IBM 341 Four-Inch Diskette Drive
Description and Maintenance Information

Federal Communications Commission (FCC) Statement:

The IBM 341 Four-Inch Diskette Drive is not required to meet FCC EMI regulations because it is a component in a system that must meet these regulations. However, the drive was tested as a stand-alone device with shielded cabling, and its radiation was below the FCC Class B limit.

First Edition March, 1983

PREFACE

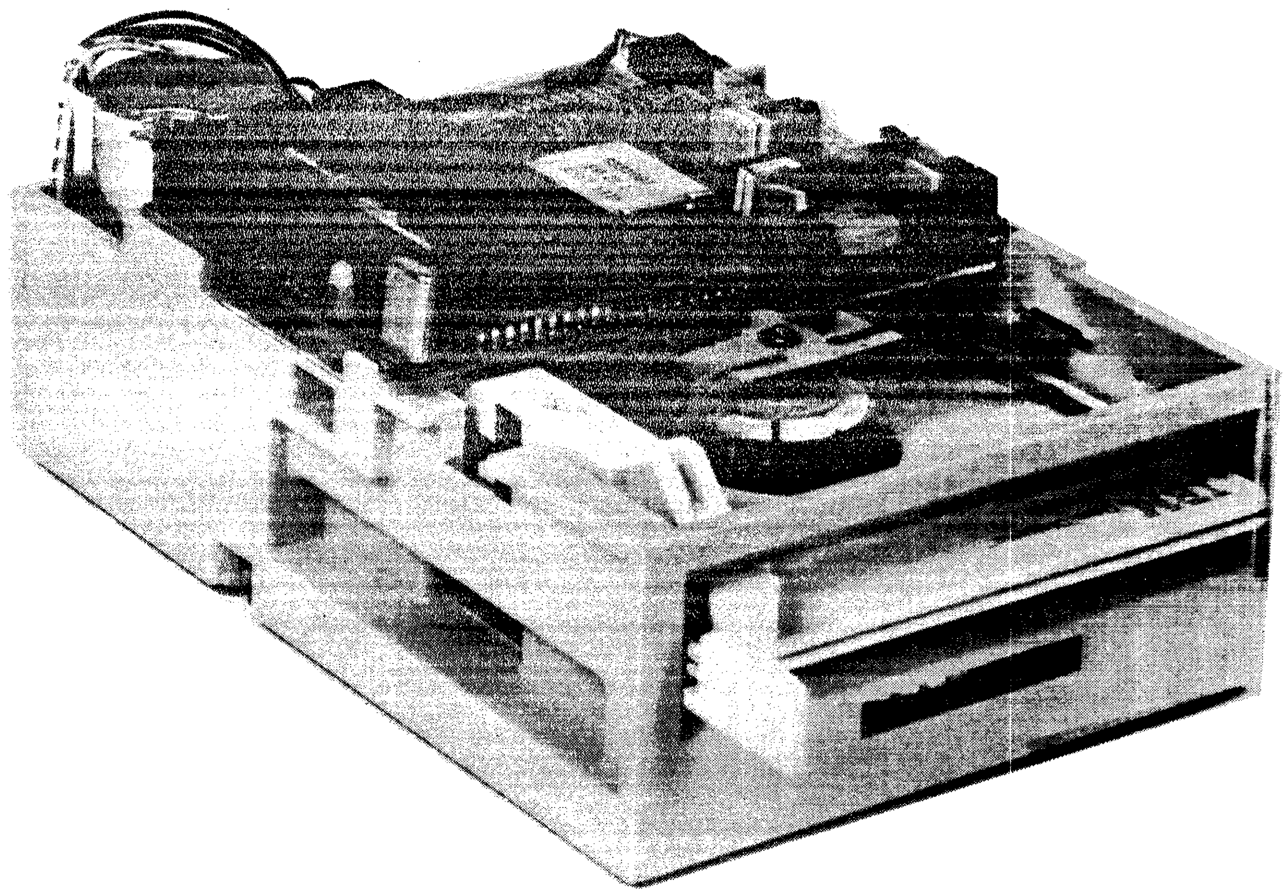
This manual describes the IBM 341 Four-Inch Diskette Drive and includes sections on specifications, system attachment data, and the information needed to install and maintain the drive.

Note: The removal and replacement procedures in this manual presuppose that the drive has been removed from the using system and that both the card assembly and the spindle drive belt are easily accessible.

CONTENTS

THE IBM 341 FOUR-INCH DISKETTE DRIVE

(IBM Part ~~8330885~~)
1696500



GENERAL DESCRIPTION

The 341 diskette drive is a small storage device that uses the 4-inch IBM DemiDiskette. (Detailed information on the DemiDiskette is available in the *IBM DemiDiskette General Information Manual*, S544-3008.)

The 341 has both read and write capabilities and contains the required power drivers for controlling the drive.

Typical applications for the 341 are:

- Text processing

  Because of its small size, the 341 can be used in typewriters and other machines that specialize in text and word processing.

