

DRIVETEC 320

SuperMinifloppy

OEM MANUAL

DRIVETEC

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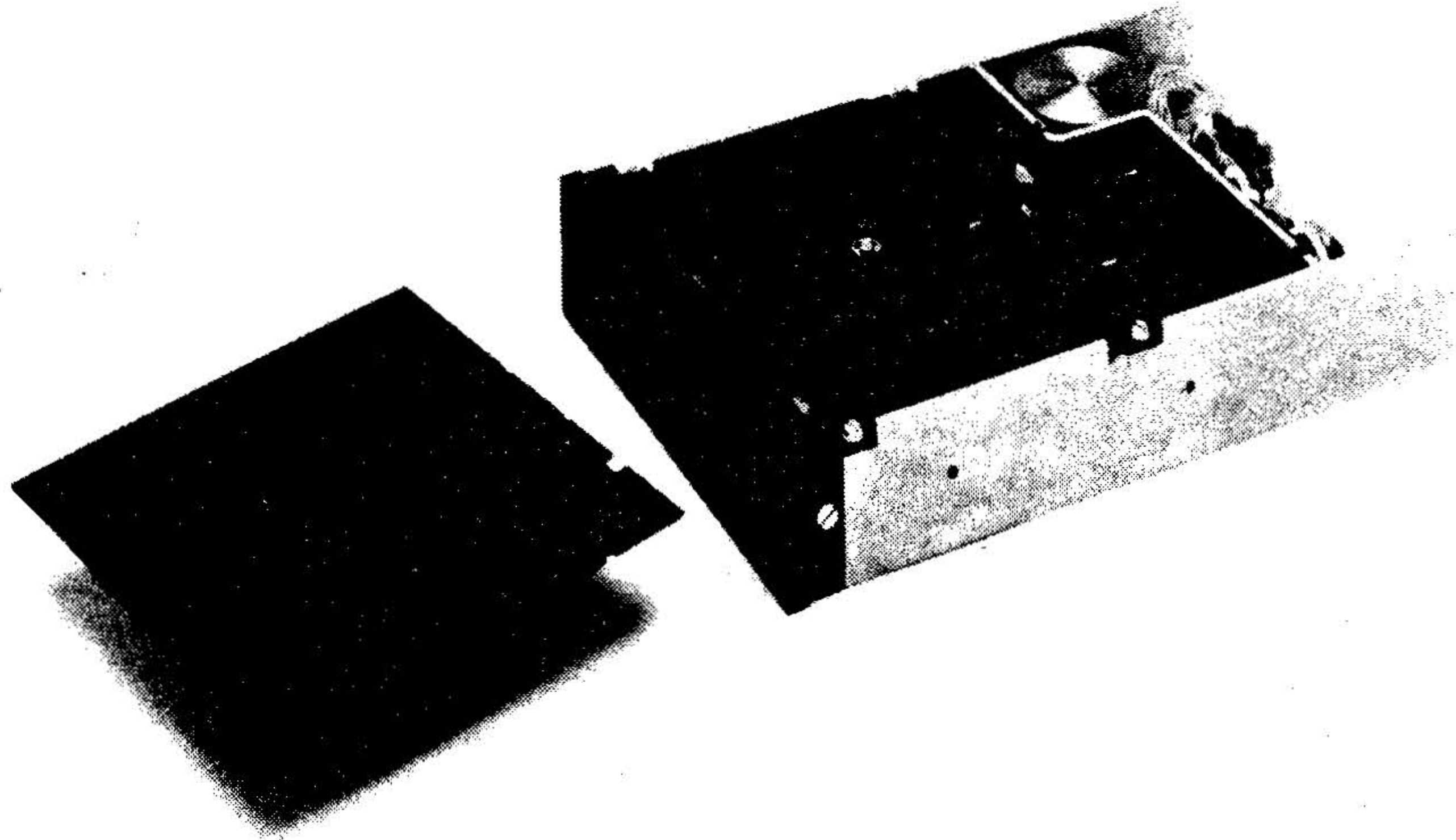


FIGURE 1. DRIVETEC 320

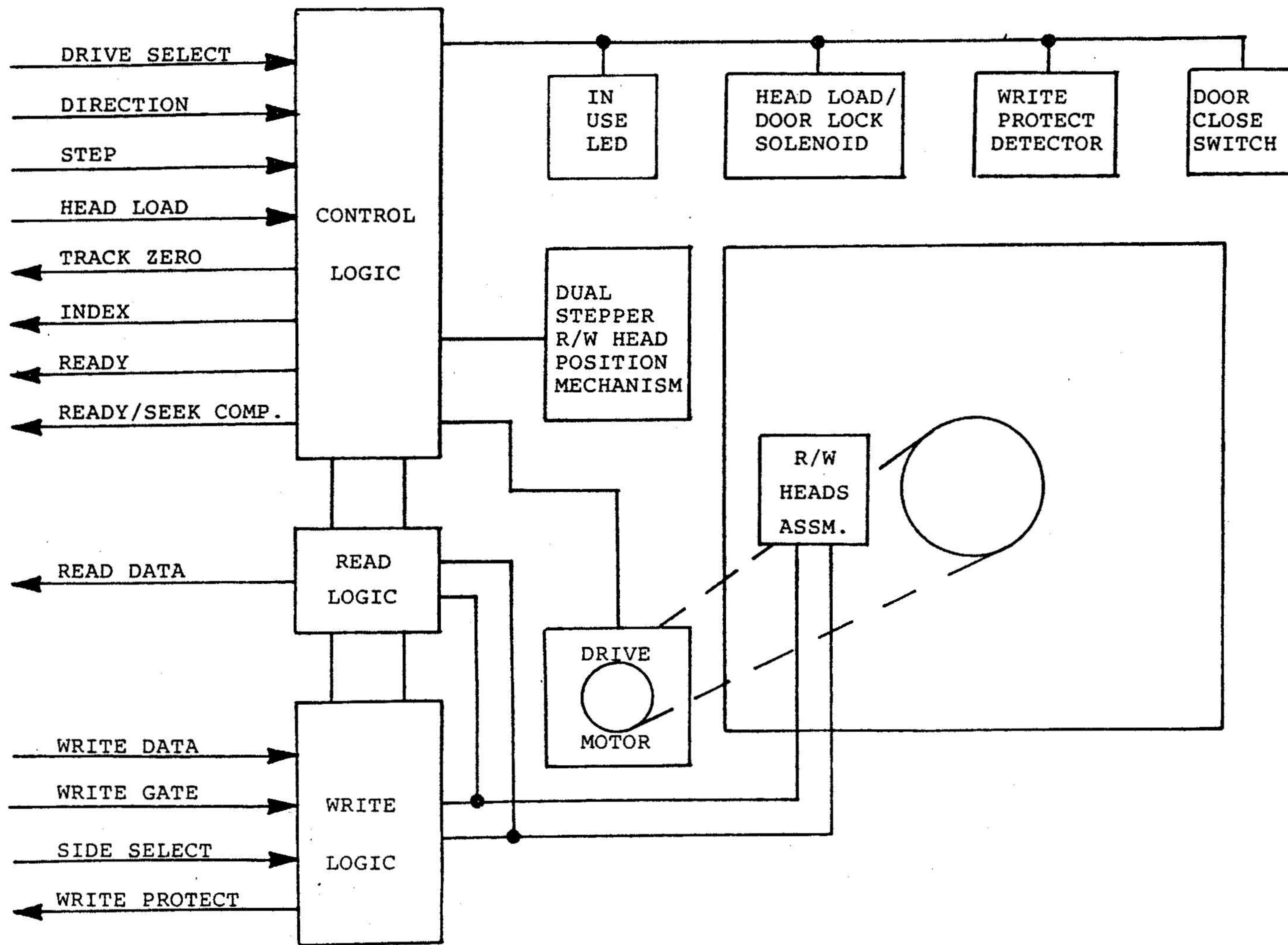


FIGURE 2. DRIVETEC 320 FUNCTIONAL DIAGRAM

1.0 INTRODUCTION

1.1 GENERAL DESCRIPTION

The Drivetec model 320 is a double-sided, closed loop embedded servo, 5.25 inch mini-diskette storage disk drive. This drive offers high reliability, high performance, and large storage capacity for OEM applications.

There are 160 cylinders having a total of 320 tracks with an unformatted capacity of 3.33 megabytes. All the electronics and mechanics are designed within 1.625" height x 5.75" width x 8.485" depth. A patented read/write head using existing technology is positioned to an accuracy of 200 micro inches through a dual stepper closed loop servo system. A brushless D.C. drive motor is utilized providing a speed tolerance of ±1%.

KEY FEATURES:

- * 192 Tracks Per Inch
- * 3.33 Megabytes Unformatted Capacity
- * 500 Kbit/second Transfer Rate
- * Brushless D.C. Drive Motor
- * Door Lock
- * Write Protect
- * LED Front Panel Indicator
- * Minifloppy I/O Compatibility
- * Buffered Seek
- * Downward Compatibility to 48 T.P.I.

1.2 SPECIFICATION SUMMARY

1.2.1 PERFORMANCE SPECIFICATIONS

Capacity	
Unformatted	
Per Drive	3.33 Megabytes
Per Surface	1.67 Megabytes
Per Track	10416 Bytes
Formatted	
Per Drive	2.94 Megabytes
Per Surface (18 sector/track)	1.47 Megabytes
Per Sector	512 Bytes
Transfer Rate	500 Kbits/second
Access Time	
Track to Track	3 Milliseconds
Average Access	160 Milliseconds
Acquisition Time	35 Milliseconds
Average Latency	83 Milliseconds

1.2.2 FUNCTIONAL SPECIFICATIONS

Rotational Speed	360 R.P.M.
Recording Density	9908 B.P.I.
Flux Density	9908 F.C.I.
Track Density	192 T.P.I.
Cylinders	160
Tracks	320
Read/Write Heads	2
Encoding Method	MFM
Media Requirements	Flexible Diskette 50u" Oxide on 0.003" Mylar 5.25" Square Jacket

1.2.3 RELIABILITY SPECIFICATIONS

M.T.B.F.	10,000 P.O.H. (Under Typical Usage)
M.T.T.R.	15 Minutes
P.M.	Not Required
Component Life	5 Years
Error Rates	
Soft read error	1×10^9 Bits Read
Hard Read Error	1×10^{12} Bits Read
Seek Error	1×10^6 Seeks
Media Life	3.5×10^6 Passes Per Track 30,000 Media Insertions

1.2.4 PHYSICAL SPECIFICATIONS

Environmental Limits	Operating
Ambient Temperature	50°F to 115°F (10°C to 46°C)
Relative Humidity	20% to 80%
Maximum Wet Bulb	78°F (26.6°C) Non-Condensing

D.C. Voltage Requirements	
+5 V.D.C. $\pm 5\%$	@ .41 Amps Typical, .42 Amps Max.
+12 V.D.C. $\pm 5\%$	@ .9 Amps Typical, 1.40 Amps Max.

Mechanical Dimensions	
Width = 5.75 in. (146.1 mm)	
Height = 1.625 in. (41.3 mm)	
Depth = 8.485 in. (215.5 mm)	
Weight = 2 lbs. 8 ozs. (1.12 Kg)	

Power Dissipation	
20 Watts (68.2 BTU/Hr) Continuous	
13 Watts (44.3 BTU/Hr) Standby	

2.0 FUNCTIONAL CHARACTERISTICS

The Drivetec 320 Super minifloppy disk drive consists of:

1. Read/Write and Control Electronics
2. Precision Track Positioning Mechanism
3. Read/Write Heads
4. Drive Motor Mechanism

2.1 ELECTRONICS

The electronics are packaged on one P.C.B. which contains:

1. On-board Microprocessor Head Positioning Circuitry
2. Read/Write Amplifier
3. Drive Motor Speed Control
4. L.S.I. Control Circuitry
5. Write Protect

2.2 DRIVE MOTOR MECHANISM

The D.C. drive motor with electronic speed control rotates the spindle at 360 R.P.M. through a pulley-belt combination. An absolute vertical clamping mechanism insures accurate, repeatable diskette registration.

2.3 TRACK POSITIONING MECHANISM

The read/write heads are mounted on a carriage which is located on precision guide rods to insure accurate radial motion. The read/write heads use manganese zinc ferrite and are glass bonded to the sliders to insure stable performance. Read/write head positioning and head track following is accomplished on a closed loop basis using servo data recorded before each sector I.D. on the diskette.

2.4 DISKETTES

The diskettes required by the drive must be preformatted prior to system usage. The information contained on the diskette includes embedded servo data to insure proper head/track following.

3.0 THEORY OF OPERATION (SERVO SYSTEM)

3.1 DUAL STEPPER POSITIONING MECHANISM

The Drivetec 320 uses two stepper motors, both under microprocessor control. One motor will coarse position the read/write heads on a desired track (open loop), the other motor will continually fine position the read/write heads to the center line of recorded data (closed loop).

3.1.1 COARSE STEPPER MOTOR

The coarse stepper motor has a 15 degree angle per step which positions the read/write heads at 192 tracks per inch. The positioning mechanism is a Lead Screw connecting to a nut follower on the carriage assembly.

3.1.2 FINE STEPPER MOTOR

The fine stepper motor has a threaded shaft which is connected to a pivot lever by a screw nut. This pivot lever acts against the spring load of the coarse stepper rotor and pivots about a fulcrum point on the base casting. For each step of the motor, the screw nut is moved one thousandth of an inch. Due to the five to one mechanical advantage of the pivot lever, a five to one ratio of motion will occur causing the carriage assembly to move 200 microinches.

