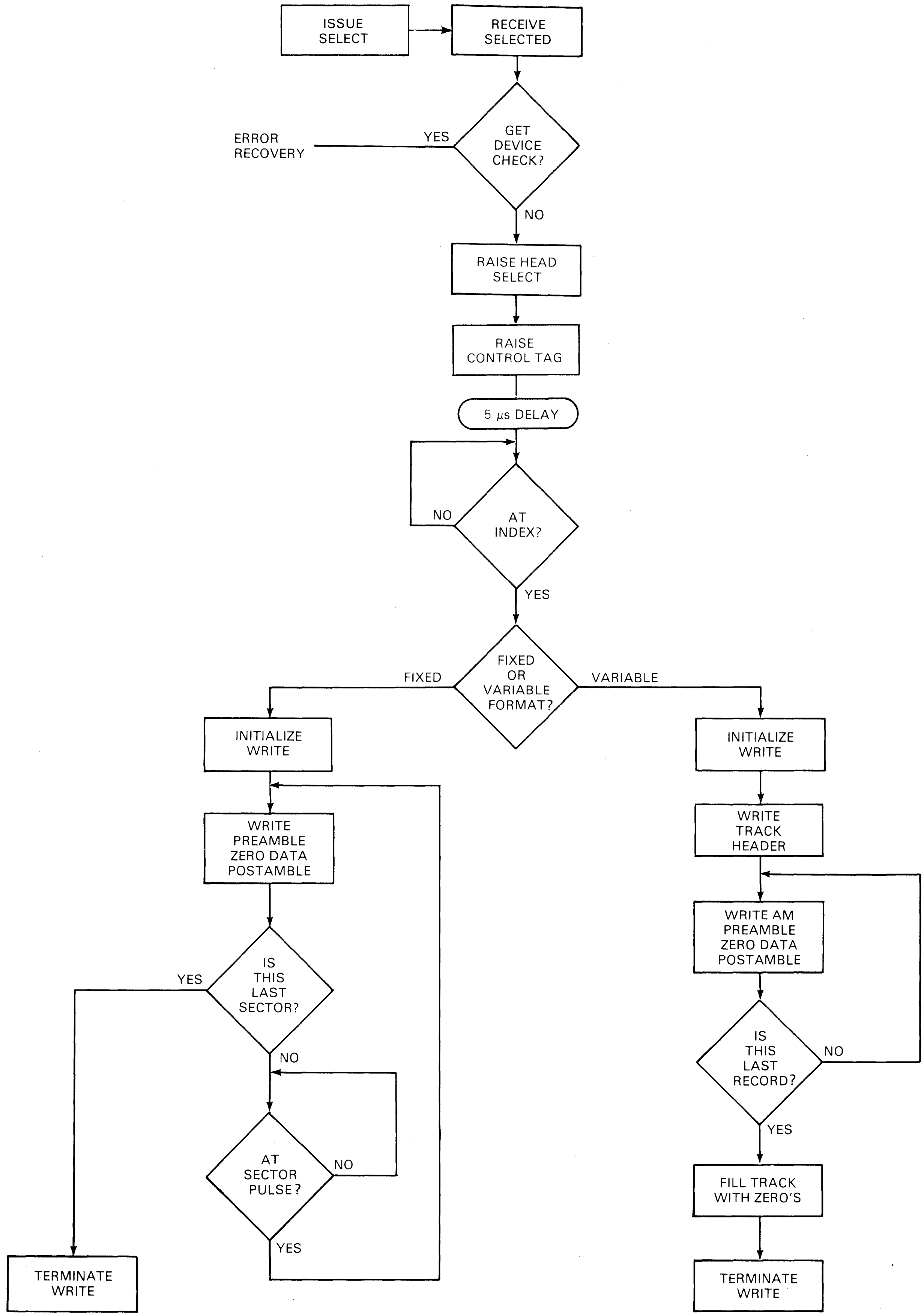


Figure 5-3. Track Initialization

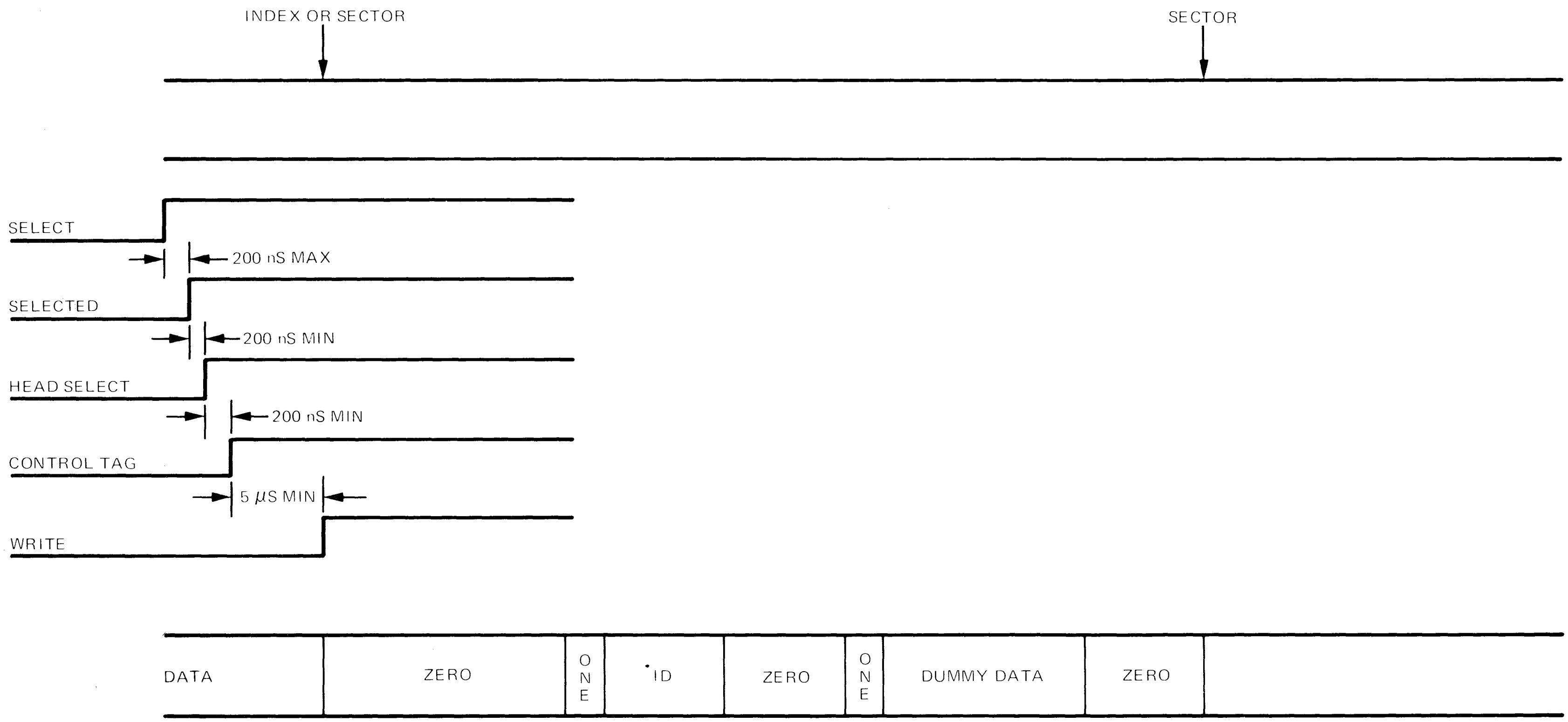


Figure 5-4. Initializing for Electronic Sectoring

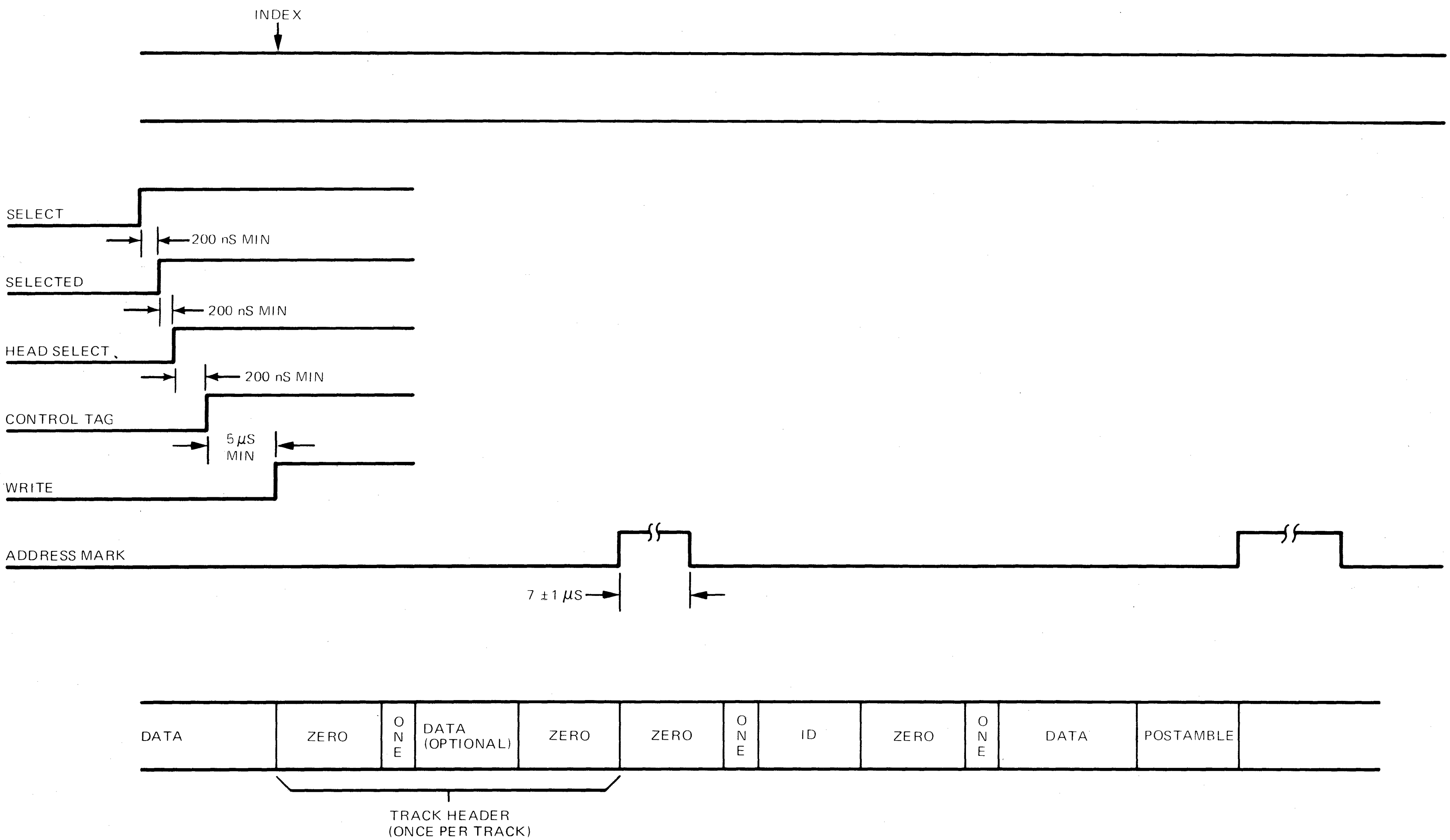