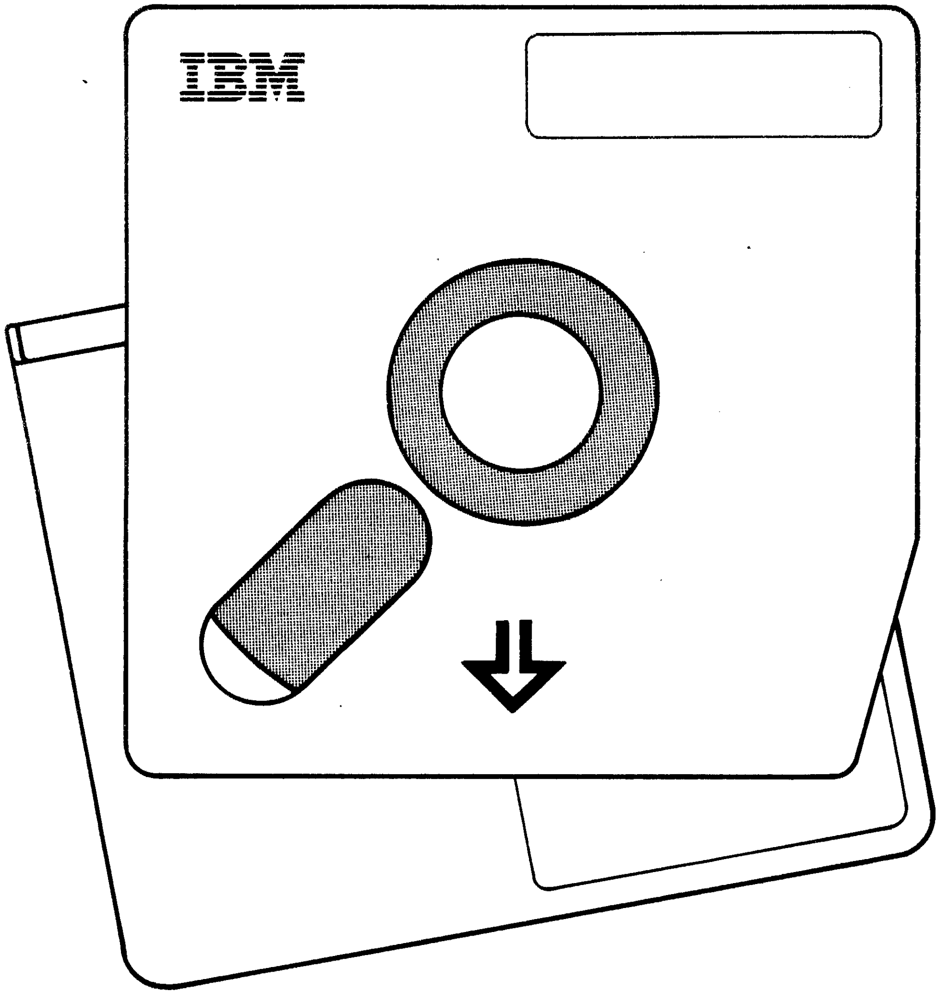
- Systems support

  Because the DemiDiskette is removable, the 341 has applications in program distribution, initial program loading, service diagnostics, error logging, and data exchange.

- Data input and output

  Small businesses and personal computing products can use the 341 for data and program input and output. The diskette is useful at terminals and work stations for data entry and inquiry.

This is a full-size drawing of a DemiDiskette.



Storage Capacities

The 341 records on one side of an IBM DemiDiskette, using FM encoding. The DemiDiskette has 46 tracks. The unformatted capacity of the diskette is 358,087 bytes. See "Data Organization" for details on the formatted capacities of the DemiDiskettes.

DemiDiskettes recorded on one 341 drive can be read on another 341 if both using systems support the same recording format.

Serviceability

The 341 was designed for minimum service requirements, and for minimum duration of repair actions if service should be needed. The drive contains or requires:

- Only three field-replaceable units
  - The drive belt
  - The electronics card
  - The mechanical assembly (the drive minus the electronics card).
- No scheduled or preventive maintenance
- No adjustments.

Diskette Adapter Module

An adapter module is available from IBM that can attach 341 drives to a conventional address/data system bus. The adapter can fully operate the drives in either 256- or 512-byte formats. The *IBM Four-Inch Diskette Drive Adapter Module Information* manual contains detailed information about the adapter module.

Components

Because the drive will normally be installed within the frame and covers of the using system, it is supplied without covers. The primary components are:

Read/Write Assembly: The drive has one head that performs the read, write, and tunnel erase functions. The read/write head is part of a flexure that is permanently mounted to the drive frame. The four-point, flexible mounting allows the read/write head to remain in the same relative position to each diskette track.

When the operator moves the operator handle after inserting the diskette, a spring-loaded pressure pad presses the recording surface against the read/write head. With a diskette loaded into the drive, the read/write head is in contact with the recording surface whether the disk is turning or stopped.

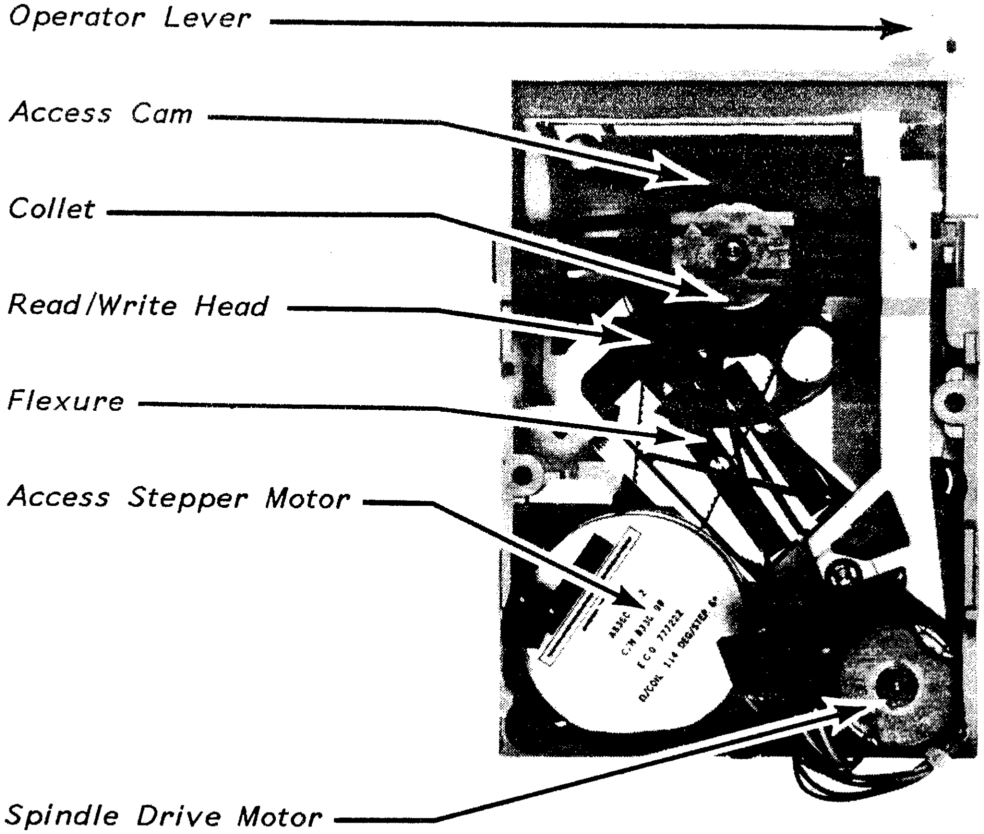
Access Mechanism: A cam moves the read/write head from track to track. A ~~24~~ 12-volt d.c. stepper motor and a timing belt drive the cam.

Spindle Drive: A variable-speed, ~~24~~ 12-volt d.c. motor and a flat belt drive the spindle. The speed of the spindle drive motor is dependent on the track on which the read/write head is positioned and is controlled by the microcomputer in the drive. The spindle stops (without unloading the read/write head) when the drive is not reading or writing.