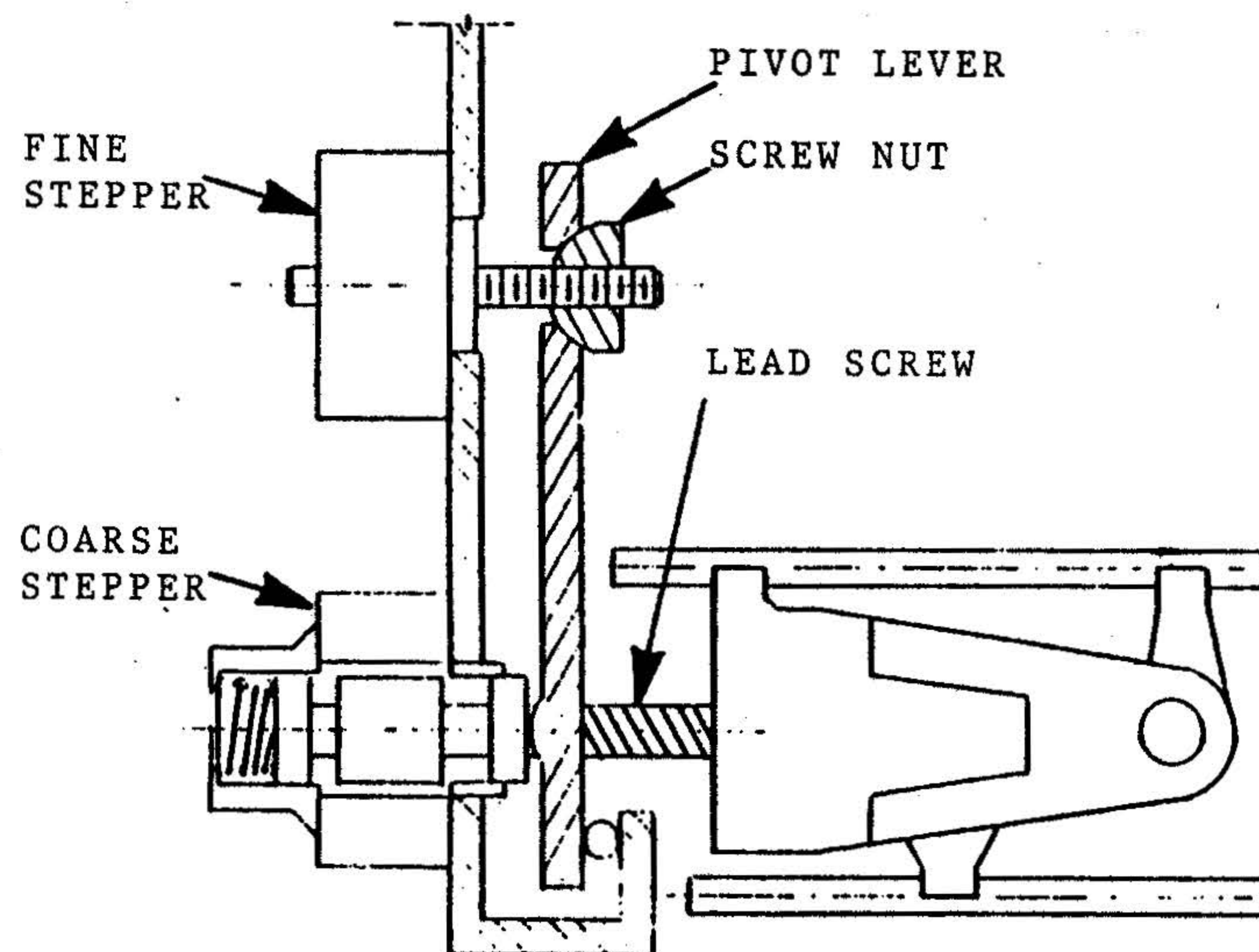


FIGURE 3. DUAL STEPPER POSITIONING MECHANISM

3.2 EMBEDDED SERVO DATA

3.2.1 LOCATION

During the formatting process of the diskette, servo data will be recorded before each sector ID header on each track. It is recorded one half track off in either direction of the center line of recorded data.

3.2.2 SERVO DATA DESCRIPTION

There are four unique servo data patterns recorded A, B, C, and D. The servo data patterns will utilize the same data with only the length of the data recorded identifying the unique pattern. Only two patterns will be used per track A + B for track 00, B + C for track 01, C + D for track 02, D + A for track 03, etc.

3.2.3 TRACK FOLLOWING OPERATION

As the read data is decoded from the diskette it will be presented to two electronic devices. The first device will do a digital identification of the servo patterns. Once the servo patterns have been identified it will interrupt the microprocessor and transfer the ID of the two servo patterns (i.e. A, B, C, or D servo bursts). The second device will perform an analog to digital conversion of the servo data patterns. It will then transfer this digital data to the microprocessor in the form of a two bit code which indicates any differences in the amplitude that occurred between the two patterns. When differences occur the microprocessor will reposition the fine stepper motor toward the center line of recorded data. This process will be repeated each time a servo pattern is detected. The multiple servo patterns recorded on each track allow the electronics to constantly update the position of the read/write heads compensating for any thermal or hydroscopic expansion or contraction of the diskette.

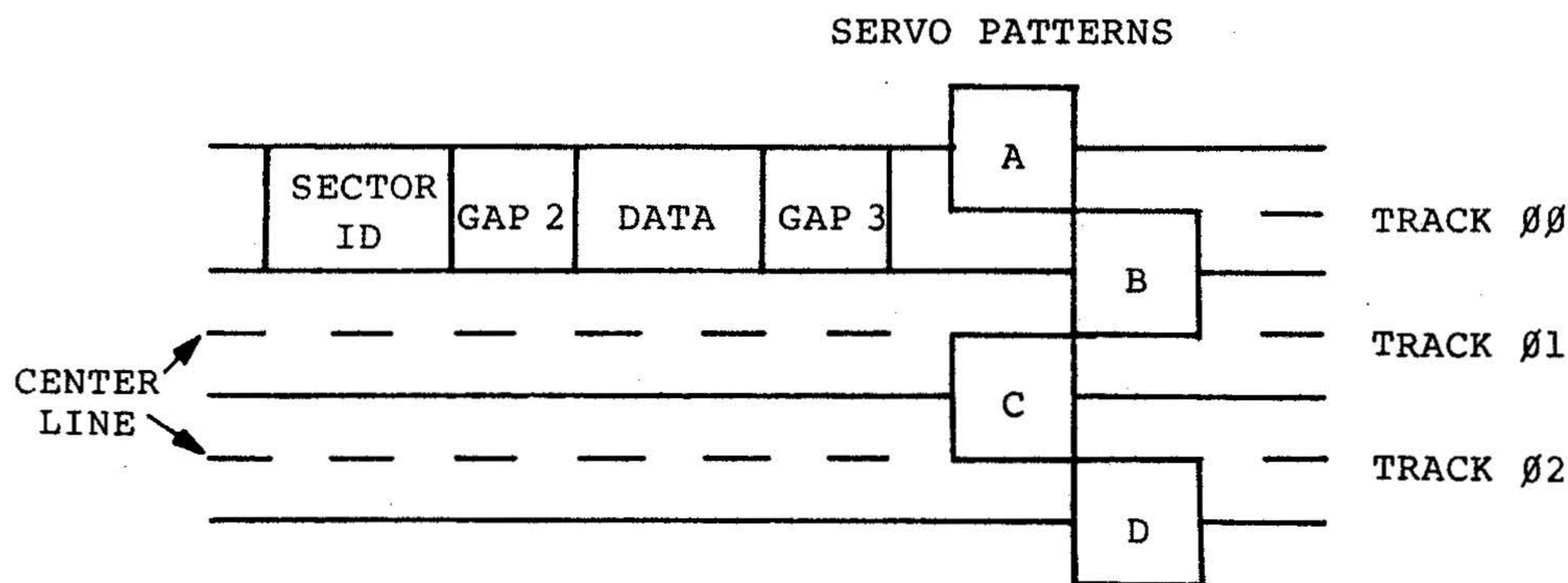


FIGURE 4. LOCATION OF SERVO PATTERNS

4.0 FUNCTIONAL OPERATIONS

4.1 POWER SEQUENCING

Applying D.C. power can be done in any sequence; however, during power up, the WRITE GATE line must be held inactive or at a high logic level to prevent destroying previously written data. After power is applied, approximately 2 sec. delay must be allowed prior to performing any seek, read or write operation. Automatic recalibration to track zero will occur when power is applied or upon diskette ejection.

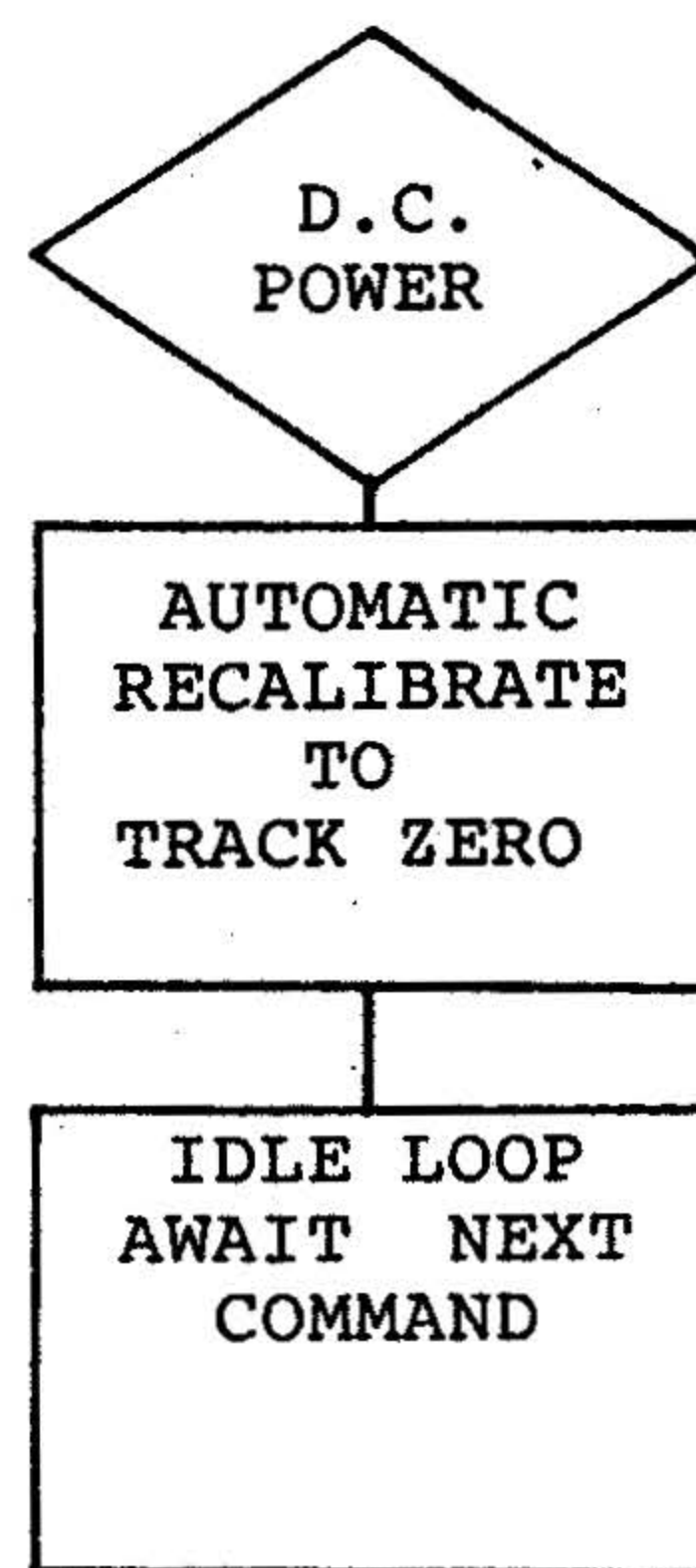


FIGURE 5. POWER ON

4.2 DRIVE SELECTION

A low logic level on this line enables communication between the individual drive and the controller. When two or more (up to four) drives are daisy chained, each drive must have a unique DRIVE SELECT address. The DRIVE SELECT address is controlled by a selectable switch DS1 through DS4. Only the drive with this line active will respond to input lines or gated output lines and lights the activity L.E.D. on the front of the drive.

4.3 DRIVE MOTOR

The drive motor will start upon diskette insertion and runs continuously as long as +5 V.D.C. and +12 V.D.C. are applied. When the diskette is removed the drive motor will stop.

4.4 TRACK POSITIONING

Seeking the read/write heads from one track to another is accomplished by:

- A. Activating DRIVE SELECT line.
- B. WRITE GATE being inactive.
- C. Monitor READY until active.
- D. Selecting the desired direction utilizing DIRECTION line.
- E. Pulsing the STEP line.
- F. Monitor READY/SEEK COMPLETE until active.

Multiple track accessing is accomplished by repeating pulsing of the STEP line until the desired track has been reached and READY/SEEK COMPLETE has become active. Head movement is initiated on the trailing edge of the STEP pulse. A low logic level on the DIRECTION line will cause a seek inward toward the spindle; a high logic level will cause a seek outward toward track zero.

4.5 SIDE SELECT

Head selection is controlled via the I/O signal line designated SIDE SELECT. A high logic level on the SIDE SELECT line selects the read/write head on the side 0 surface of the diskette. A low logic level selects the side 1 read/write head. When switching from one side to the other a 100 microsecond internal delay is required prior to read data being valid. After the internal delay has expired the drive electronics will read the servo data and position the read/write head on the center line of recorded data and allow READ DATA to be valid after READY/SEEK COMPLETE becomes active.

4.6 READ OPERATION

Reading data from the Drivetec 320 is accomplished by:

- A. Activating DRIVE SELECT line.
- B. Selecting the desired read/write head.
- C. WRITE GATE being inactive.
- D. READY/SEEK COMPLETE and READY being active.

4.6 READ OPERATION CONT.

The encoding scheme of the recorded data is Modified Frequency Modulation. Encoding rules for MFM allow clock bits to be omitted from some bit cells, with the following prerequisites:

The clock bit is omitted from the current bit cell if either the preceding bit cell or the current bit cell contains a data bit. In this encoding scheme clock bits are written at the start of their respective bit cells and data bits at the center of their bit cells.

4.7 WRITE OPERATION

Writing data to the Drivetec 320 is accomplished by:

- A. Activating the DRIVE SELECT line.
- B. Selecting the desired read/write head.
- C. Monitor READY/SEEK COMPLETE, WRITE PROTECT and READY.
- D. Read data until sector to be updated has been found.
- E. Activating the WRITE GATE line.
- D. Pulsing the WRITE DATA line with the data to be written.