Figure 5-5. Initializing for Address Mark Sectoring

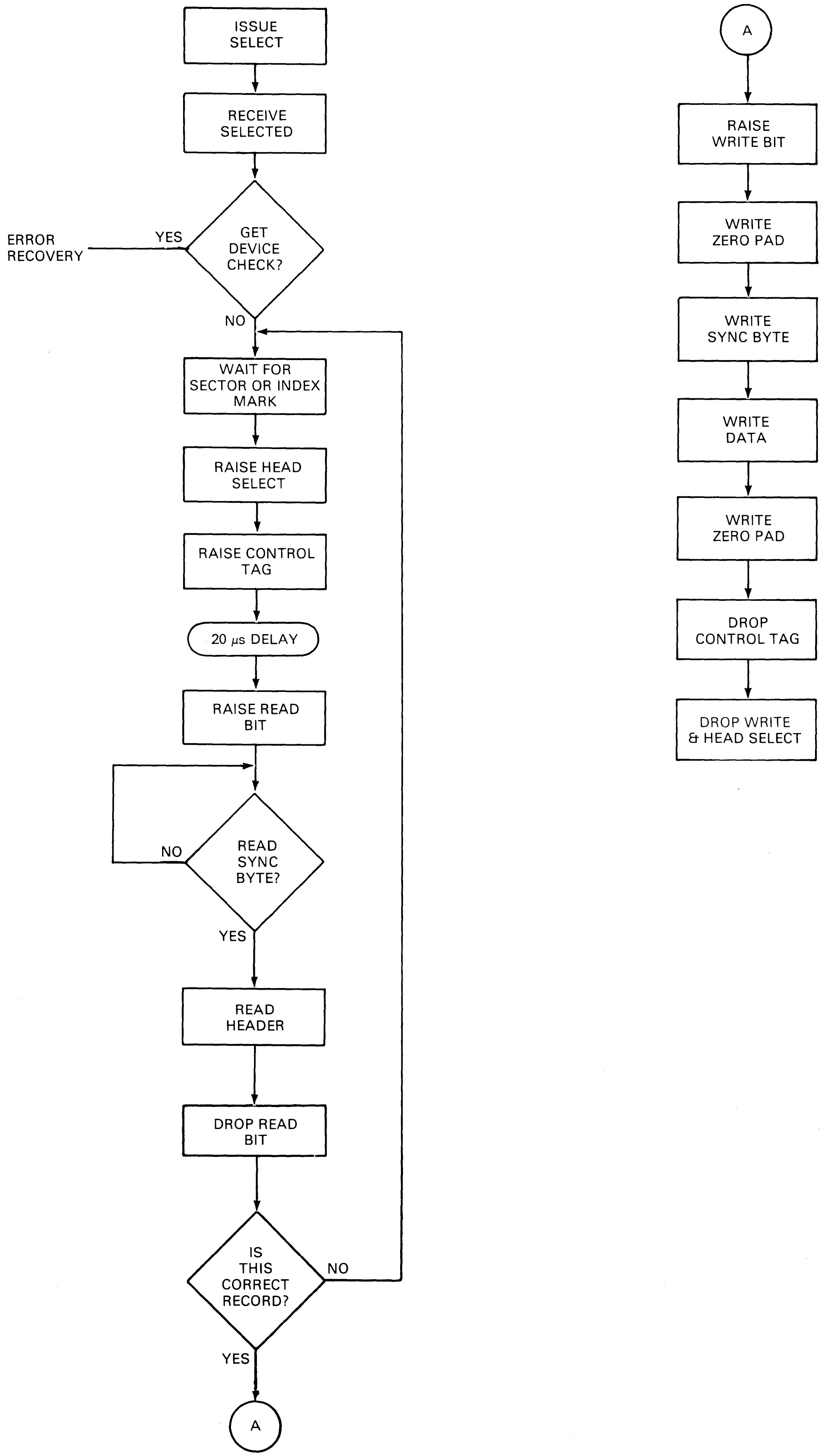


Figure 5-6. Write Using Electronic Sectoring

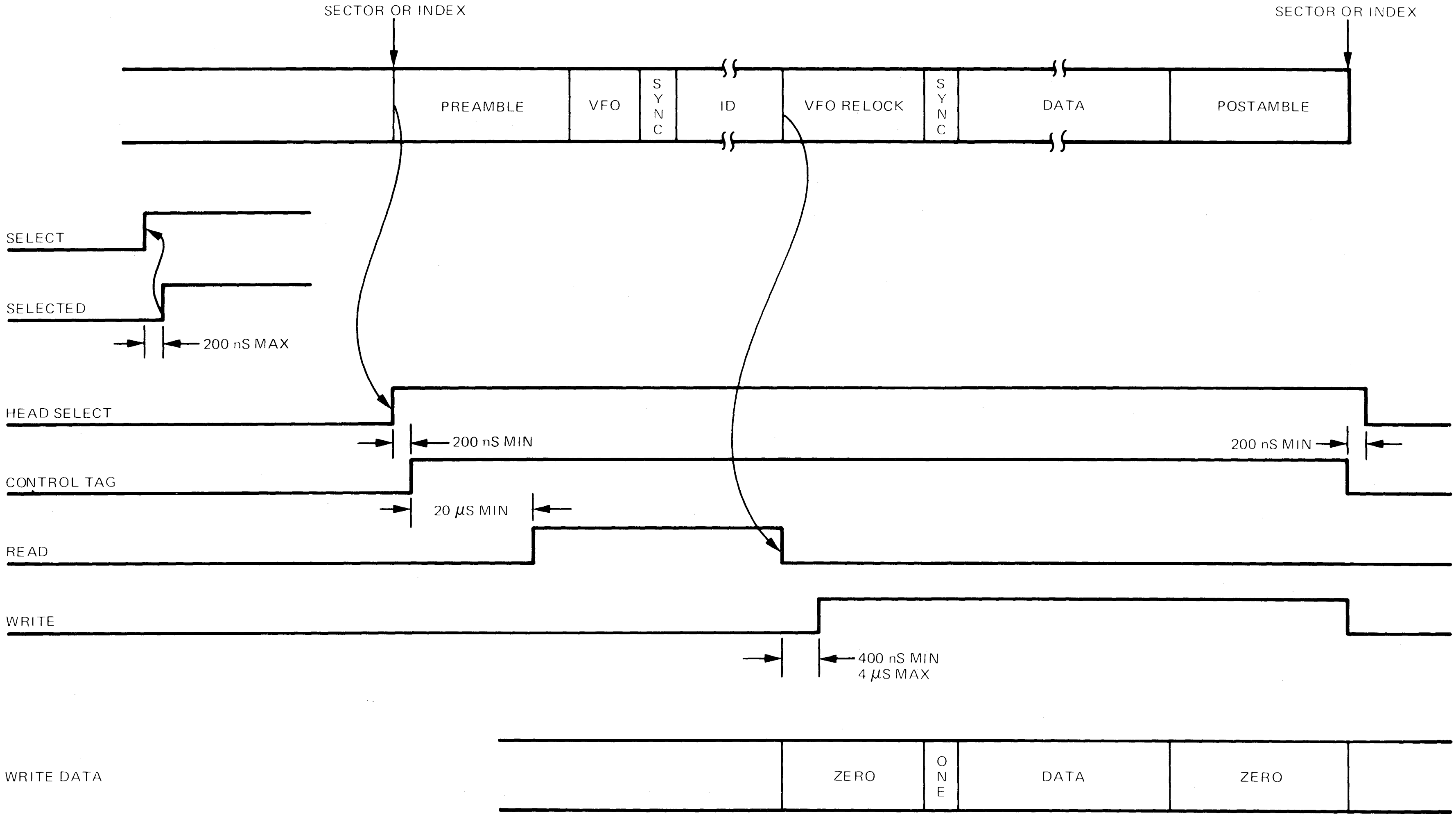