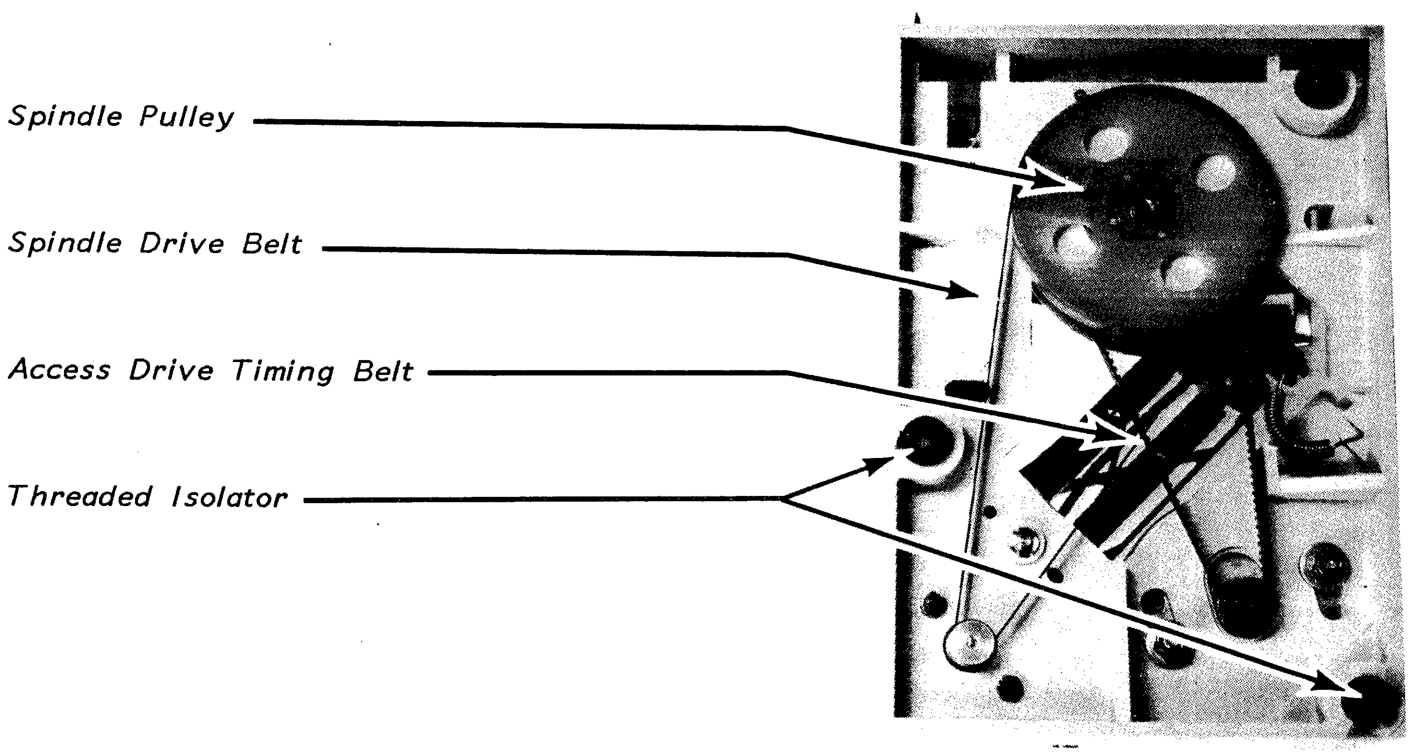
Disk Clamping Mechanism: The drive has an expanding device called a collet that passes through the center hole in the disk and clamps the disk to the spindle when the operator closes the operator lever.

Component Locations

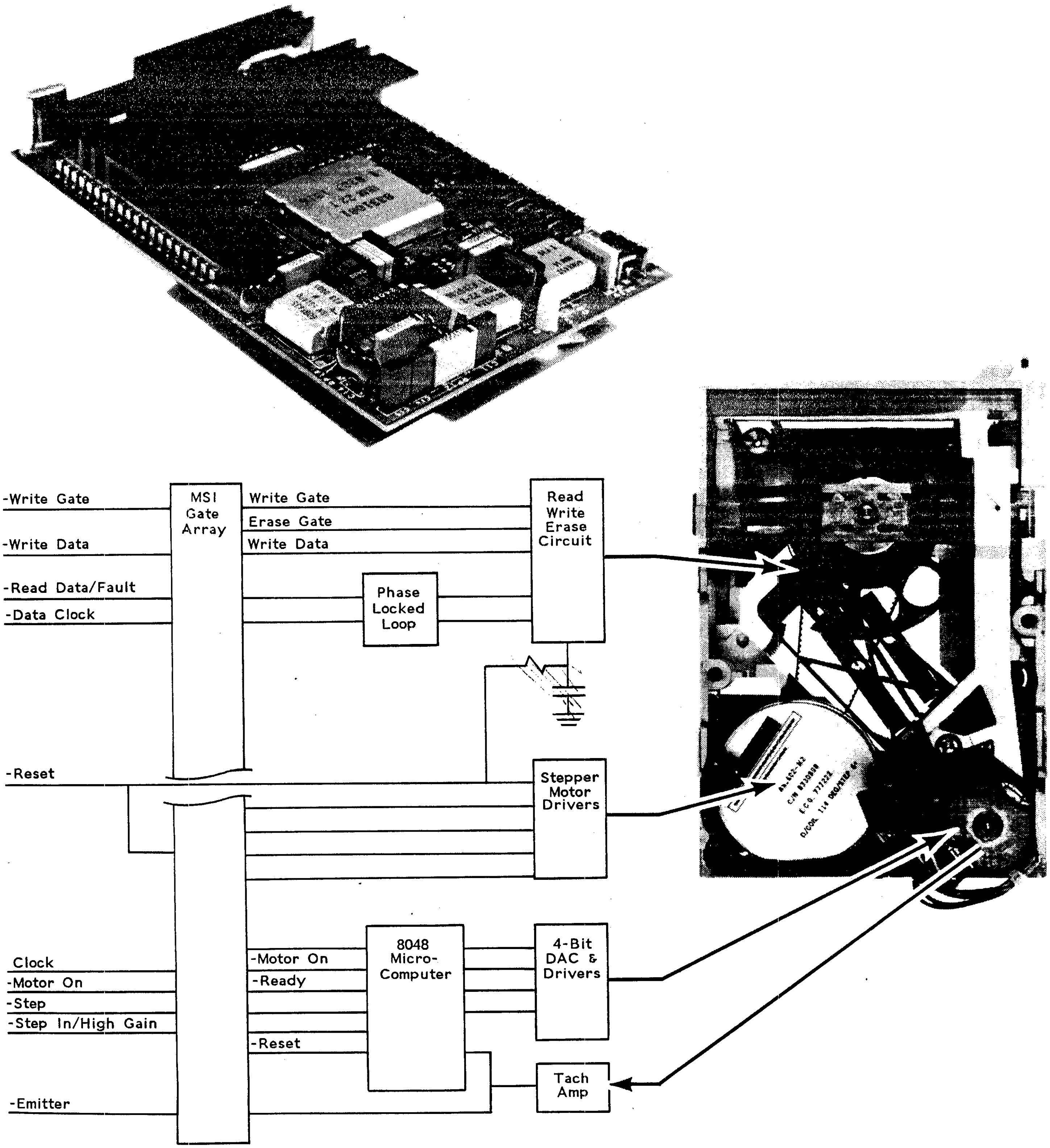
Top View
(Electronics card removed)