The timing relationships required to initiate a WRITE DATA sequence are shown in figure 9 and 10. These timing specifications are required in order to guarantee that the read/write heads position has stabilized prior to writing data. DRIVE SELECT or SIDE SELECT may not change nor a STEP command be issued for a minimum of 100 microseconds after WRITE GATE has returned to its inactive state. WRITE DATA encoding is MFM and should not be precompensated.

4.8 DRIVE STATUS LINES

The drive status lines can be verified by:

- A. Activating DRIVE SELECT
- B. Monitoring the following lines for the active or inactive state.
 - * INDEX
 - * WRITE PROTECT
 - * TRACK ZERO
 - * READY
 - * READY/SEEK COMPLETE

5.0 SIGNAL and POWER INTERFACE

Drivetec 320 has two interface connectors. One connector (J1) is for data signals. A second connector (J2) interfaces D.C. power +5 V.D.C. and +12 V.D.C. sources.

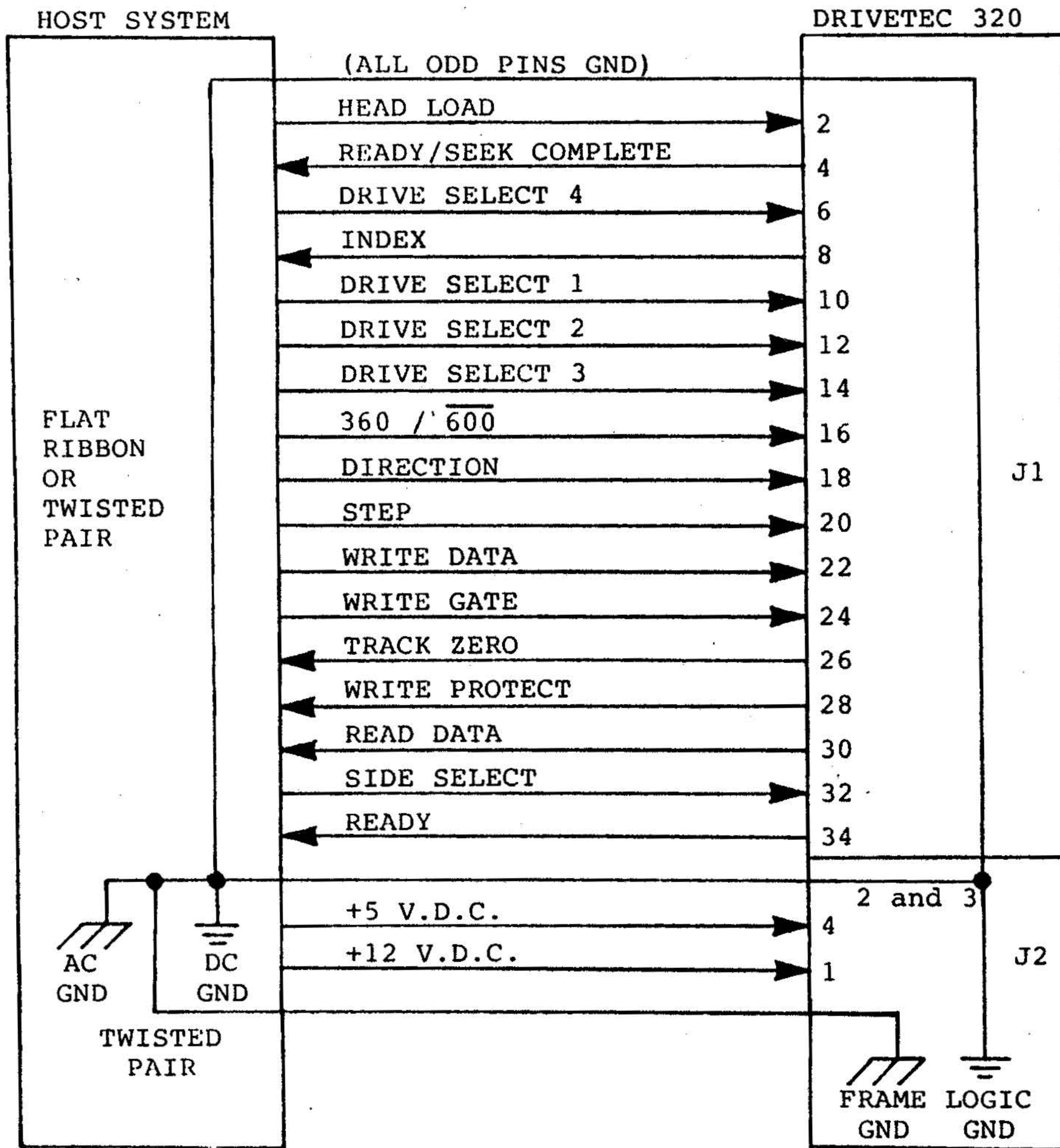


FIGURE 6. INTERFACE

5.1 SIGNAL INTERFACE

All lines in the signal interface are TTL compatible, active (true) when low. Drivetec 320 uses the 7438 driver as a line driver and 7414 schmitt trigger inverter as a line receiver. The input of each receiver is terminated through a 220/330 ohm resistor pack. When using two or more drives on a daisy chain remove all termination resistor packs except for last drive on daisy chain.

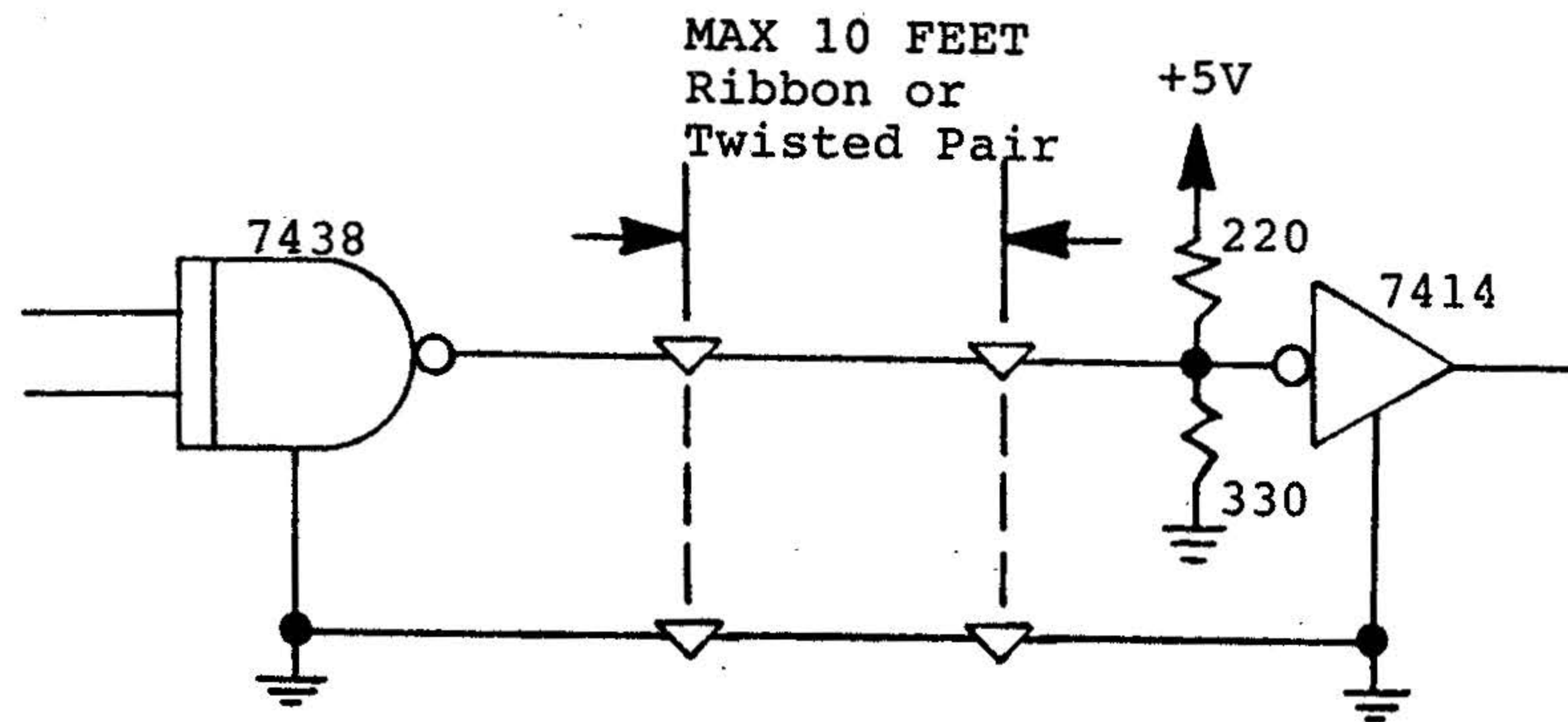


FIGURE 7. INTERFACE DRIVER/RECEIVER

5.2 INPUT LINES

There are eleven (11) low active TTL input lines to the Drivetec 320. Individual signal line characteristics are described below.

High Level:	False	2.4 to 5.25 Volts
Low Level:	True	0 to 0.4 Volts
Impedance:		220/330 ohms to 5V and Ground

5.2.1 DRIVE SELECT (Pins 6,10,12 and 14)

The Drivetec 320 is configured to operate with up to four (4) drives in a multiplexed multiple drive system. Four (4) separate input lines (DS1, DS2, DS3, and DS4) are provided so that up to four (4) drives in a multiplexed system may have separate input pins. Only the drive with its unique DRIVE SELECT line active will respond to commands from the host. A low logic level on the interface selects a unique DRIVE SELECT line for a drive.

5.2.2 DIRECTION (Pin 18)

Direction defines the direction of read/write head movement when the STEP line is pulsed. A low logic level on this line allows the Head Position Mechanism to move the read/write heads toward the center of the diskette when the STEP line is pulsed. With the DIRECTION line at a high logic level, a pulse on the STEP line causes the Head Position Mechanism to move the read/write heads away from the center of the diskette. DIRECTION is monitored during the trailing (positive going) portion of the STEP pulse. The logic state of DIRECTION can be changed at any time after the trailing (positive going) edge of the STEP pulse, and to within 1 microsecond before the trailing edge following STEP pulse. The logic state of DIRECTION cannot be changed during the positive going transition of STEP, or within the preceding 1 microsecond of the positive going transition of STEP. Prior to change of DIRECTION an 18 millisecond delay must be allowed during a seek operation.

5.2.3 STEP (Pin 20)

A low pulsed level on this line will cause the read/write heads to be moved one track. The minimum rate at which the drive will step from one track to another is 3 milliseconds. However STEP pulses can be received at a higher rate of speed in the BUFFERED SEEK mode. The Drivetec 320 has a guard band when step pulses will be ignored due to internal timing restrictions. This guard band is from 20 milliseconds to 22 milliseconds. The direction of movement is controlled by the DIRECTION line.

5.2.3.1 BUFFERED SEEK (OPTIONAL)

Drivetec 320 will allow the user the option to send STEP pulses to the drive at a higher rate of speed. The maximum rate at which STEP pulses can be received is 10 microseconds per step and the minimum is 400 microseconds per step. A unique feature in the BUFFERED SEEK mode is that once the first STEP pulse is received the drive will start to seek while receiving additional STEP pulses in parallel.

5.2.4 WRITE DATA (Pin 22)

This interface line provides the data to be written on the diskette in the appropriate sector. Each transition from a high logic level to a low logic level on this line causes write current to be reversed through the head.

5.2.5 WRITE GATE (Pin 24)

A low logic level on this line enables the write current source and allows data to be written from the WRITE DATA line.

5.2.6 360 / $\overline{600}$ (Pin 16)

Refer to CUSTOMER OPTIONS

A strobed low active level on this line along with DRIVE SELECT will command the spindle motor to increase rotational speed to 600 RPM. The purpose of this function is to provide for downward compatibility read only of 48 TPI diskette's.