Figure 5-7. Write Using Electronic Sectoring (Format I)

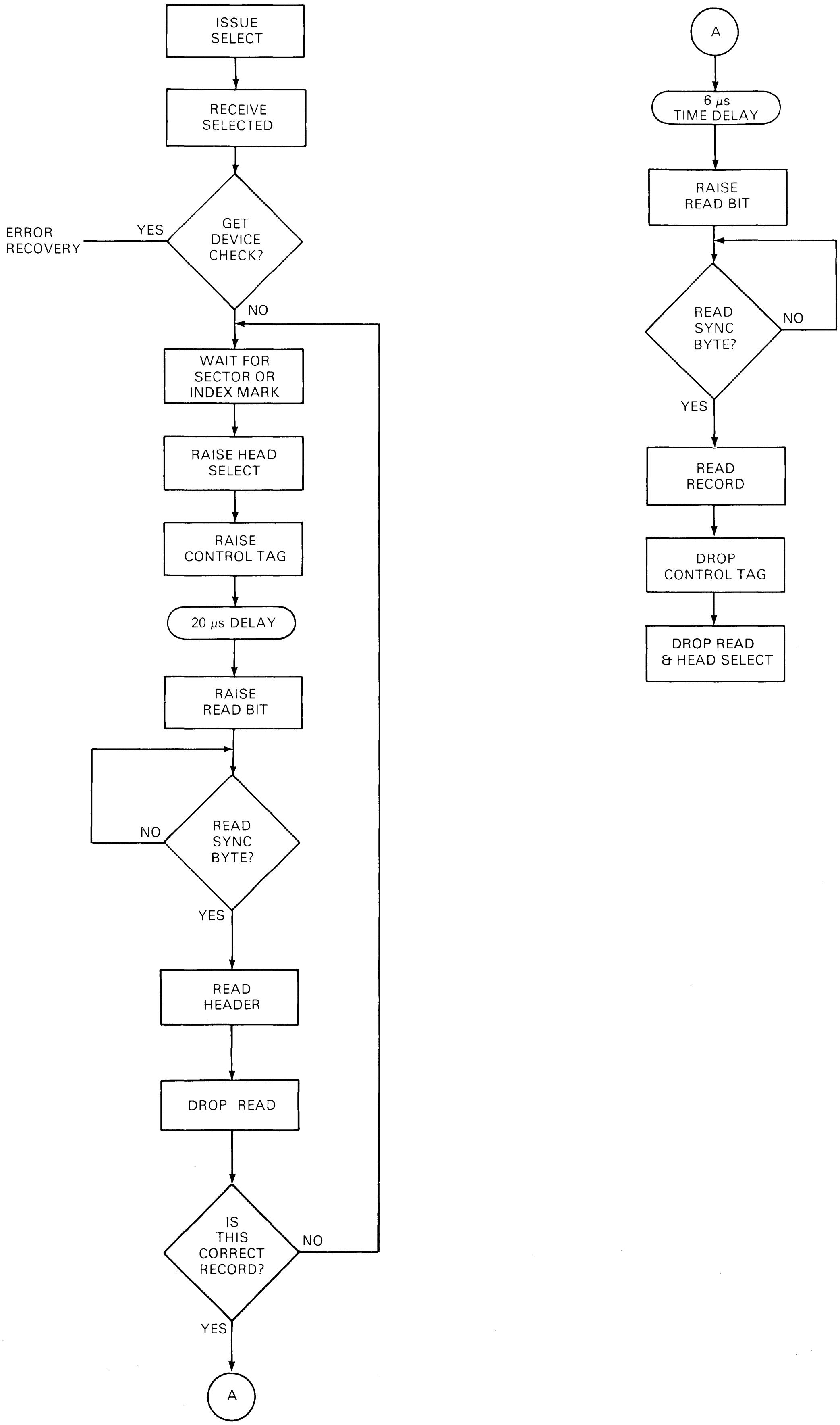


Figure 5-8. Read Electronic Sectoring

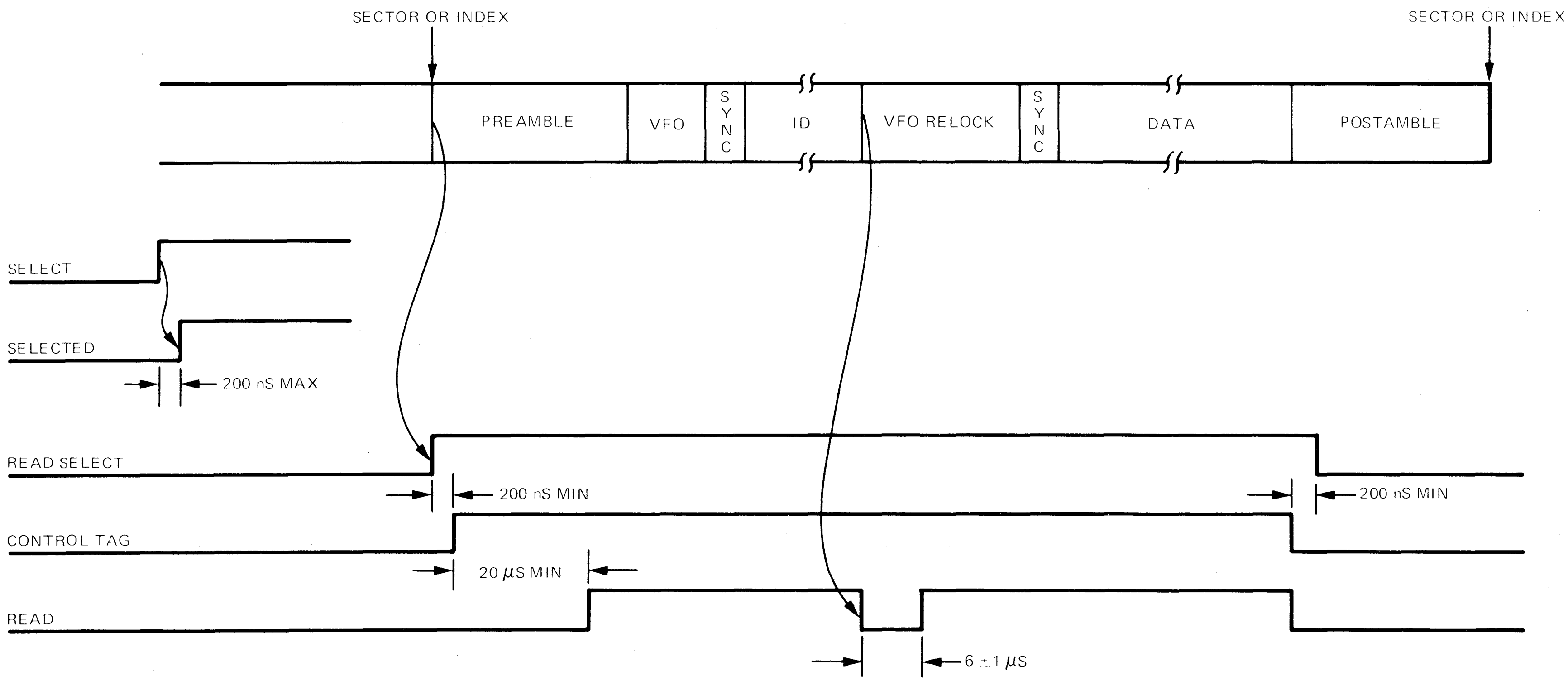


Figure 5-9. Read Using Electronic Sectoring (Format I)