Bottom View

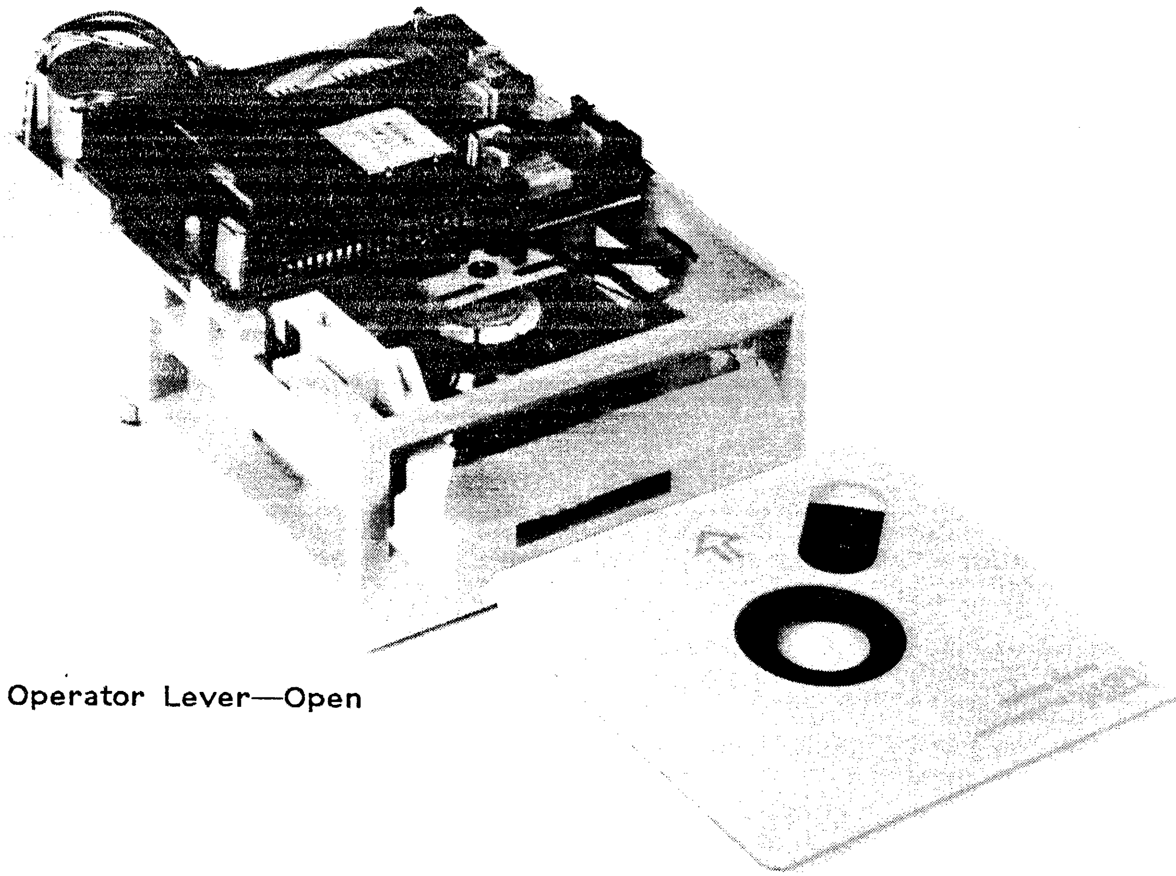


Electronics Card: The following illustration shows the major logical components of the electronics card and the relationship of those components to the mechanical assemblies of the drive.

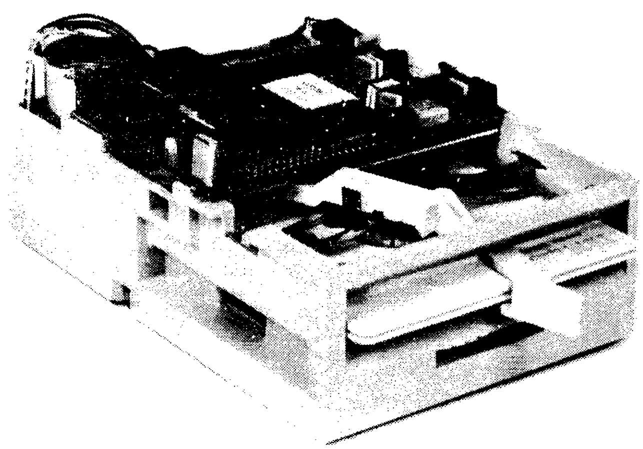


Diskette Insertion

The diskette cartridge has a specially shaped corner that must match a mating surface in the drive. If the diskette is incorrectly positioned, the diskette cannot fully seat in the drive, and the operator lever cannot be closed.