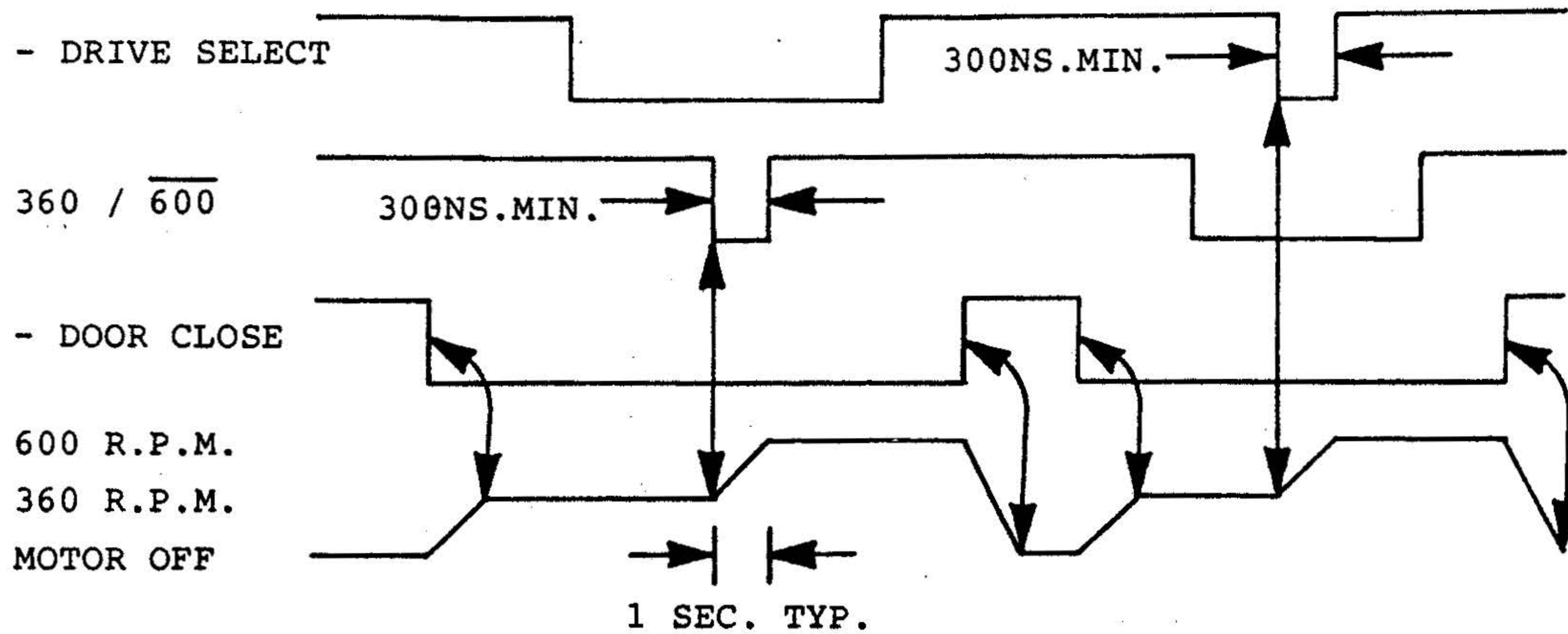


FIGURE 8. SPINDLE SPEED CONTROL TIMING

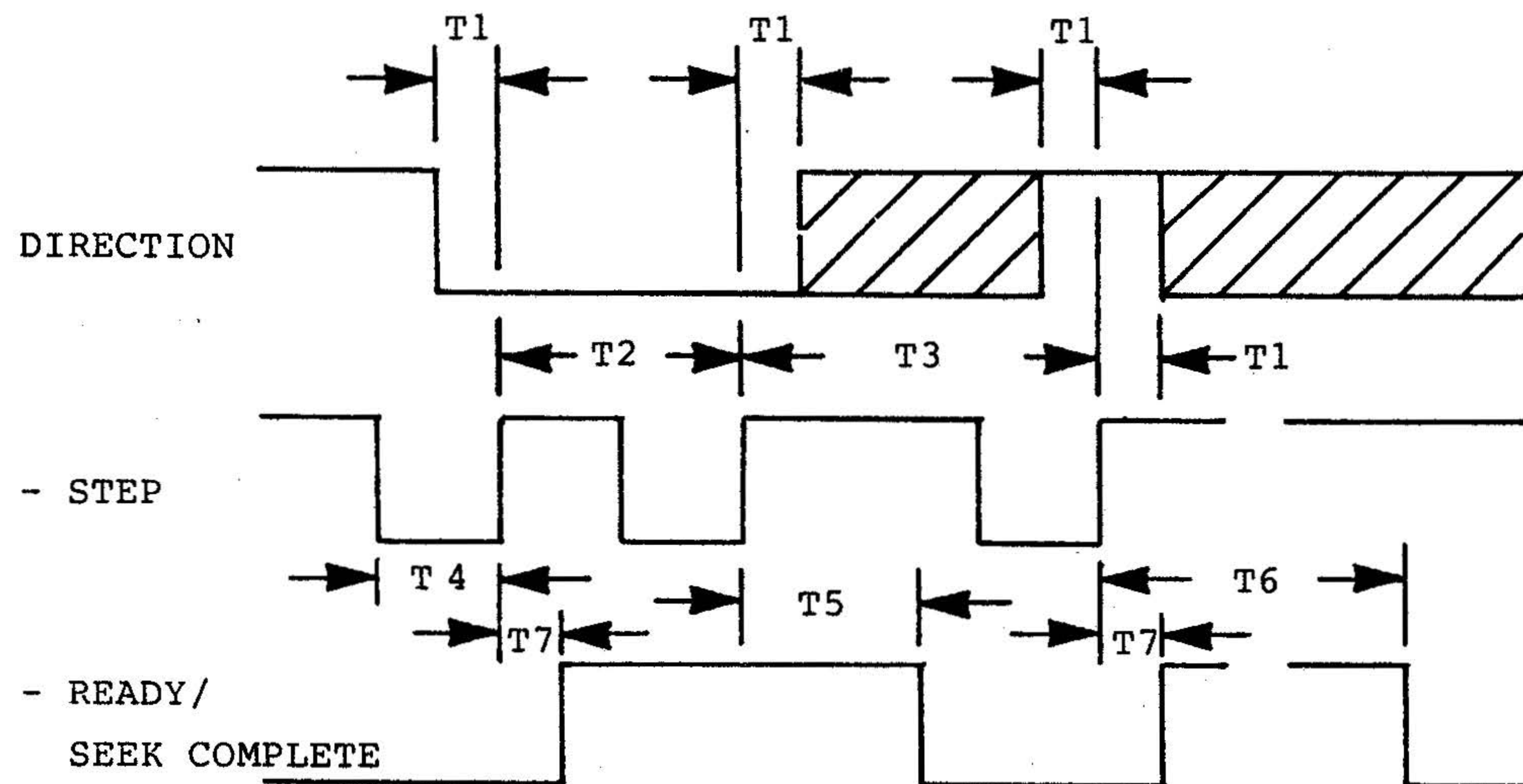
5.2.6 SIDE SELECT (Pin 32)

SIDE SELECT line defines which surface will be used for data recording or retrieval. A low logic level on this line selects the read/write head for surface one (1). A high logic level on this line selects the read/write head for side zero (0) of the diskette. When switching from side 0 to side 1 and conversely, SEEK COMPLETE line must be monitored before any read or write operation can be initiated.

5.2.7 HEAD LOAD (Pin 2)

Refer to CUSTOMER OPTIONS

A low logic level on this option input line will cause the read/write head to be loaded against the diskette if the HL jumper is cut.



GENERAL TIMING	TRACK TO TRACK	BUFFERED SEEK
T1 = 1us MIN.	T2 = 3ms MIN.	T2 = 10us to
*T3 = 18ms MIN.	T5 = 35ms TYP.	400us MAX.
T4 = 1us MIN.		T6 = Dependent on
T7 = 200ns MAX.		Seek Length

*Note Step settle delay prior to change of DIRECTION

FIGURE 9. STEP TIMING

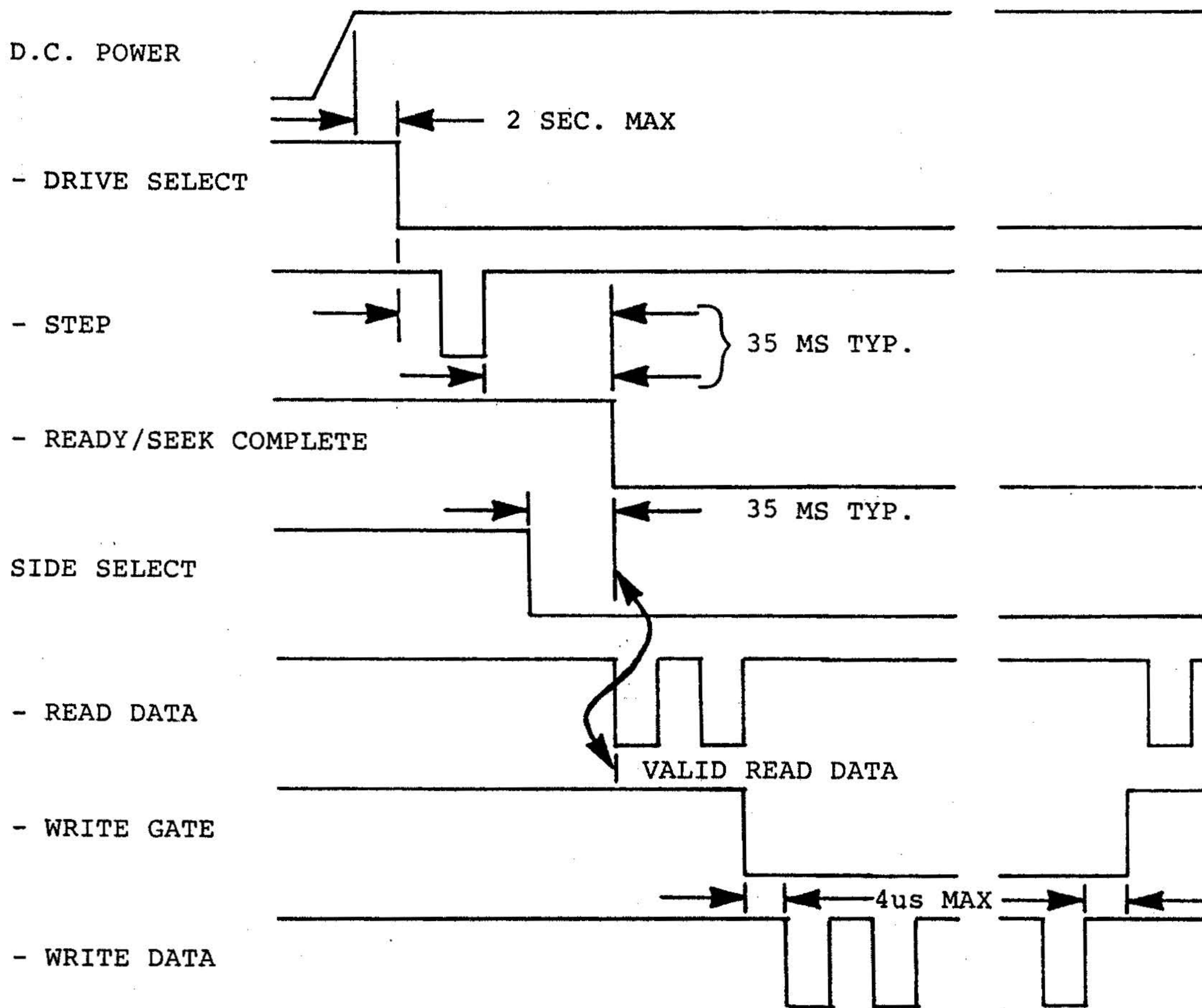
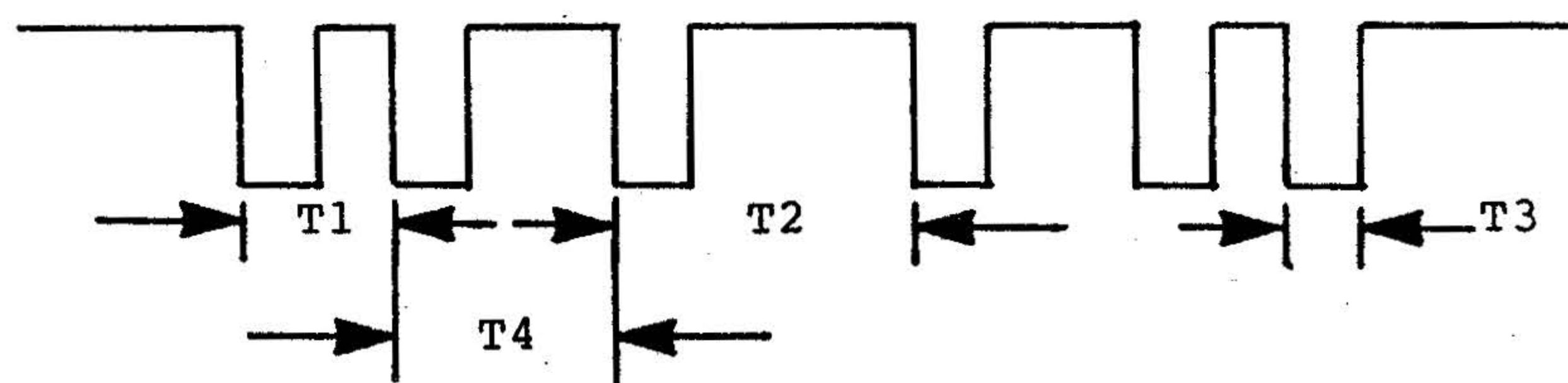