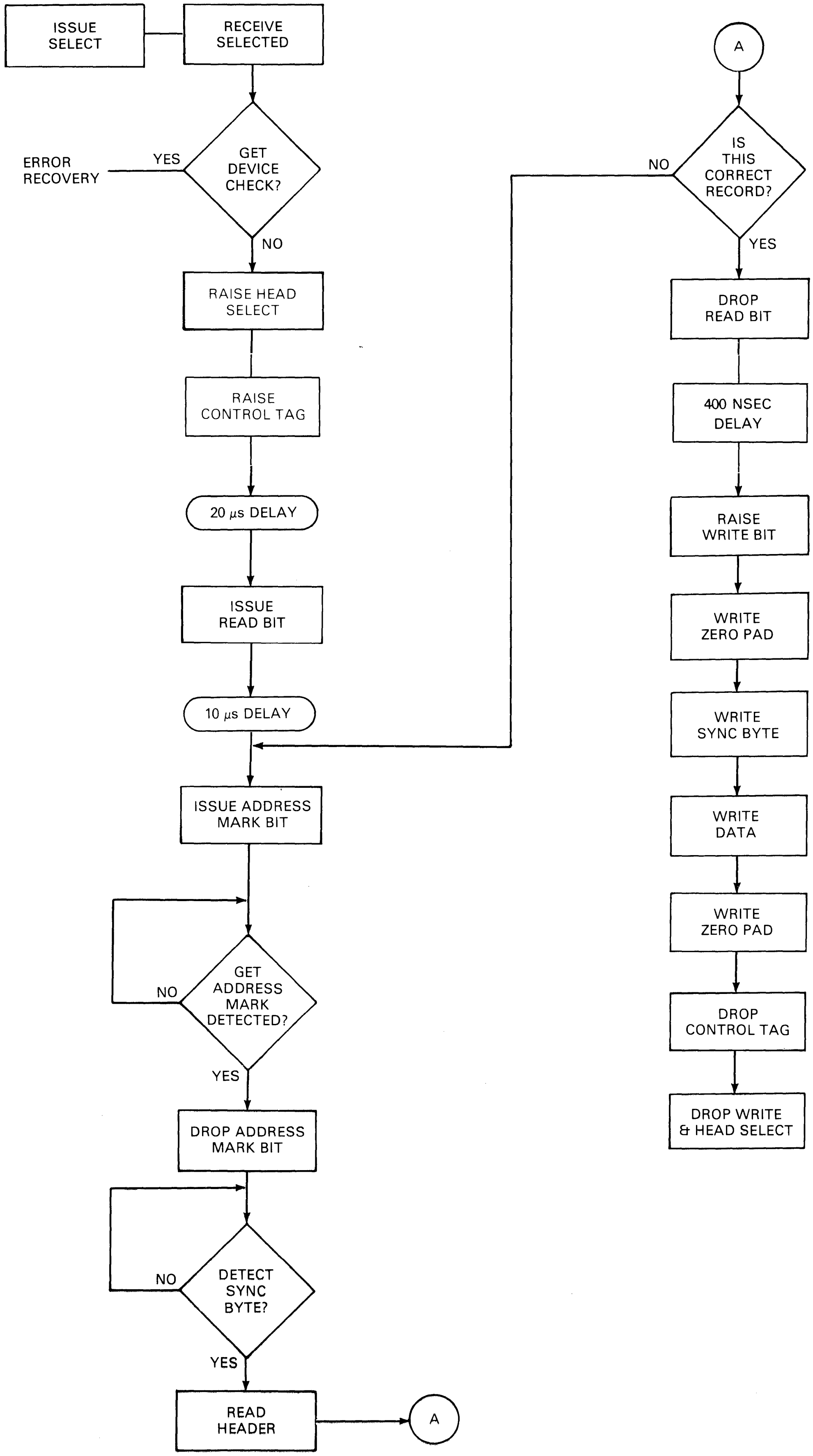


Figure 5-10. Write Using Address Marks

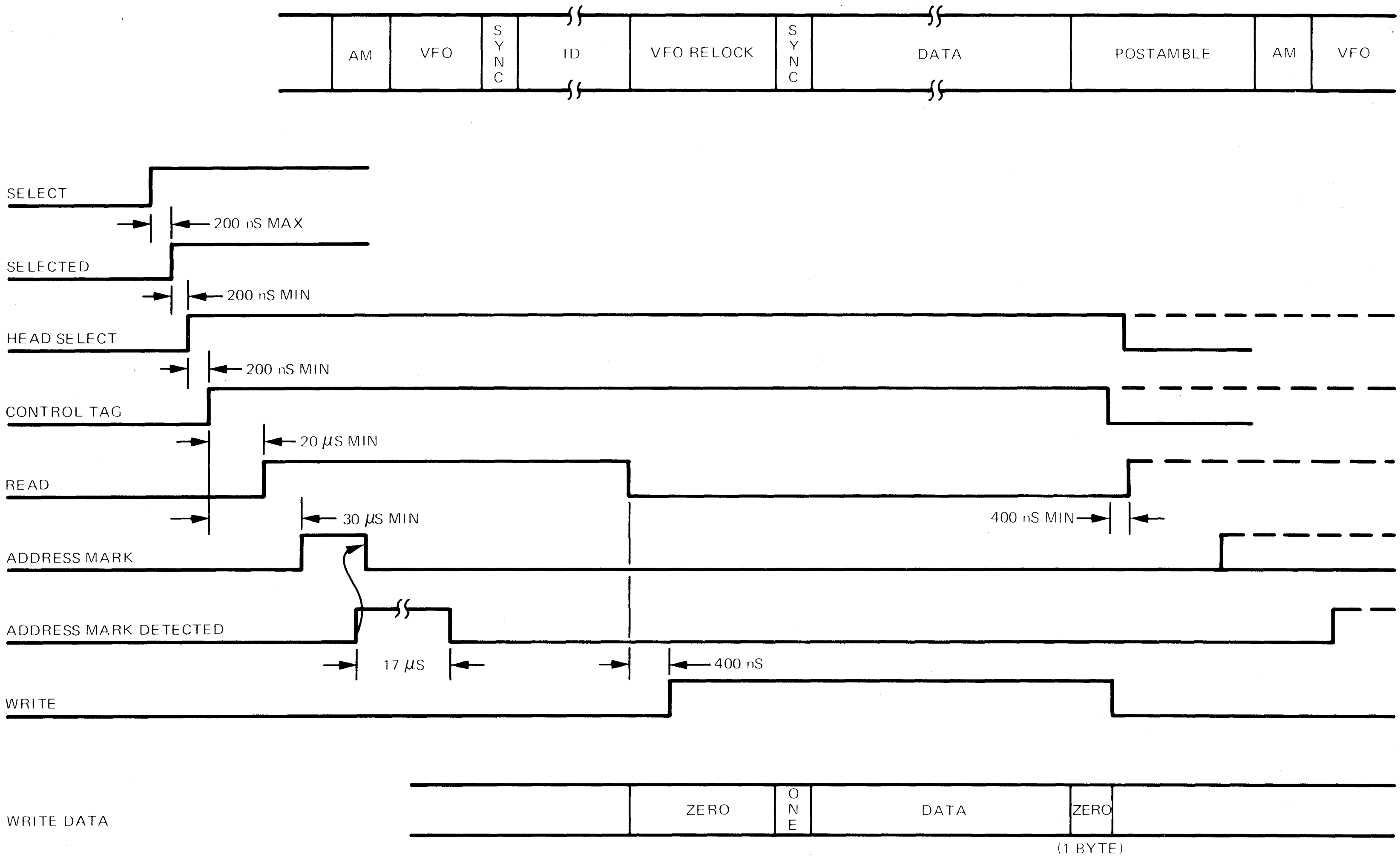


Figure 5-11. Write Using Address Mark Sectoring (Format II)