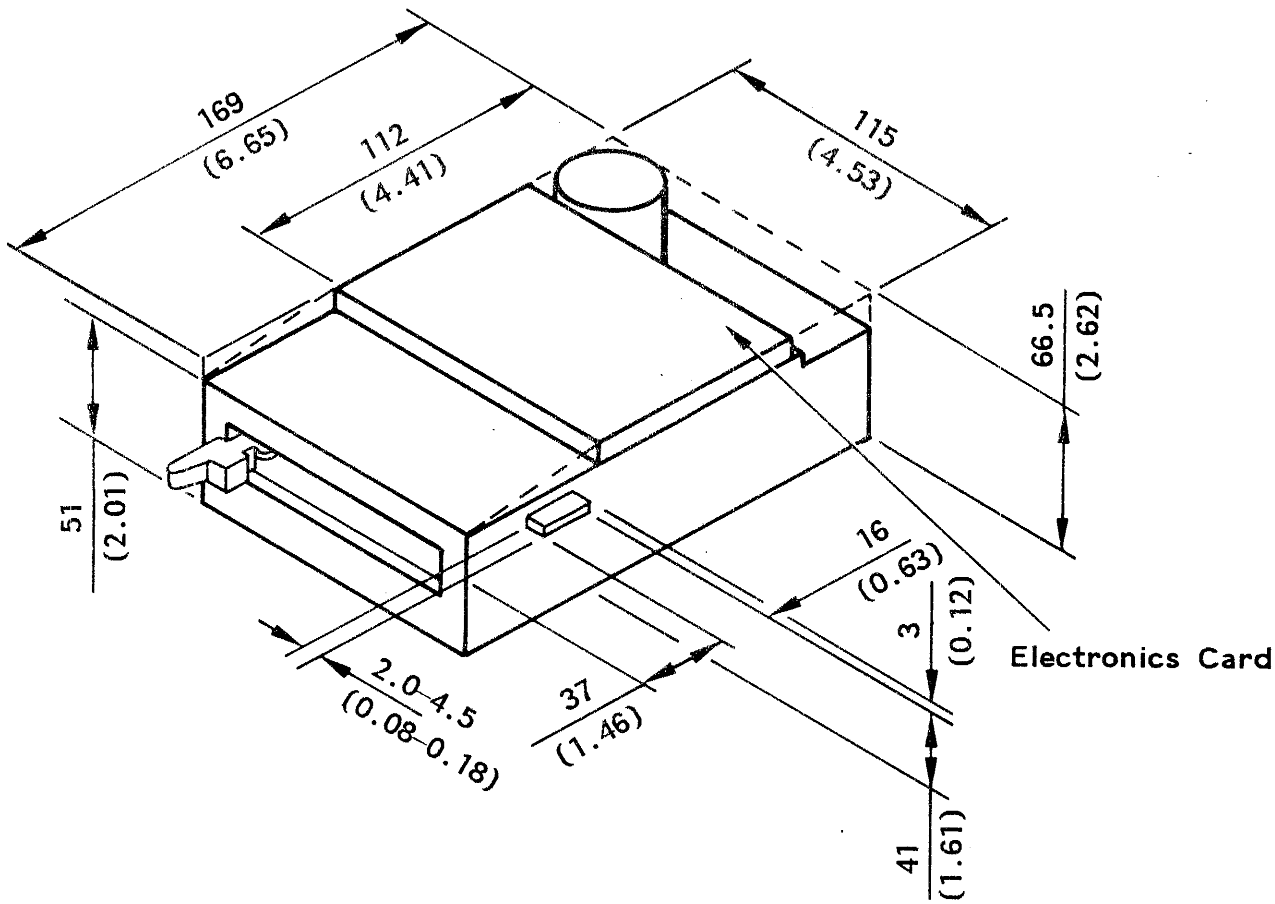
Operator Lever—Open



Operator Lever—Closed

Physical Characteristics

Weight: 0.88 kg (1.94 pounds)



Notes:

1. All dimensions are shown in millimeters with inches below.
2. The operator lever increases the length measurement.
3. The threaded isolator mounts increase the height dimensions by 3.0 mm (0.12 inch).

Functional Characteristics

• Uses FM encoding	
• Recording surfaces per diskette	One
• Total tracks per surface	46
• Total unformatted capacity (in kilobytes)	358.0
• Data rate (kilobits per second)	333.3
• Spindle speed (average r/min.)	
– Outer track	261.7
– Inner track	415.4
• Latency (milliseconds)	
– Outer track	114.6
– Inner track	72.2
• Track to track access (average milliseconds)	40.0
• Access settle time (average milliseconds)	10.0
• Spindle start time (average milliseconds)	200.0

The following measurements in:	Millimeters	Inches
• Linear density (bits per:)	270.270	6864.9
• Linear velocity (per second)	1233.3	48.6
• Track spacing	0.37	0.0146
• Inner track radius, Track 0	28.35	1.116
• Outer track radius, Track 45	45.0	1.772

Notes:

1. Spindle speed and latency vary by track.
2. Access time (where N is the number of track crossings):

T (average) = N x 40 milliseconds + 10 milliseconds (settle time)

Environmental Limits

Operating

The system design should keep the temperature of the drive and the electronics package, when under the system covers, within the following limits:

	Operating	Power Off
Temperature	10 to 48.9°C (50 to 120°F)	10 to 51.7°C (50 to 125°F)
Relative Humidity *	8 to 80%	8 to 80%

* Maximum wet bulb 26.7°C (80°F).

For environmental limits of media contact your media vendor.

Shipping and Storage

During shipping and storage, the temperature of the 341 must not exceed 60°C (140°F).

POWER REQUIREMENTS

The 341 requires only d.c. power. The voltages in the following table are measured at the drive. Power sequencing is not required, however, the restrictions given for the '-reset' signal must be followed.

In the following chart, the current requirements are maximum; the voltage requirements are maximum and minimum instantaneous values (including ripple). The voltage ripple (a.c. component) limits are maximum peak-to-peak.

Voltage	Drive Status	Tolerance	Current	Ripple
+5 Vdc	Standby	± 10%	0.47 A	*
	Operating	± 10%	0.61 A	150 mV
	Start & Access	± 10%	0.61 A	*
-5 Vdc	Standby	± 10%	0.15 A	*
	Operating	± 10%	0.16 A	150 mV
	Start & Access	± 10%	0.15 A	*
+12 ~~+24~~ Vdc	Standby	± 10%	.04 ~~0.02~~ A	*
	Operating	± 10%	.62 ~~0.31~~ A	~~500 mV~~ 250 mV
	Start & Access	± 10%	2.80 ~~1.40~~ A**	*