FIGURE 10. WRITE INITIATE TIMING



WRITE DATA TIMING

T1 = 2us \pm 10ns	T3 = 150ns MIN
T2 = 4us \pm 20ns	1100ns MAX
	T4 = 3us \pm 15ns

FIGURE 11. WRITE DATA TIMING

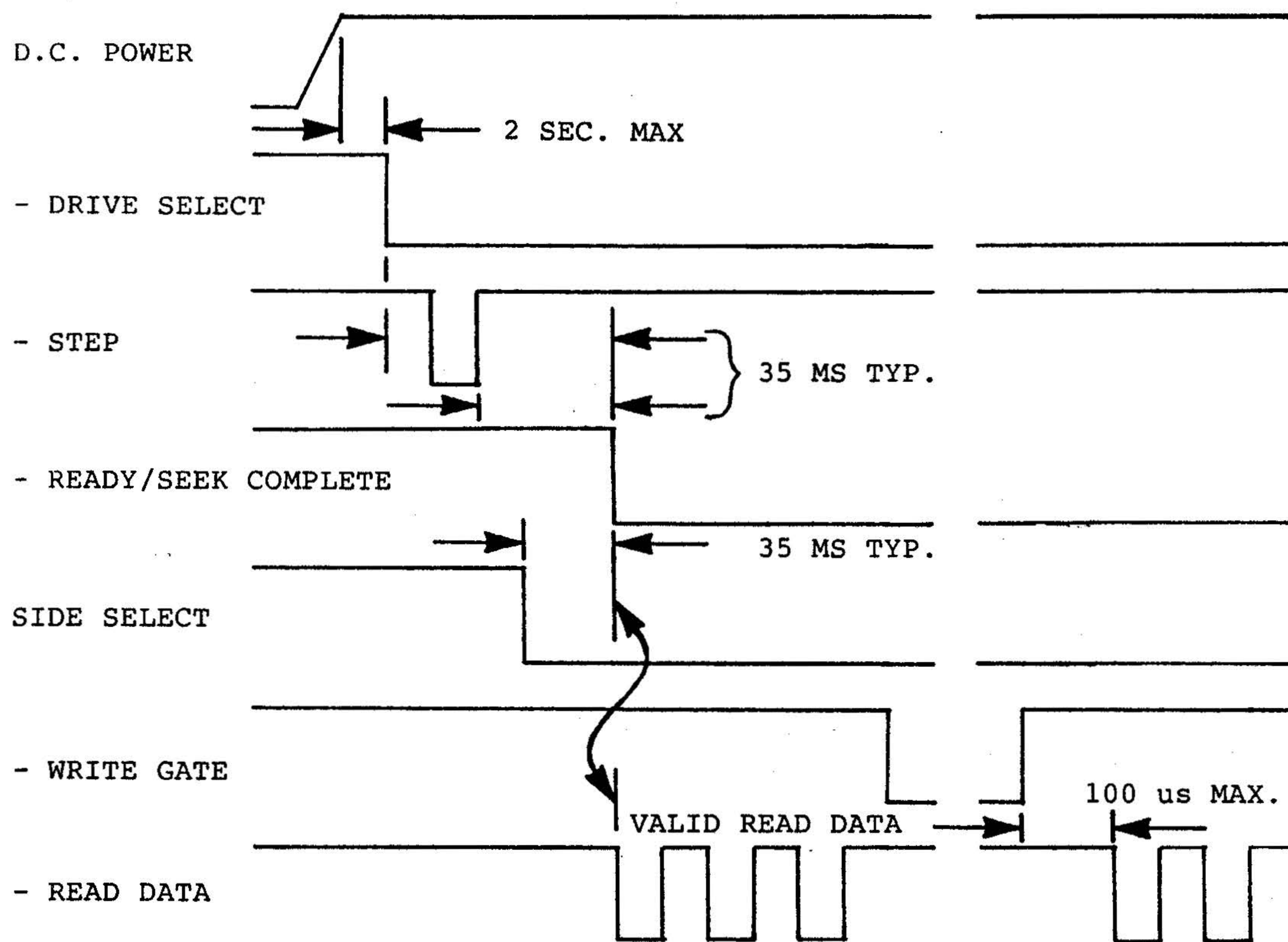
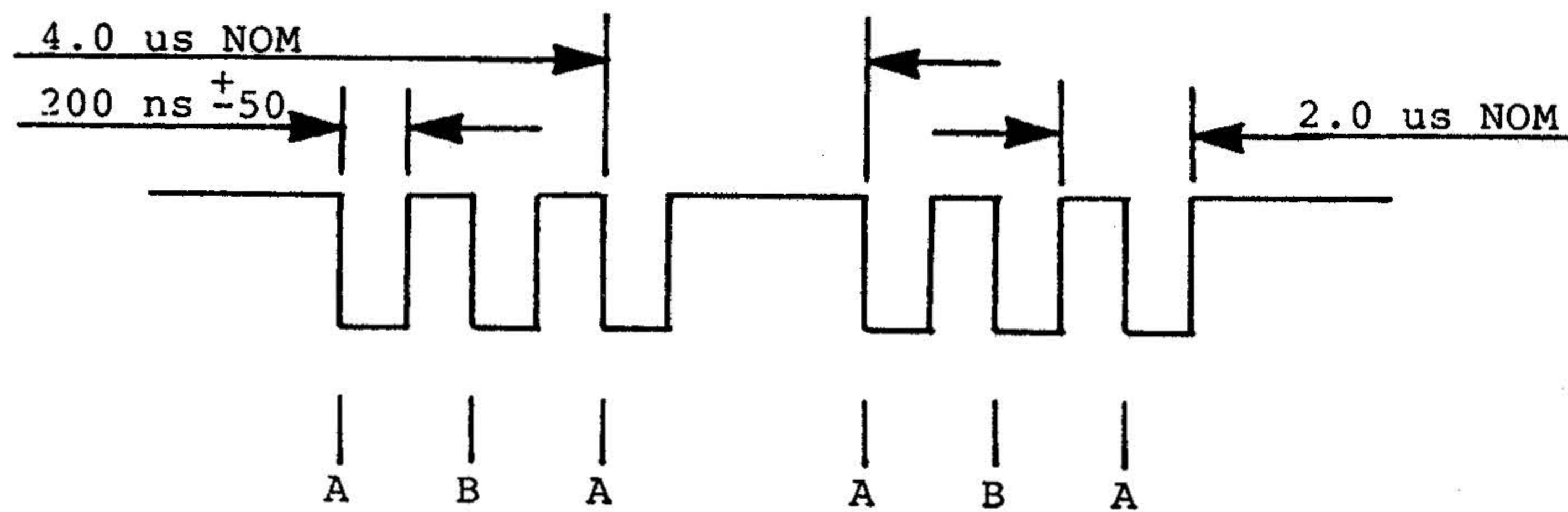


FIGURE 12. READ INITIATE TIMING



A = Leading edge of bit may be \pm 400 ns from its nominal position
 B = Leading edge of bit may be \pm 200 ns from its nominal position

FIGURE 13. READ DATA TIMING

5.3 OUTPUT LINES

There are six (6) output lines from the Drivetec 320 and two (2) Customer options. Each line has the following properties.

High Level:	False	2.4 to 5.25 V, cutoff current 250 uA
Low Level:	True	0 to 0.4 V, MAX. sink 48mA

5.3.1 INDEX (Pin 8)

This interface signal is provided by the drive once each revolution and indicates the beginning of a track. The read/write head senses an Index Pattern recorded on the diskette. The leading (negative going) edge of the INDEX pulse is valid with a minimum pulse width of $1.3 \pm .1$ milliseconds.

5.3.2 TRACK ZERO (Pin 26)

A low active level on this signal line indicates that the read/write heads is positioned at TRACK ZERO. Upon initial power up and door open the Drivetec 320 will automatically recalibrate to TRACK ZERO.

5.3.3 WRITE PROTECT (Pin 28)

A low active level on this signal line indicates that WRITE PROTECTED diskette has been installed. Under normal operation, the drive will inhibit writing when a protected diskette has been installed.

5.3.4 READ DATA (Pin 30)

Data from the diskette is outputted to the host system in the same form as it was received on the write data line. Each flux reversal that is sensed on the diskette produces a transition to a low active level. The leading edge of this signal is the only transition that is valid.

5.3.5 READY (Pin 34)

A low active level on this line indicates that at least two (2) INDEX pulses have been sensed after properly inserting a diskette and closing the door. READY will go inactive if the motor speed is not maintained at its proper rate or if the door is opened.

5.3.6 READY / SEEK COMPLETE (Pin 4)

A low active level on this line indicates that the read/write heads are properly positioned and reading or writing of data is valid. READY/SEEK COMPLETE will go inactive when performing the following commands DRIVE SELECT with STEP, SIDE SELECT, or HEAD LOAD.

5.3.6.1 STEP INTERACTION

Upon completion of the last step pulse the read/write head normally requires a 18 millisecond settle time before READ DATA will become valid. When READ DATA has become valid the drive electronics will start to read the embedded servo data recorded between the sectors. The electronics will then position the read/write head to the centerline of recorded data and then set READY/SEEK COMPLETE to its active state.

5.3.6.2 SIDE SELECT INTERACTION

When switching from one read/write head to the other READY/SEEK COMPLETE will go inactive. The electronics will then position the selected read/write head to the centerline of recorded data and then set READY/SEEK COMPLETE to its active state. At this time the host will have access to read or write data.

5.3.6.3 HEAD LOAD INTERACTION Refer to CUSTOMER OPTIONS

If this option is implemented the READY/SEEK COMPLETE line will remain in its active state. The drive will be track following whether it is currently selected or not.

5.3.6.4 READ DATA / INDEX INTERACTION

At any time DRIVE SELECT is active and READY/SEEK COMPLETE is inactive a 1F (125khz) data pattern will be provided on the READ DATA interface line. INDEX pulses will also be disabled when READY/SEEK COMPLETE is inactive. When READY/SEEK COMPLETE becomes active the raw READ DATA will be provided to the interface along with valid INDEX pulses.

5.4 POWER INTERFACE

The Drivetec 320 requires only D.C. power for operation. D.C. power to the drive is provided via P2/J2 located on the rear of the drive P.C.B.. The two (2) D.C. voltages, their specifications and their P2/J2 pin designators are outlined below. The specifications are for one drive. For multiple drive systems the current requirements are a multiple of the maximum current times the number of drives in the system.

P2 PIN	DC VOLTAGE	TOLERANCE	CURRENT	MAX RIPPLE
4	+5 V.D.C.	±5%	0.41 A TYP. 0.42 A MAX.	50mV
3	+5 Return			
2	+12 Return			
1	+12 V.D.C.	±5%	0.9 A TYP. 1.4 A MAX.	100mV

5.4.1 TYPICAL CURRENT REQUIREMENTS

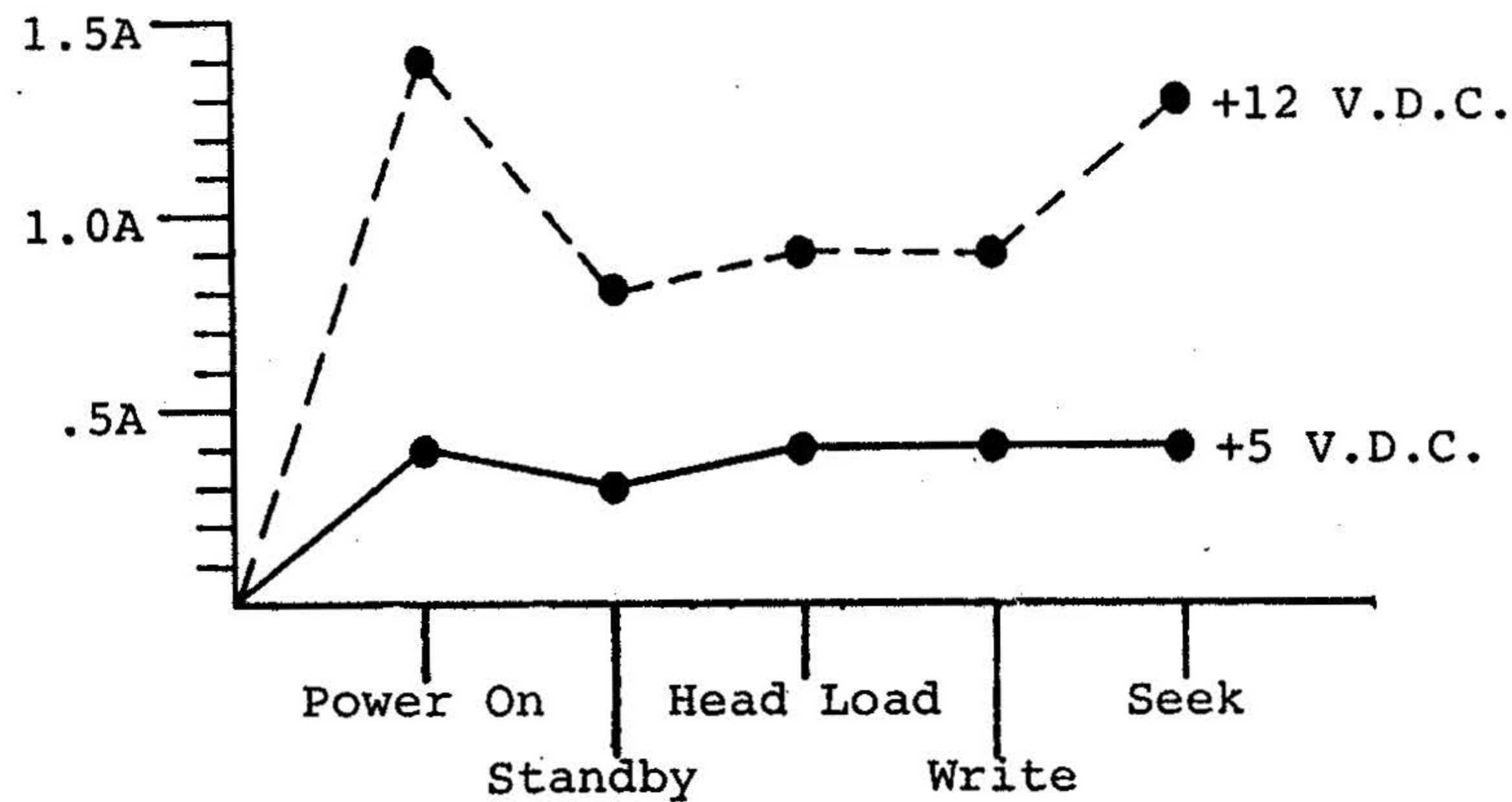


FIGURE 14. CURRENT REQUIREMENTS

5.5 FRAME GROUND

The drive must be frame-grounded to the host system to insure proper operation. If the frame of the drive is not fastened directly to the frame of the host system with a good A.C. ground, a wire from system A.C. frame ground must be connected to the drive. A faston tab is provided on the drive where a faston connector can be installed. The tab is AMP P/N 61664-1 and its mating connector is AMP P/N 60972-1.