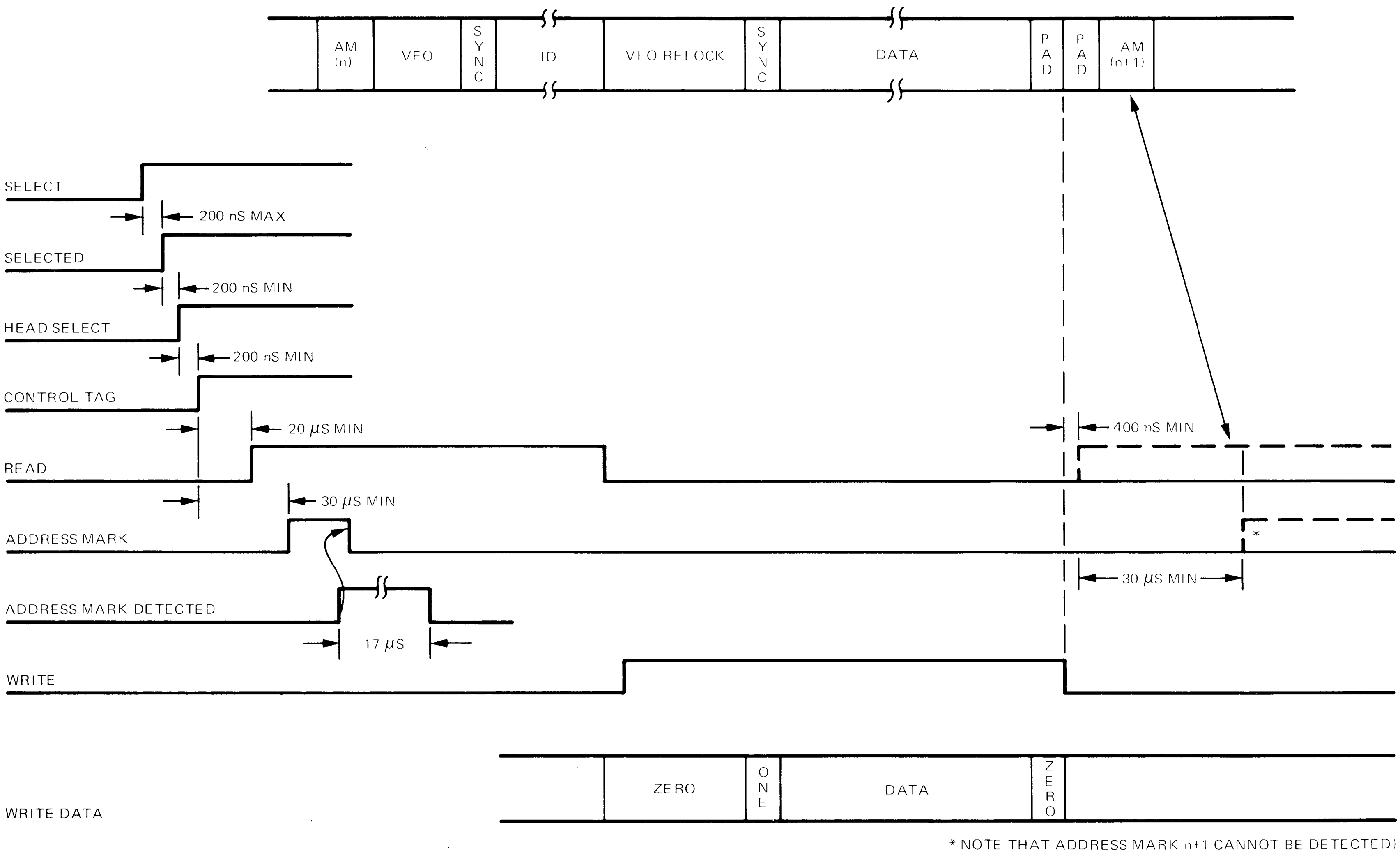


Figure 5-12. Write Using Address Mark Sectoring (Format III)