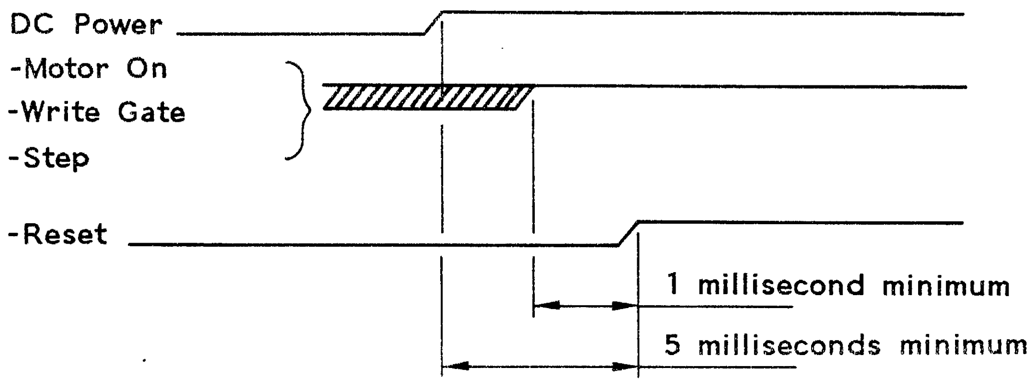
Drive Status Explanation

- Standby: Motor not running; access mechanism not moving
- Operating: Motor running; access mechanism not moving
- Start & Access: Motor accelerating; access mechanism moving

* Allowable instantaneous power supply voltage is limited to the power supply tolerance.

** When the drive motor is first energized, there is a peak current requirement of 2.8 ~~1.4~~ A from the +12 ~~+24~~ volt supply. This decays to 0.62 ~~0.31~~ A in approximately 80 milliseconds. Approximately 100 milliseconds after the drive motor is energized, an additional .44 ~~0.22~~ A (a total of 1.06 ~~0.53~~ A) is required for track accessing. The added current is removed as soon as the access mechanism reaches the desired track.

The following figure shows the sequence of the power-up timing for the 341 drive.



The signal input voltage levels required by the 341 drive are defined as:

- 0 Vdc to 0.4 Vdc is the down level.
- +2.5 Vdc to +5.5 Vdc is the up level.

Drive Input Signal Lines

Reset

The down level on this line resets the drive controller, disables the write and erase current, and turns off the motors.

Note: While power is coming up, this line must be at the down level until the +5 and ~~+24~~ +12 volts power supplies are at their operating levels. While power is going off, this line must be at the down level while the power supplies are still at their operating levels.

When the 'reset' line goes to the up level, the drive controller turns on the spindle motor and moves the read/write head to track 0, which is the inner track.

Note: Allow a minimum of 3.5 seconds after the 'reset' line goes to the up level before sending any command, except a track 0 read command, to the drive.

To ensure data integrity, use the power-on signal from the system power supply to drive the 'reset' line. Any variations on the 'reset' line can destroy data when powering on or off with a diskette loaded in the drive. To reset the drive when power is on, the 'reset' line must be held in the down level for a minimum of 5 milliseconds.

~~*Clock*~~

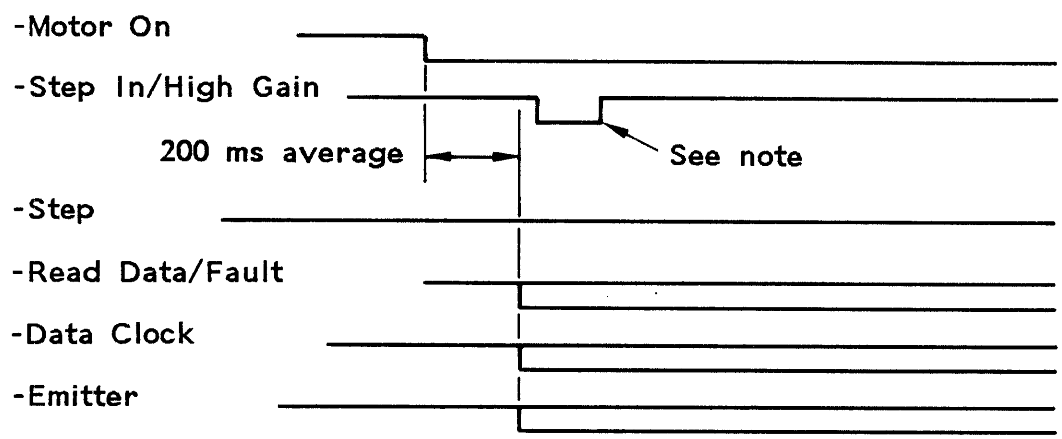
~~A 2/3 MHz signal on this line controls the spindle speed and erase gate timing. The signal must be generated from an oscillator with a tolerance of ± 0.05% or less. The clock signal must have a duty cycle between 10% and 90%.~~

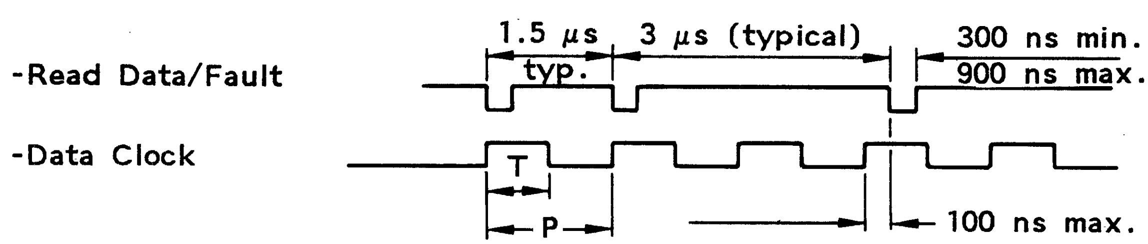
Motor On

The down level on this line starts the spindle motor. When the drive microcomputer has determined that the speed is correct, the 'emitter', 'read data/fault', and 'data clock' lines are gated to the channel attachment. During an access operation, the 'motor on' line must be at the down level whenever the 'step' line is at the down level. The only exception to this requirement is described under "Drive Detected Errors."

When the 'motor on' line reaches the up level, the 3 drive output lines are gated off.