5.6 SYSTEM POWER and GROUND DISTRIBUTION

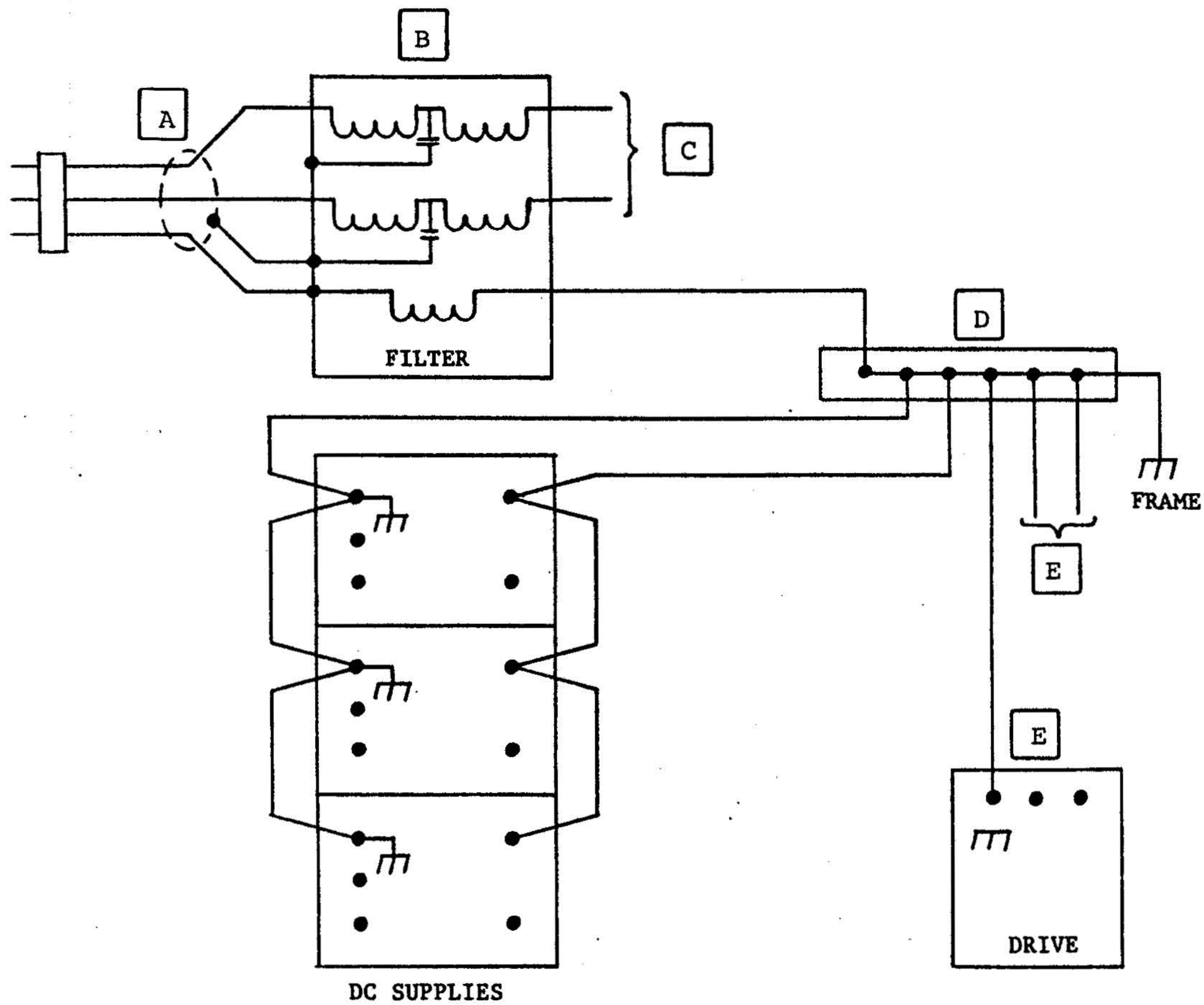


FIGURE 15. POWER DISTRIBUTION

- A. Shielded power cable - should be only one shield and tied to ground at filter end only.
- B. Line filter - Isolated from frame with system ground filtered.
- C. A.C. distribution - Twisted pair cable including ground wire. Wire size must be large enough to maintain less than 25 mv/ft. drop.
- D. A.C. ground TB - Only one connection to frame for all A.C. grounds and one (1) D.C. ground.
- E. D.C. distribution - Separate twisted pair cable from each device type to the D.C. supplies. Wire size should be large enough to maintain less than 10 mv/ft. drop.

6.0 PHYSICAL INTERFACE

The electrical interface between the Drivetec 320 and the host system is via two (2) connectors. The first connector, J1/P1, provides the signal interface and the second connector, J2/P2, provides the D.C. power.

This section describes the physical connectors used on the drive and recommended connectors to be used with them.

6.1 J1/P1 CONNECTOR (Signal)

Connection to J1 is through a 34 Pin P.C.B. edge connector. The dimensions for this connector are shown in figure 13. The pins are numbered 1 through 34 with the even numbered pins containing control and data signals and the odd pins being ground. A key slot is provided between pins 4 and 6 for optional connector keying.

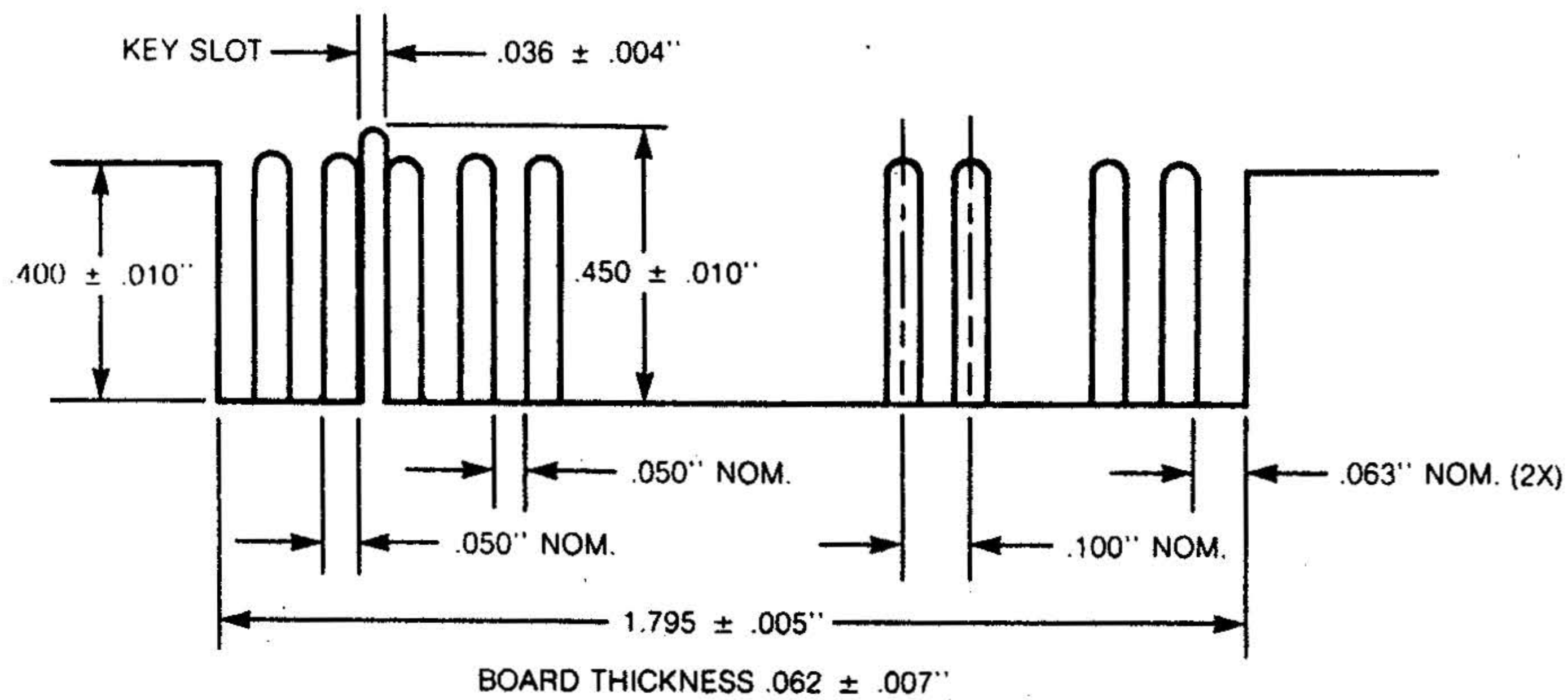


FIGURE 16. J1 CONNECTOR

6.2 J2/P2 CONNECTOR (Power)

The D.C. power connector, J2, is located in the rear of the drive. J2 is a four (4) pin AMP connector P/N 641737-1. The recommended mating connector (P2) is AMP P/N 1-480424-0 utilizing AMP pins P/N 61473-1.

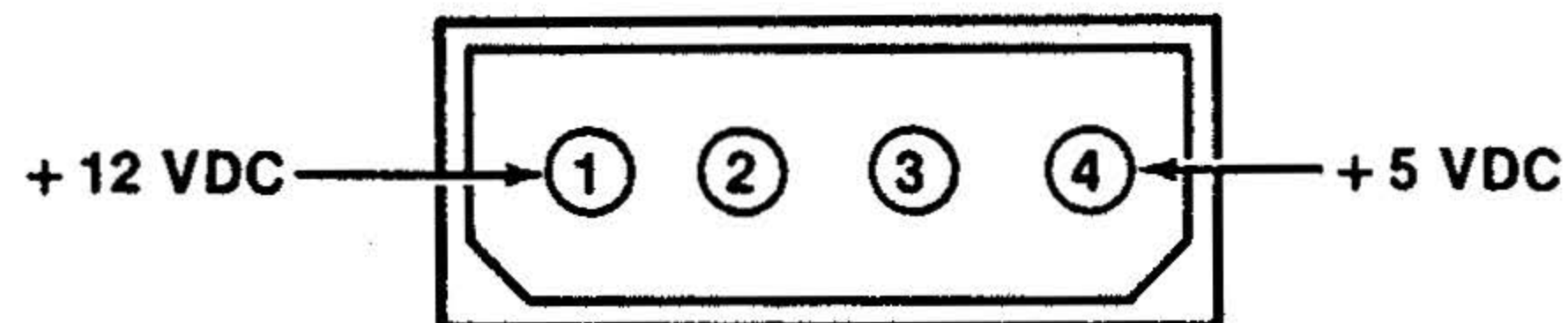


FIGURE 17. J2 CONNECTOR

7.0 DRIVE PHYSICAL SPECIFICATION

This section contains the mechanical dimensions and mounting recommendations for the Drivetec 320.

7.1 MECHANICAL DIMENSIONS

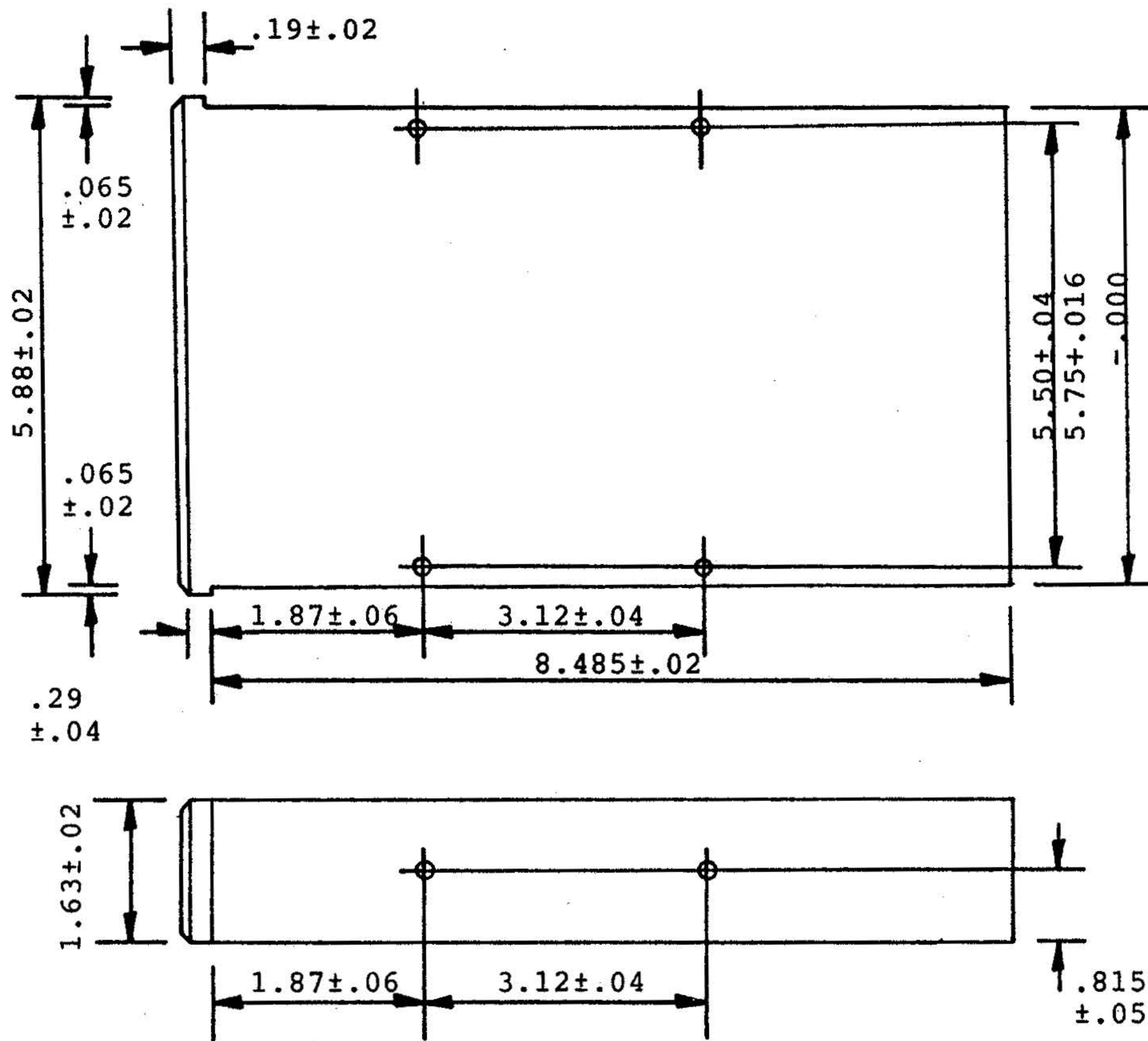


FIGURE 18. PHYSICAL DIMENSIONS

7.2 MOUNTING

The drive is capable of being mounted in one of the following positions:

- Front Loading -mounted vertical left or right.
-mounted horizontal with P.C.B. down.