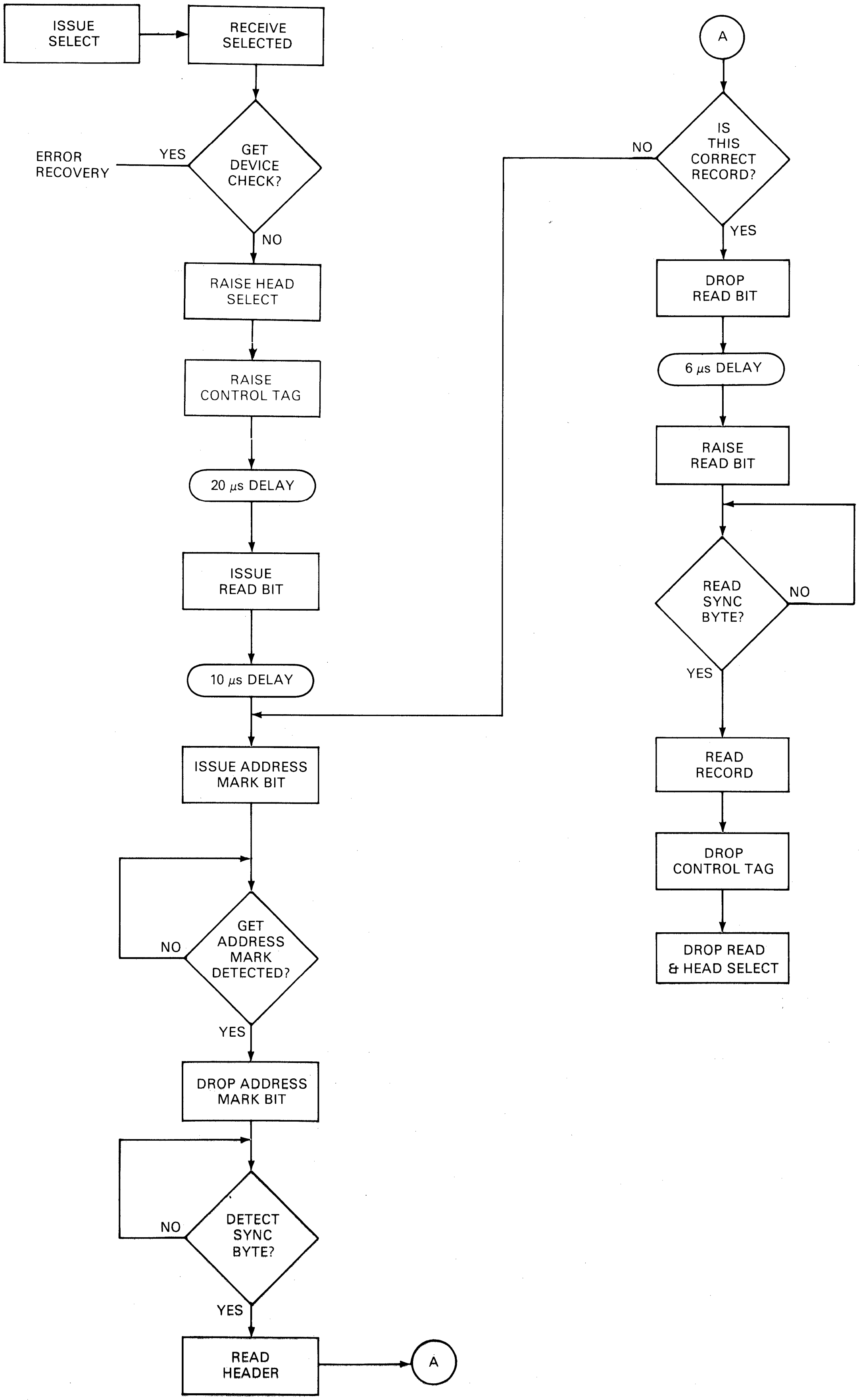


Figure 5-13. Read Using Address Marks

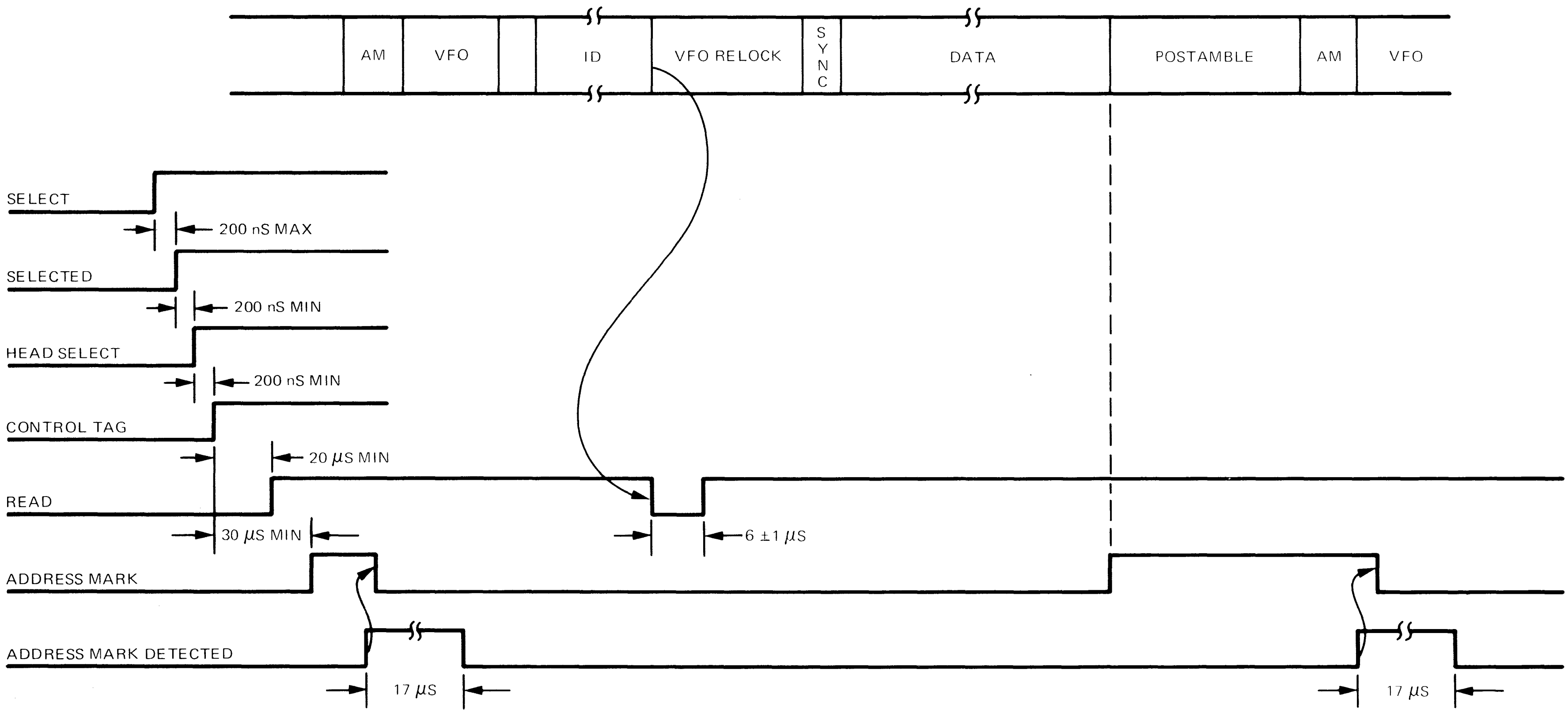


Figure 5-14. Read Using Address Mark Sectoring (Format II)

SECTION 6
SIGNAL LEVELS

ALL SIGNALS EXCEPT DATA AND CLOCK

Type	single ended
Wire	95 ohm impedance twisted pair
Termination	100 ohms to +5V at both ends
High Level	5 ± 0.5V
Low Level	0.2 ± 0.2V
Rise and Fall Times	0–50 nS (10% – 90% points)
Recommended Line Driver and Receiver	(see Figure 6-1)

READ/WRITE DATA AND CLOCK

Type	differential
Wire	twisted coax with common shield 90 ohm impedance to shield 180 ohm impedance to other conductor
Termination	91 ohms to ground at both ends
High Level	+1 ± .4V
Low Level	0 ± .1V
Logical States	P line High; M line low — logical 0 P line low; M line high — logical 1
Clock Receiver	See Figure 6-2
Data Driver/ Receiver	See Figure 6-3

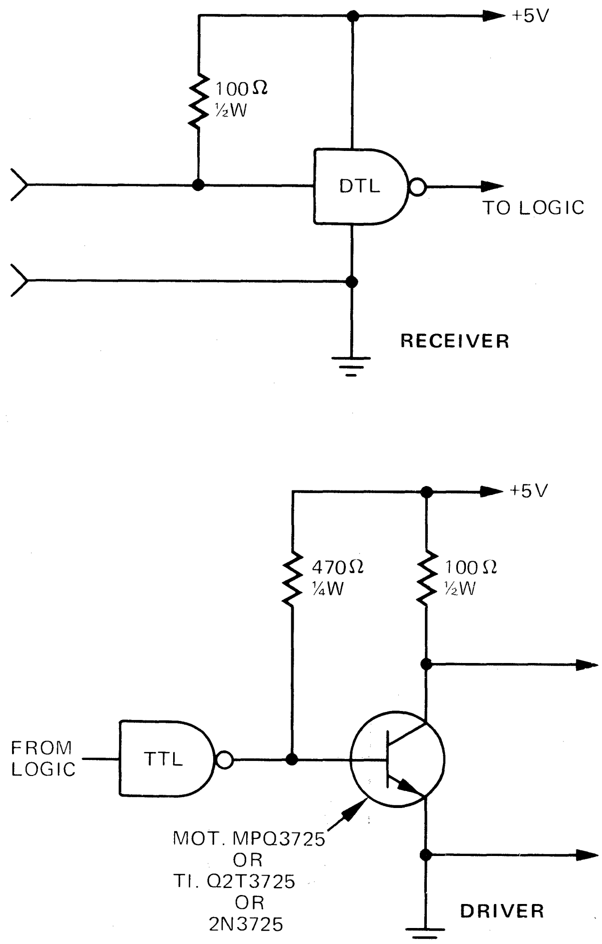


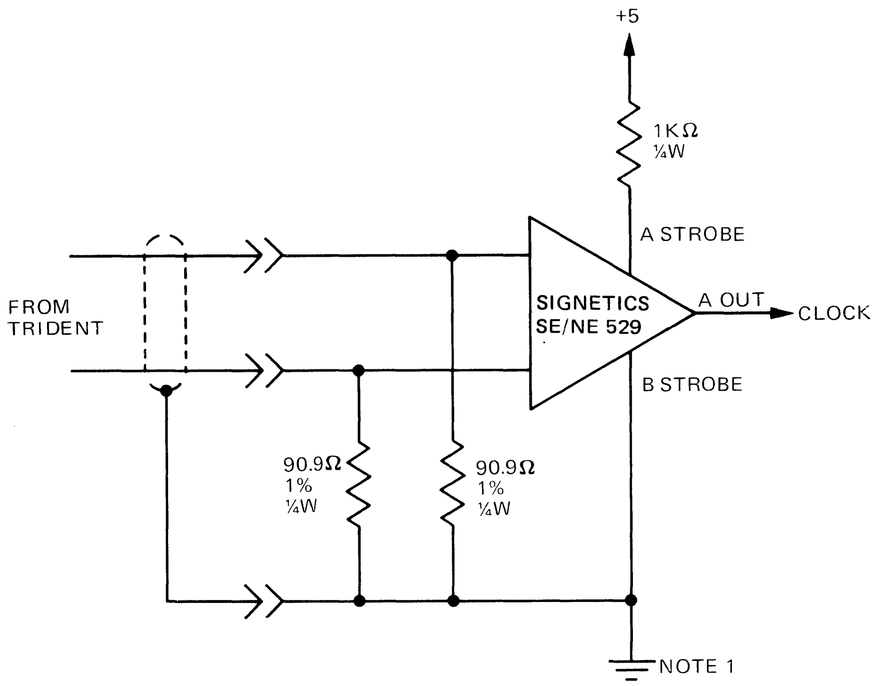
Figure 6-1. Recommended Logic Driver/Receiver

MATING CONNECTORS

Bussed connector	12424-001
Radial connector	12433-001
Line Terminator	12421-001

CABLE LENGTH

Bussed cable	100 feet max (30 M)
Radial cable	100 feet max (30 M)



NOTES:
1. ALL CONNECTIONS TO GROUND MUST BE MADE ON THE BOARD CONTAINING THE RECEIVER, INCL. SHIELD.
2. DECOUPLING CAPACITORS (.047 µfd OR GREATER, MUST BE CERAMIC) MUST BE ON THE BOARD PHYSICALLY NEAR THE RECEIVER.