The following figure shows the motor on and read timing for the 341 drive.





$$\frac{T}{P} = 0.5 \pm 0.1$$

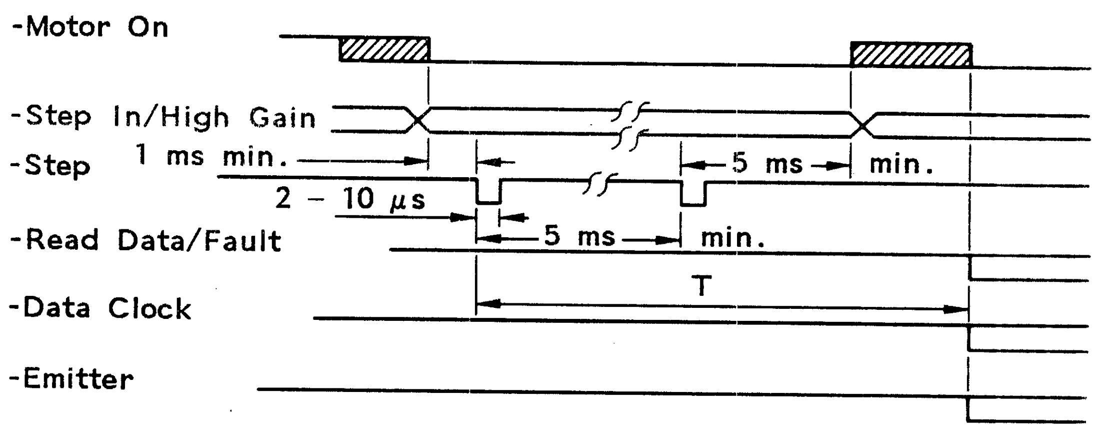
Note: The 'step in/high gain' line must be brought to the up level after detecting 16 consecutive clock bits and no data bits.

Step

A negative pulse on this line causes the read/write head to move to an adjacent track. The direction of the move depends on the level of the 'step in/high gain' line. The minimum time between step pulses must be 5 milliseconds. The step pulse width is from 2 to 10 microseconds.

The 'motor on' line must be at the down level whenever the 'step' line is at the down level. The only exception to this requirement is described under "Drive Detected Errors."

The access and read timings are shown in the following figure.



T (average) = N x 40 ms + 10 ms settle time

Where: N = number of tracks crossed

Step In/High Gain

The levels on this line provide dual purposes:

- When the 'step in/high gain' line is at the up level and the 'step' line is pulsed, the read/write head moves away from the spindle.

  When the line is at the down level and the 'step' line is pulsed, the read/write head moves toward the spindle.

  Note: The 'step in/high gain' line must remain at the same level for a minimum of 5 milliseconds after the step pulse.

- When the 'step in/high gain' line is at the down level and no step pulses are being received, the adapter indicates a synchronization mode. The data is synchronized by keeping the 'step in/high gain' line at the down level until 16 consecutive clock pulses have been detected with no data transitions. After the 16 clock pulses are completed, the line goes to the up level.

Write Gate

The down level on this line allows write current to flow through the read/write head. The direction of the write current is reversed by a transition on the 'write data' line.

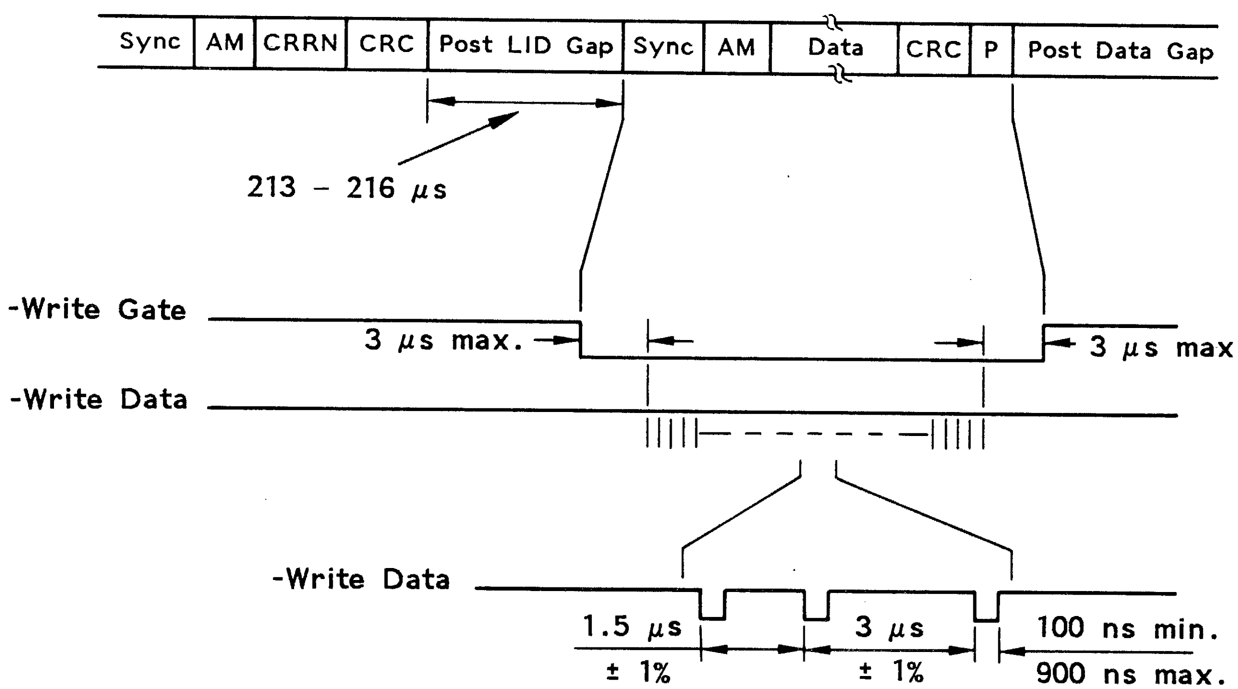
The 'write gate' line should be at the up level at all times when the drive is not actually writing data. These times include motor off, power on, and power off.

When updating a record on a diskette, this line must be brought to the down level 213 to 216 microseconds after the last bit of the second CRC byte of the ID field. The line must be brought to the up level after writing the 1-byte pad.

Write Data

The transition to the down level on this line causes the direction of the current in the read/write head to reverse when the 'write gate' line is at the down level. The maximum time from the start of the write gate to the first write data pulse is 3 microseconds. The maximum time from the last write data pulse to the end of the write gate is also 3 microseconds.

The write timing is shown in the following figure.



Drive Output Lines

These lines are at the down level only when the spindle is at the proper speed and the access mechanism is stopped and settled. At all other times they are at the up level.

Read Data/Fault

Pulses to the down level occur on this line for each flux reversal received from the read head when the 'write gate' line is at the up level. The information carried by this line includes both clock and data bits. The pulse width on this line is from 300 to 900 nanoseconds.

The fault function of this line is explained under "Drive Detected Errors."

Data Clock

The signal on this line is a square wave synchronized to the pulses on the 'read data/fault' line. The falling edges of the data clock square wave are at the clock and data bit boundaries. The rising edges indicate the center of a bit cell.