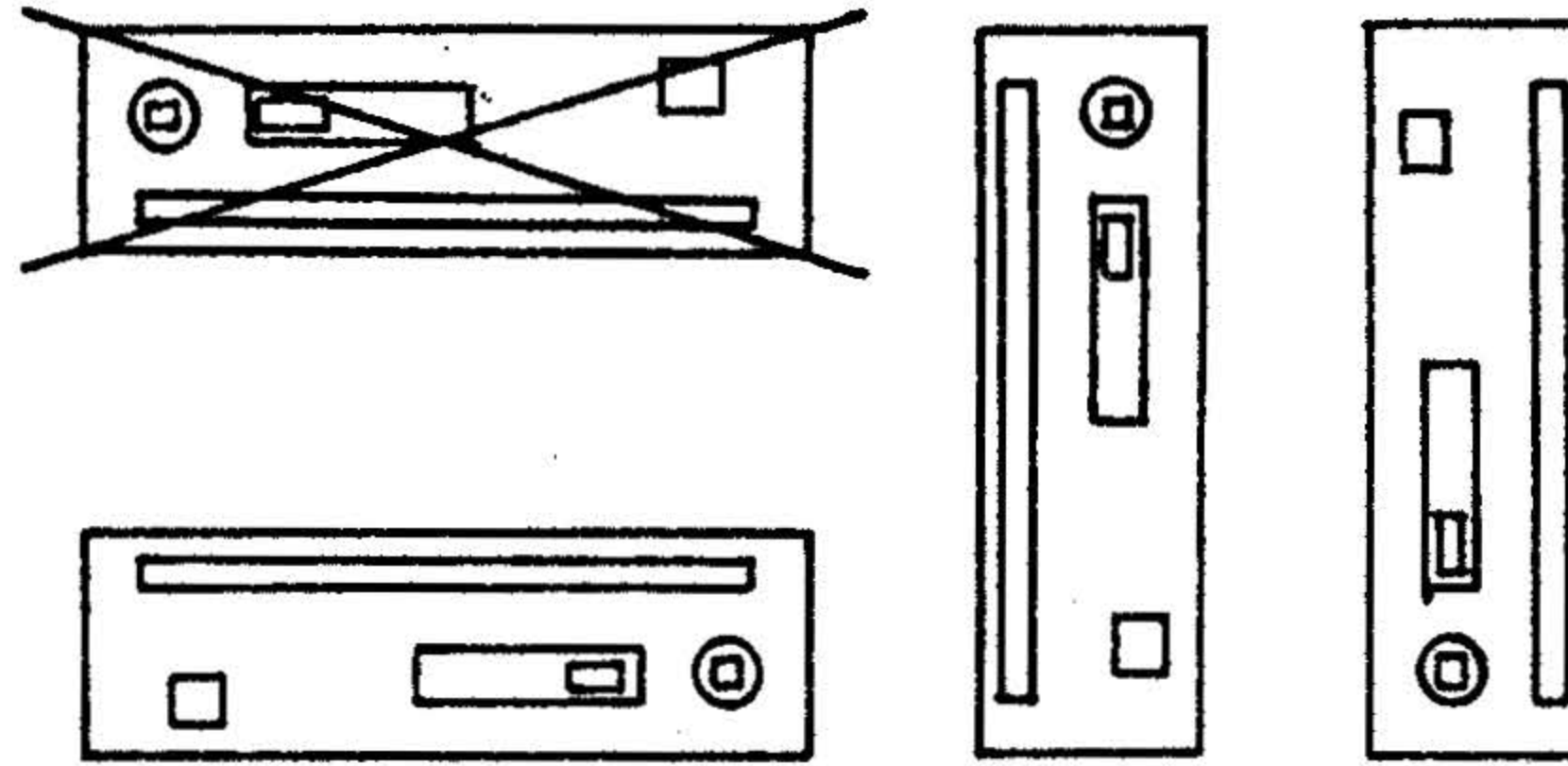


FIGURE 19. RECOMMENDED MOUNTING

8.0 CUSTOMER OPTIONS

Drivetec 320 can be modified by the user to alter the standard configuration as shipped from the factory.

8.1 RADIAL HEAD LOAD

The drive P.C.B. contains a cut trace option (HL). This allows the user to load all the read/write heads on systems that daisy chain two (2) or more drives on a controller by use of the HEAD LOAD interface line. The advantage of this option is that the read/write heads can be kept loaded on all drives thereby eliminating the head load time during a disk copy operation. As currently shipped from the factory the read/write head will load from DRIVE SELECT.

8.2 WRITE FAULT

A low active level on this option indicates that WRITE GATE has been asserted by the host before READY/SEEK COMPLETE has gone to its active state or if a STEP pulse was received with WRITE GATE active. WRITE FAULT is reset on the next edge of READY/SEEK COMPLETE becoming inactive. This alternate output is installable by assigning a alternate I/O pin and jumpering.

8.3 DISK CHANGE

A low active level on this option indicates the READY signal has gone false (Door opened) after DRIVE SELECT went false. The DISK CHANGE circuit is reset on the true to false (low/high) transition of DRIVE SELECT provided that the drive is READY. This alternate output is installable by assigning a alternate I/O pin and jumpering.

8.4 360 / $\overline{600}$ DOWNWARD COMPATABILITY

Drivetec model 320 has the ability to read previously recorded 48 TPI diskette's. Due to the difference's in data tranfer rates between 48 TPI disk drives (250 Khz) and Drivetec 320 (500 Khz) we have selected a method that will allow the user to control the speed in which the spindle rotates. By allowing the spindle to increase in speed from 360 RPM to 600 RPM the 500 Khz data tranfer rate can be maintained when reading a pre-recorded 48 TPI diskette.

8.4.1 SPINDLE SPEED SELECTION

When the drive is selected and a logic high level is provided, to pin 16 the spindle will rotate at 360 RPM. A low logic level will cause the spindle to increase in rotational speed to the rate of 600 RPM. Once this line has been asserted to a logic low level the drive will automatically recalibrate both stepper motors to track zero and the spindle speed will be maintained at 600 RPM until the drive has been deselected and the diskette removed.

8.4.2 PSUEDO INDEX

Because the drive cannot detect the physical index hole on the diskette a puesday index pulse will be generated from the drive electronics while in the 600 RPM mode. The rate at which index pulses will occur is 108 milliseconds in duration and 5 milliseconds in width. This value has been selected to allow pulses to be skewed due to the unknown position of sector headers.

8.4.3 TRACK POSITIONING R/W HEADS

Positioning of the read/write head will require the controller to issue step pulses in groups of four. For example if the drive has been recalibrated to track zero and the desired track to be accessed is track ten then forty step pulses should be issued. This allows for the additional posibility under read error conditions to step in quarter track increments either direction to recover data.

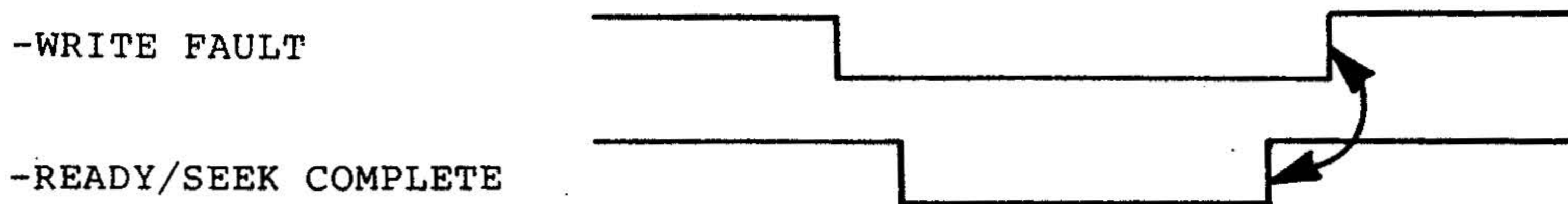


FIGURE 20. WRITE FAULT RESET

9.0 TRACK FORMAT

9.1 GENERAL

The Drivetec 320 is a closed loop track following servo disk drive which allows formatted storage up to 2.94 Megabytes per diskette. For this reason the diskette's must be preformatted with embedded servo data and user data sectors prior to system usage. The encoding technique used is MFM which is the common encode used for double density recording.

9.2 MEDIA

9.2.1 JACKET

The diskette consists of a flexible magnetic disk enclosed in a jacket. The jacket has a liner material which minimizes static electricity charges and serves as a low-friction wiper material for the magnetic disk.

9.2.2 TEMPERATURE RANGE

The operating temperature range for the media is 50 to 125 degrees fahrenheit. The upper temperature limit applies to the warmest exterior diskette surface. Humidity range is 20% to 80% relative humidity with a maximum wet bulb temperature of 85 degrees fahrenheit.

9.2.3 CERTIFICATION

The entire surface area contained within the usable tracks limit is evaluated for extra bits, missing bits, modulation, and minimum amplitude requirements. The tested bit density is 9908 flux changes per inch (fci) which is identical to actual usage.

9.3 ENCODING

Modified Frequency Modulation is based on the IBM system 34 method of encoding and has become the industry standard for double density recording.

9.3.1 MODIFIED FREQUENCY MODULATION (MFM)

MFM doubles the available data bit density over FM by reducing the bit cell size by one half. Clock bits are only written when data bits are not present in both the preceding and current bit cell. As a result there is only one flux transition per bit cell as opposed to a maximum of two (2) for FM. Because of this, twice the number of data bits can be written without increasing the number of FCI on the media. As with FM, clock bits are written at the beginning of the bit cell while data bits are written at the center of the bit cell.

9.3.1 MODIFIED FREQUENCY MODULATION (MFM) CONT.

Since every bit cell does not have a clock pulse, the data/clock windows cannot be timed from the clock pulse. Instead, the data separator must continually analyze the clock and data bit positions within their respective windows to synchronize the windows to the clock/data bit. This requires an analog phase lock loop (PLL) to achieve precise synchronization.

9.4 WRITE PRECOMPENSATION

The Drivetec 320 does not require precompensation of recorded data because of superior read/write head performance. Therefore write precompensation is **NOT RECOMMENDED**.

9.5 FORMAT DESCRIPTION

Each data track on the floppy diskette is organized into data records or sectors. Index is recorded on each track and decoded by the drive electronics, indicating one revolution of the media. This is used to generate the READY signal and is sent to the host for its timing requirements as well. Each track is begun by a index pulse followed by a number of sectors.

9.6 GAP FIELD DESCRIPTION

9.6.1 GAP 1

Gap 1 is written after the index data and delays read data while index is active to the interface.

9.6.2 GAP 2

Gap 2 separates the ID field from the data field. This separation is necessary to protect the ID field from erasure during a write update.

9.6.3 GAP 3

Gap 3 separates the end of a data field from the next sequential ID field and allows variations in rotational speed when write updating. If a sector is updated in a drive that is rotating slower than nominal and that diskette is then placed in a drive that is rotating faster than nominal, the updated data field will cover more area than before. Therefore, Gap 3 is present to prevent overwriting the next servo data field.

9.7 ID FIELD DESCRIPTION

9.7.1 SYNC

The Sync field is a fixed number of bytes for data separator synchronization prior to the address mark.

9.7.2 ADDRESS MARK

The (AM) is a unique byte used to identify the different fields.

9.7.3 IDENTIFICATION FIELD

The ID field is a four (4) byte address field containing cylinder number, head number, sector number, and sector length.

9.7.4 CYCLIC REDUNDANCY CHECK

The CRC is a two (2) byte polynomial appended onto the end of the ID field for error detection.

9.8 DATA FIELD DESCRIPTION

9.8.1 SYNC

The Sync field is a fixed number of bytes for data separator synchronization prior to the address mark.

9.8.2 ADDRESS MARK

The AM is a unique byte used to identify the different fields.

9.8.3 DATA FIELD

The Data Field is the area set aside for user storage.

9.8.4 CYCLIC REDUNDANCY CHECK

The CRC is a two (2) byte polynomial appended onto the end of the data field for error detection.

9.8.5 WRITE GATE OFF

Write Gate Off (WG OFF) is one (1) byte to allow for WRITE GATE turn off after an update write.

9.9 SERVO DATA PATTERN FIELD DESCRIPTION

The Servo Data pattern field is recorded before every ID field. The Servo Data fields provides the necessary information for track following by the read/write heads.

9.10 INDEX FIELD DESCRIPTION

The Index field is recorded between the last Gap 3 and Gap 1 which provides information necessary to decode and generate an Index pulse once per revolution.

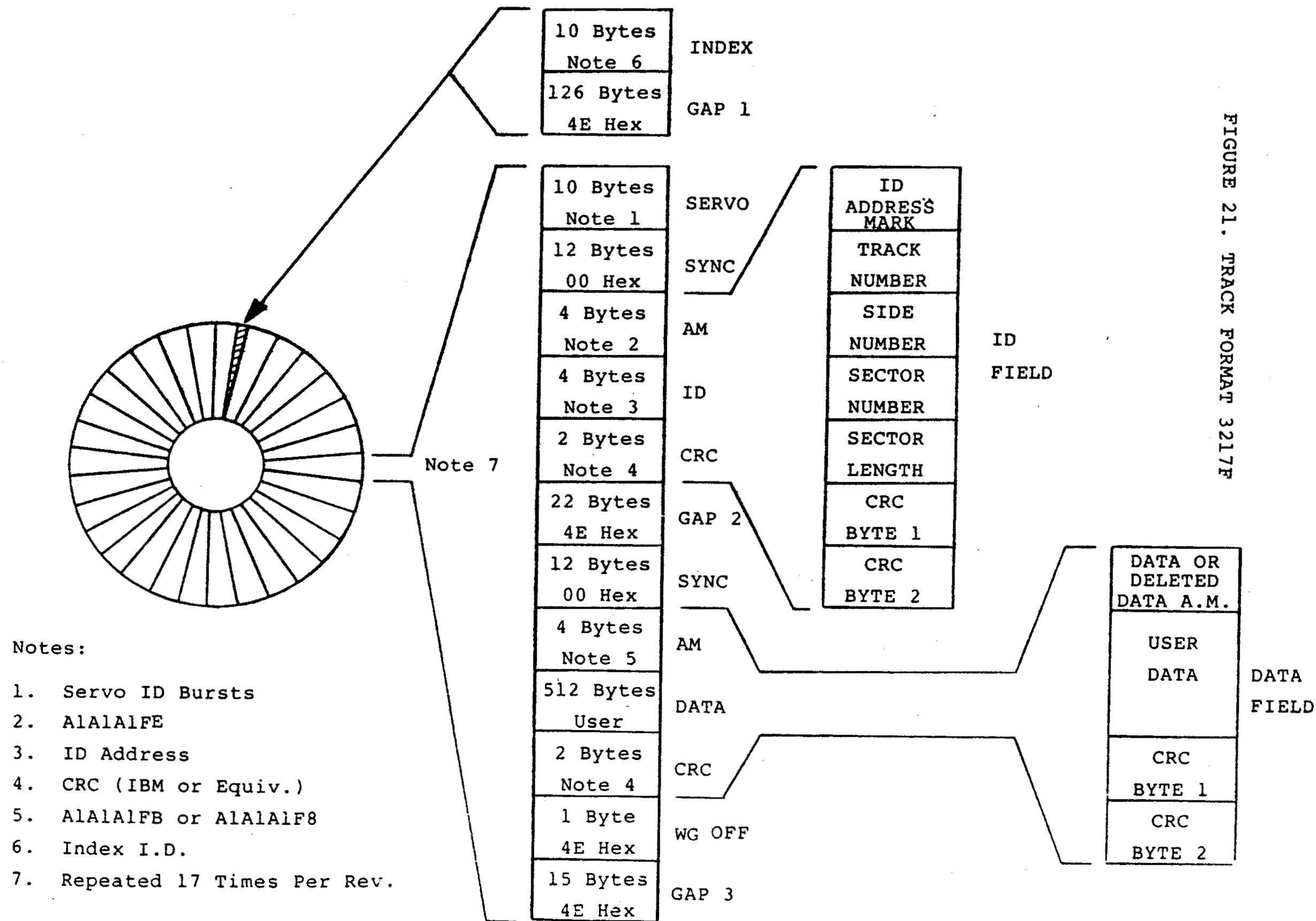
9.11 PREFORMATTED DISKETTE ORDERING INFORMATION

The following information will describe availability of preformatted diskettes from Drivetec.