OR

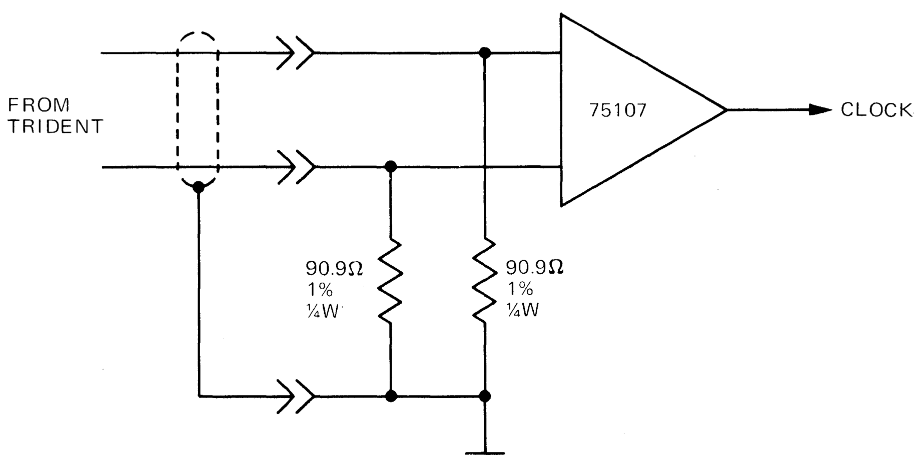
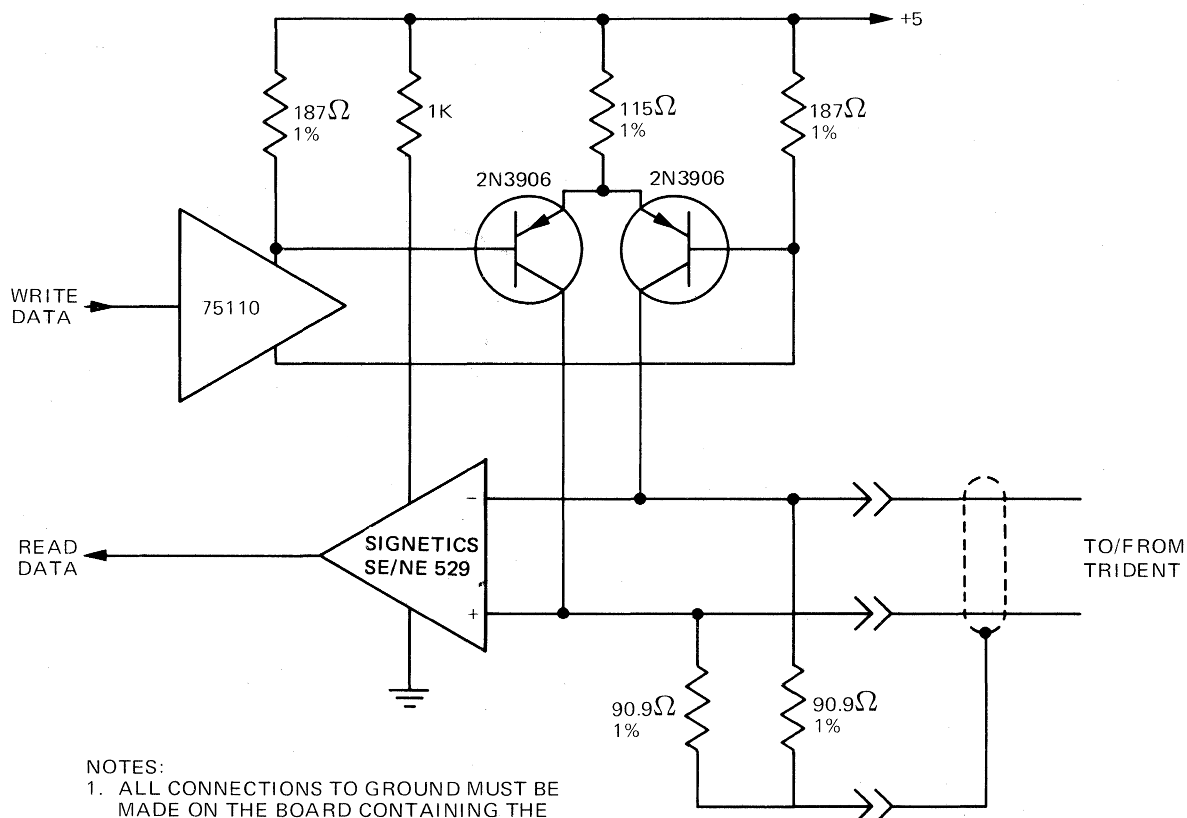


Figure 6-2. Recommended Clock Receiver



NOTES:
1. ALL CONNECTIONS TO GROUND MUST BE MADE ON THE BOARD CONTAINING THE RECEIVER, INCL. SHIELD.
2. DECOUPLING CAPACITORS (.047 μfd OR GREATER, MUST BE CERAMIC) MUST BE ON THE BOARD PHYSICALLY NEAR THE RECEIVER.

OR

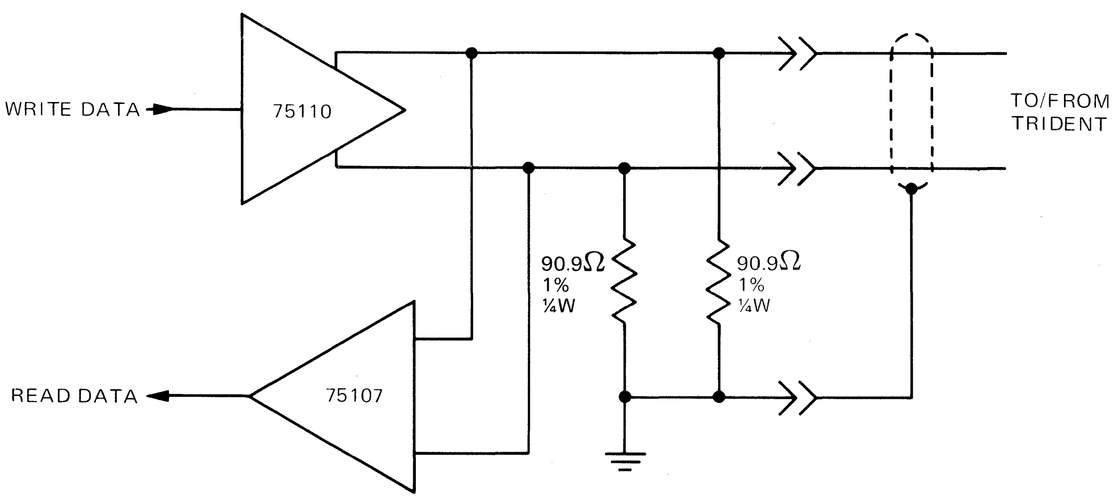


Figure 6-3. Recommended Data Receiver/Driver

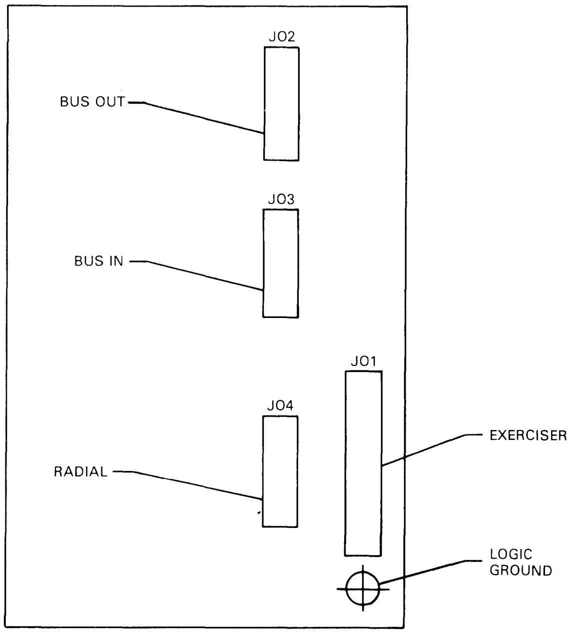


Figure 6-4. Signal Connector Locations

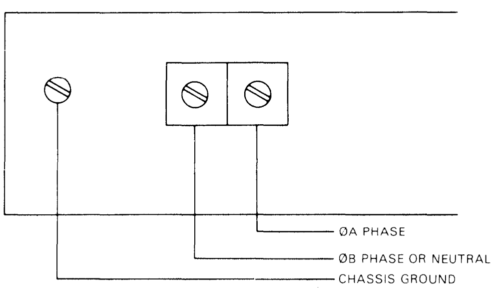


Figure 6-5. Power Connection

PIN NO.	SIGNAL	PIN NO.	SIGNAL
01	SECTOR	21	GROUND
02	END OF CYLINDER	22	BUS 1
03	ADDMKDET	23	GROUND
04	OFFSET	24	BUS 2
05	TERMINATOR +5V	25	GROUND
06	INDEX	26	BUS 3
07	TERMINATOR +5V	27	GROUND
08	READY	28	BUS 4
09	GROUND	29	GROUND
10	RDONLY	30	BUS 5
11	GROUND	31	GROUND
12	DEVICE CHECK	32	BUS 6
13	GROUND	33	GROUND
14	ONLINE	34	BUS 7
15	GROUND	35	TERMINATOR IN
16	SEEK INCOMPLETE	36	BUS 8
17	GROUND	37	CONTROLTAG
18	SPARE	38	BUS 9
19	GROUND	39	SETCYLTAG
20	BUS 0	40	SETHDTAG

Figure 6-6. Bussed Cable Pin Numbers

PIN NO.	SIGNAL	PIN NO.	SIGNAL
01	TERMINATOR +5V	11	GROUND
02	TERMINATOR +5V	12	SELECT
03	GROUND	13	GROUND
04	COMPSECIDX	14	R/W DATA P
05	GROUND	15	GROUND
06	ATTENTION	16	R/W DATA M
07	GROUND	17	GROUND
08	SELECTED	18	R/W CLOCK P
09	GROUND	19	GROUND
10	SEQUENCE	20	R/W CLOCK M

Figure 6-7. Radial Cable Pin Numbers

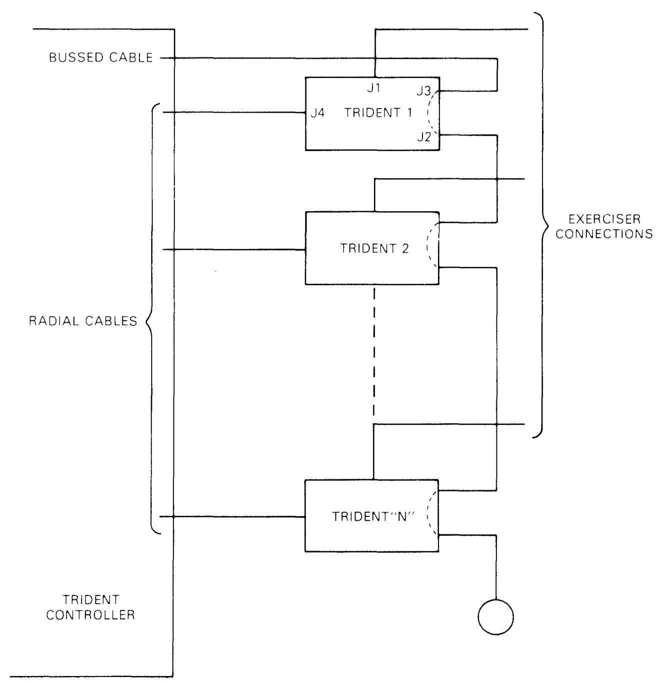


Figure 6-8. Cabling Diagram

SECTION 7
CONTROLS AND INDICATORS

FRONT PANEL

Start

This toggle switch controls power to the spin motor only. All internal power supplies are energized even when this switch is off.

Read Only

This toggle switch is placed in the Read Only position to inhibit any writing on the pack. The inhibit is activated and released only when the drive is not selected.

Device Check

This indicator is lit whenever an internal failure or control error is detected. It is reset by the Device Check Reset I/O Command.

Ready

This indicator is off when the drive is not ready. It blinks during the power-up or power-down sequences and is on when the drive is ready to accept commands from the controller.

REAR PANEL

AC Power

This toggle switch controls power to the ent TRIDENT disk drive.

INTERNAL

Degate Switch

This toggle switch is PC card mounted. In the interfac position, the controller interface is enabled and th exerciser interface is disabled. In the opposite positio the controller is disabled and the exerciser is enabled If it is placed in the degate position prior to power-u or power-down, transient signals do not disturb an other TRIDENT on the same controller bus. The monitoring capabilities of the exerciser are active in eithe position.

Sector Count Selection

Two IC sockets are wired to accept jumpers coded to select sector count information.

SECTION 8
ENVIRONMENTAL CHARACTERISTICS

GENERAL

The disk pack and disk drive shall be subjected to the same environmental conditions for at least two hours before the disk pack shall be installed and used in the disk drive.

TEMPERATURE

Equipment Operational:	60°F to 100°F (15°C to 38°C) with a max. gradient of 20°F (11°C) per hour.
Equipment Non-operational:	−40°F to 150°F (−40°C to 65°C)
Temperature Cycling:	No condensation shall result.

HUMIDITY

Equipment Operational:	10% to 80 % R.H., with a wet bulb temp. limit of 75°F (24°C) provided there is no condensation.
Equipment Non-operational:	5% to 80% R.H., provided there is no condensation.

ALTITUDE

Equipment Operational:	32 in. Hg. to 24 in. Hg. (81 cm to 61 cm)
Equipment Non-operational:	From 1,000 feet below sea level to 40,000 feet above sea level. (12 KM)

VIBRATION

Equipment Operational:	The equipment shall withstand a peak displacement of ±0.006 in. (.015 cm) for the frequency range of 5 Hz to 60 Hz and ±1g for the 60 Hz to 500 Hz range.
Equipment Non-operational:	The equipment, without internal bracing and/or external packaging, shall withstand ±1.5g from 5 Hz to 55 Hz for one hour along each of three mutually perpendicular axes, with a 20 minute sweep time. (Except heads must be held retracted as for shipping.)

SHOCK

The equipment in non-operational status shall not suffer damage or fail to operate according to specifications, when subjected to 18 impact shocks of 5g (±10%) consisting of 3 shocks along each direction of three mutually perpendicular axes. Each shock impulse shall be a half sine wave with a time duration of 11 (±1) msec.

DUST CONTROL

The disk drive is equipped with air filters to ensure the circulation of clean air through the disk drive. All air filtration and air moving mechanisms are completely within the assembly. The pack area is completely closed while the disk drive is operational except for designated air entrance and exit channels. Care should be taken to keep dust and dirt exposure via the service/pack area openings to a minimum.

SECTION 9
POWER REQUIREMENTS

AC POWER

Voltage	Frequency	Phasing	Current (Amperes) Run	Start
100-127 VAC	60 Hz ±1%	Line to Neutral	7.5	24-30
100-127 VAC	50 Hz ±1%	Line to Neutral	7.5	24-30
162-264 VAC	60 Hz ±1%	Line to Neutral	4.5	13
162-264 VAC	50 Hz ±1%	Line to Neutral	4.5	13
162-264 VAC	60 Hz ±1%	Line to Line	4.5	13
162-264 VAC	50 Hz ±1%	Line to Line	4.5	13

DC POWER

Internally generated.

TERMINATOR POWER

+5V ±5%, 1.2A maximum

SECTION 10
PHYSICAL CHARACTERISTICS

TABLE TOP MOUNTING

Height	10 3/8" (26 cm)
Width	17 1/2" (44 cm)
Depth	32" (81 cm)
Weight	200 pounds (91 kgms)

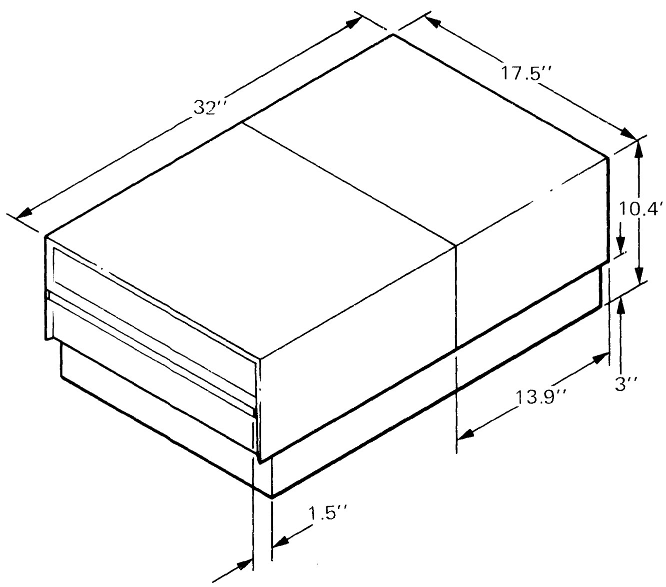


Figure 10-1. Outline Dimensions

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