	Number of Sectors	Sector Size	Drivetec Part Number
1.	17	512 bytes	* #3217F
2.	30	256 bytes	* #3230F
3.	18	512 bytes	** #3218R
4.	32	256 bytes	** #3232R

* The 3217F and 3230F format structure is compatible with IBM double density design. Both formats are compatible with Western Digital and N.E.C. floppy controller chips. A 22 byte Gap 2 is required by IBM which is common to the 3217F and 3230F preformatted diskette's.

** The 3218R and 3232R have a format structure similar to what Seagate recommends for their 5.25" winchester disk drive's. In order to utilize in your system the controller must be able to handle smaller gap sizes associated with these formats.



17 SECTOR (IBM) TRACK FORMAT

FIGURE 21. TRACK FORMAT 3217F

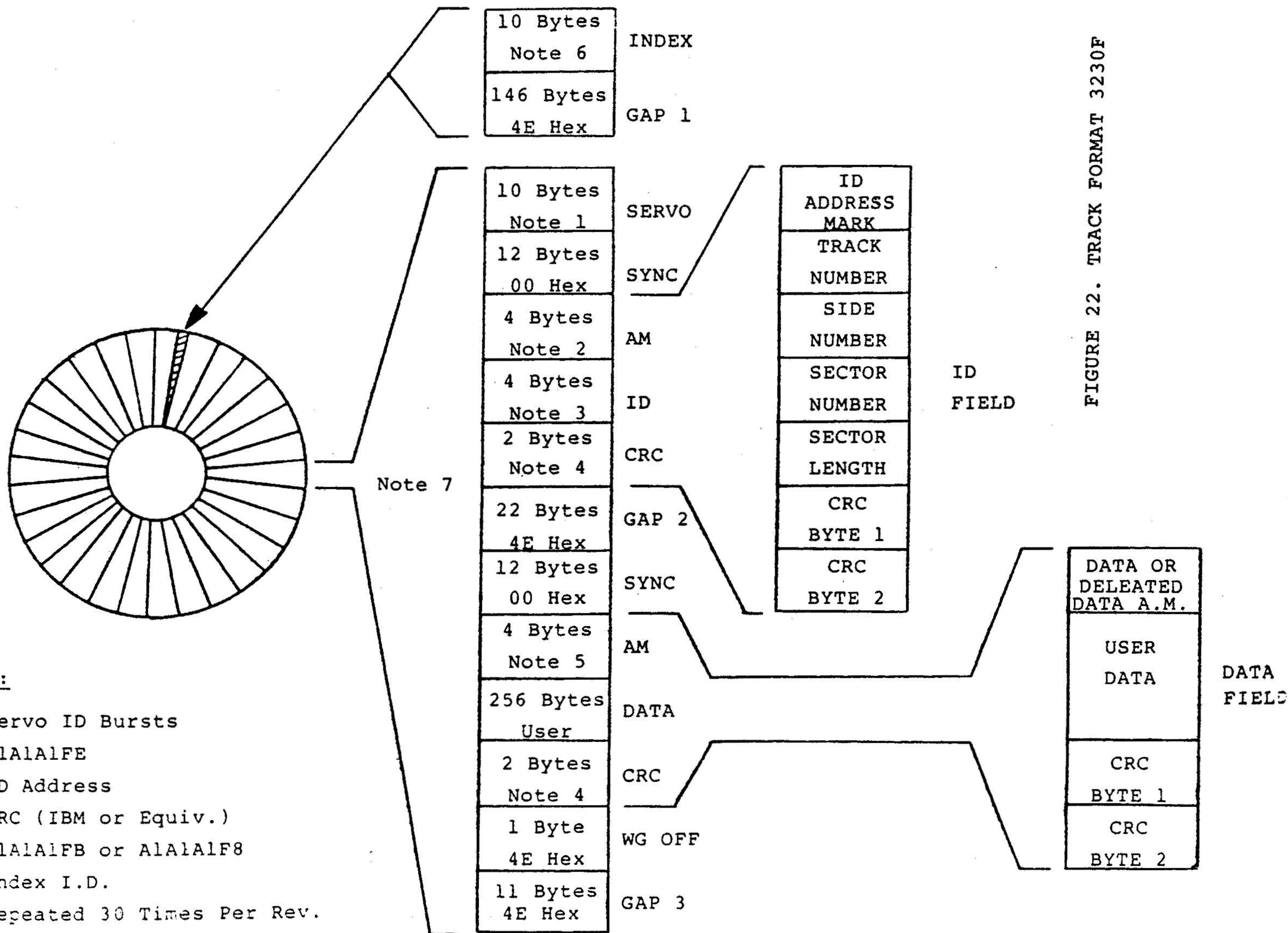


FIGURE 22. TRACK FORMAT 3230F

Notes:

1. Servo ID Bursts
2. A1A1A1FE
3. ID Address
4. CRC (IBM or Equiv.)
5. A1A1A1FB or A1A1A1F8
6. Index I.D.
7. Repeated 30 Times Per Rev.

30 SECTOR (IBM) TRACK FORMAT

Notes:

1. Servo ID Bursts
2. A1A1A1FE
3. ID Address
4. CRC (IBM or Equiv)
5. A1A1A1FB or A1A1A1F8
6. Index ID
7. Repeated 18 Times Per Rev

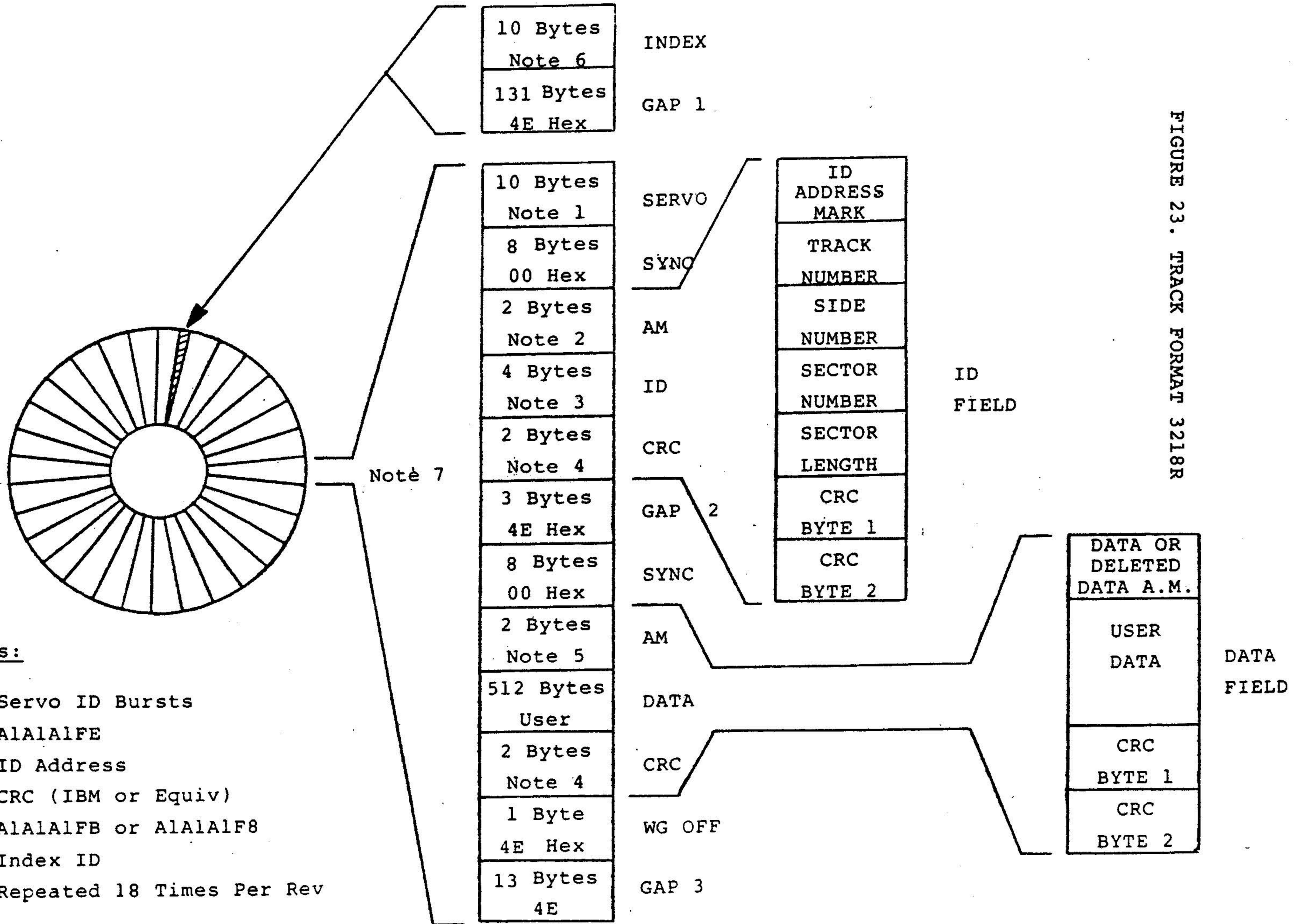
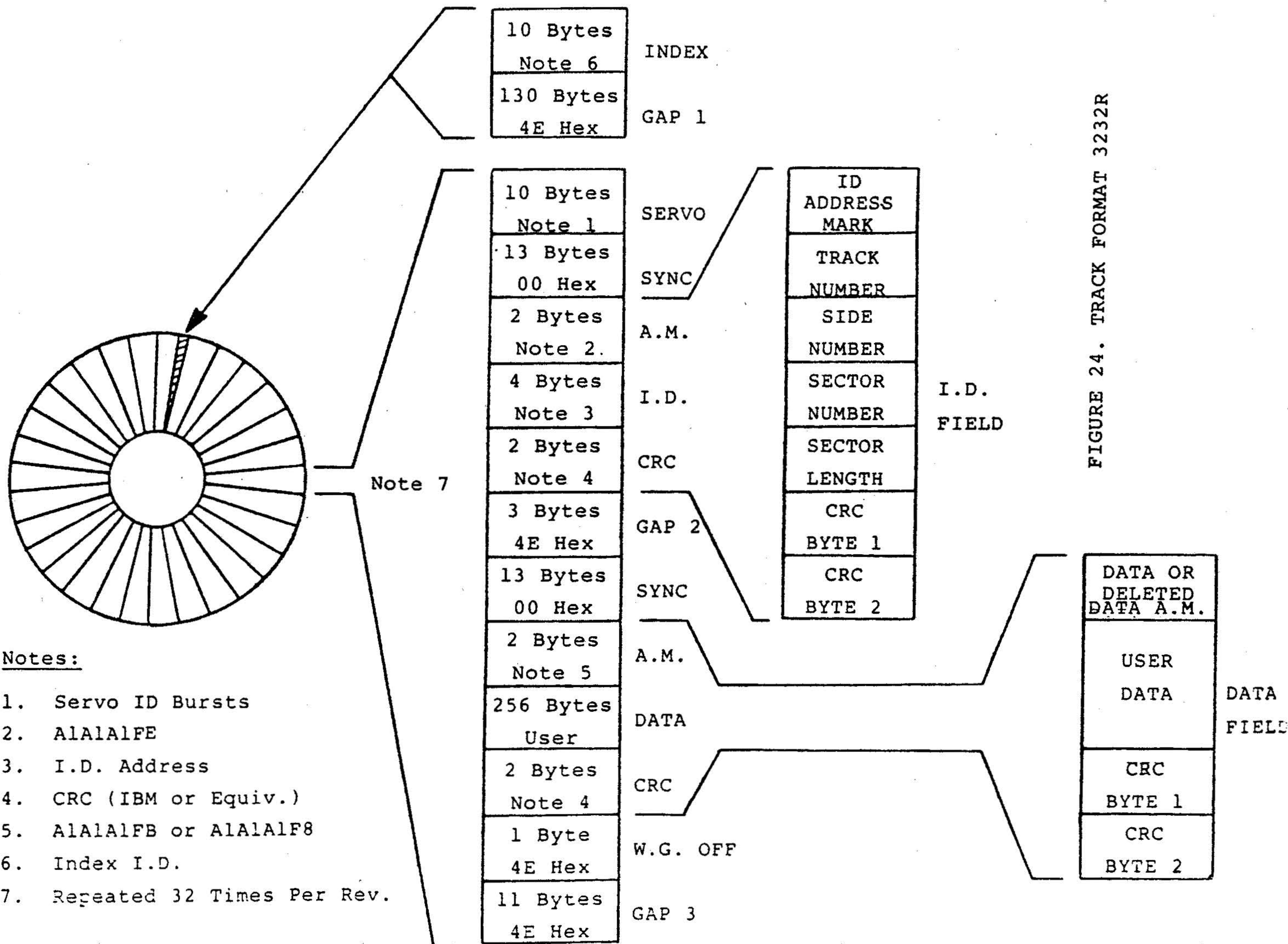


FIGURE 23. TRACK FORMAT 3218R

18 SECTOR (RIGID) TRACK FORMAT



Notes:

1. Servo ID Bursts
2. A1A1A1FE
3. I.D. Address
4. CRC (IBM or Equiv.)
5. A1A1A1FB or A1A1A1F8
6. Index I.D.
7. Repeated 32 Times Per Rev.

32 SECTOR (RIGID) TRACK FORMAT

FIGURE 24. TRACK FORMAT 3232R