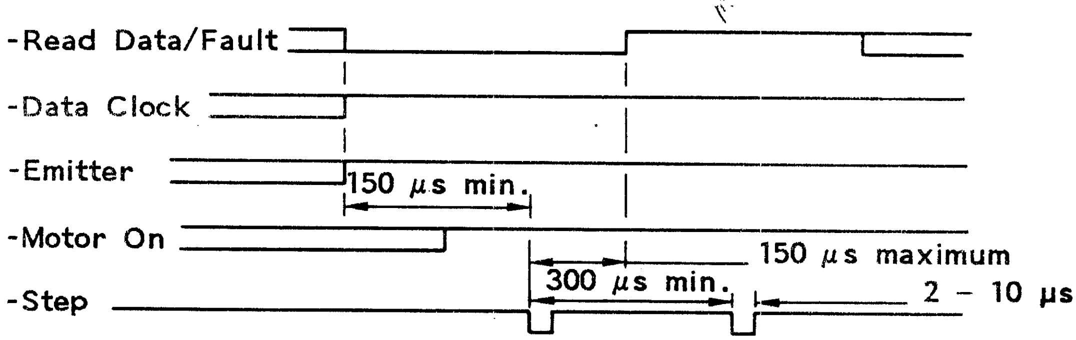
Emitter

The signal on this line is generated by the spindle tachometer amplifier. The emitter period varies with the track position, but 64 emitter periods represent approximately one revolution of the spindle.

DRIVE DETECTED ERRORS

The 341 can detect and report to the system certain drive-related errors. The following paragraphs describe those errors, the error codes, and the procedure for transferring the error codes to the system.

The read fault timing is shown in the following figure.



The 'read data/fault' line stays at the down level, indicating a drive-detected error, until it is recognized by the adapter. The drive remains in this state until it receives a step command with the motor off. The drive then sends the most significant bit of the error code on the 'read data/fault' line. The first and last bits of the code are always a logical "0" (positive voltage). The error code bits are valid 150 microseconds maximum after the step pulse. The minimum time between step pulses is 300 microseconds.

Errors and Error Codes

The hexadecimal codes listed in the following explanations use binary encoding in which a line value of 0 volts equals a 1 bit and a line value of +5 volts equals a 0 bit.

Spindle-Speed Error

(Hexadecimal 2C)

The design of the drive requires that the spindle must be at the proper speed within four revolutions. A spindle-speed error indicates that the requirement was not met. Some of the possible causes for this error are:

- Spindle binding
- Motor binding
- ~~+24~~ +12 volt line out of specification
- Diskette binding

Rotor-Locked Error

(Hexadecimal 24)

The microcomputer in the drive issued a motor start, but did not receive any emitter pulses in return. Some of the possible causes for this error are:

- +12 ~~±24~~ volts missing
- Motor unplugged

Access-Too-High Error

(Hexadecimal 6C)

The adapter tried to cause the drive to make an access beyond track 45.

Access-Too-Low Error

(Hexadecimal 64)

The adapter tried to cause the drive to make an access below track 0.

Erase-Current Error

(Hexadecimal 44)

The erase current is off when it should be on, or it is on when it should be off.

Spindle-Off Error

(Hexadecimal 34)

The microcomputer in the drive is receiving tachometer pulses when the motor is supposed to be stopped. A possible cause for this error is a failure of the spindle motor driver or in some other associated circuit.

Drive Detected Error Reporting Procedure

The following is the sequence of events required when the microcomputer in the diskette drive detects an error and needs to communicate the problem to the system attachment:

1. The drive turns off the stepper motor and the spindle motor and goes not ready. The not ready condition causes all the output lines to go to the up level and turns off the write and erase currents.

2. The 'read data/fault' line goes to the down level to signal a fault.

3. The system attachment (adapter) must monitor the 'read data/fault' line at all times. When the line remains at the down level for more than 3 microseconds, the attachment causes the 'motor on' line to go to the up level and sends an interrupt to the system.

4. The system reads the status register, resets the interrupt, and sends an access command to the system attachment.

5. The system attachment sends a step pulse to the drive with the 'motor on' line at the up level. This condition, normally restricted, indicates to the microcomputer in the drive that the system has recognized that the drive is reporting an error and that the system is ready to receive the error code.

   After the step pulse has been sent to the drive, the adapter sends an interrupt to the system.

6. After receiving the step pulse, the drive sends the most significant bit of the error register on the 'read data/fault' line and prepares the internal error register to receive the next step pulse.

7. The system responds to the interrupt, reads the status register in the adapter, and stores the level of the 'read data/fault' line.

8. The system resets the interrupt and sends another access command to the attachment.

9. These last four steps are repeated seven more times to recover the 8-bit error code stored in the drive. There is no limit to the number of times these steps can be repeated.

10. To end the error reporting procedure, the attachment causes the 'motor on' line to go to the down level and sends a single step pulse to the drive.

    When the drive receives the access pulse and senses the 'motor on' line at the down level, the microcomputer branches to location 000. The effect of this action is a power-on-reset sequence.

SIGNAL AND POWER CONNECTORS

The 341 uses a "100 mil" (2.54 mm) connector for signals and d.c. power. The Berg connectors listed, or equivalents, are available for the signal and power cables.

Signal Cable Connector

Berg Quickie II, part ~~66432-820~~ 66432-826

Or, you may construct a cable connector using:

Berg Mini PV Pin Housing, part ~~65043-027~~ 65043-024 (~~20~~ 26 position)
Berg Mini PV pins, part 47217 (strip)
Berg Mini PV pins, part 47715 (loose)

Card Connector Pin Assignments (Attachment)

A01	-EMITTER	B01	GROUND
A02	RESERVED	B02	GROUND
A03	-MOTOR ON	B03	GROUND
A04	-STEP	B04	GROUND
A05	-STEP IN/HIGH GAIN	B05	GROUND
A06	-READ CLOCK	B06	GROUND
A07	-READ DATA/FAULT	B07	GROUND
A08	-WRITE GATE	B08	GROUND
A09	-WRITE DATA	B09	GROUND
A10	-RESET	B10	GROUND
A11	RESERVED	B11	GROUND
A12	RESERVED	B12	GROUND
A13	RESERVED	B13	KEY

Note: Pin B13 is omitted to polarize the connector. The matching position in the cable connector housing should contain a polarizing insert.

DC Power Cable Connector

Berg Mini PV Pin Housing, part 65043-033 (8 position)
Berg Mini PV pins, part 47217 (strip)
Berg Mini PV pins, part 47715 (loose)

Card Connector Pin Assignments

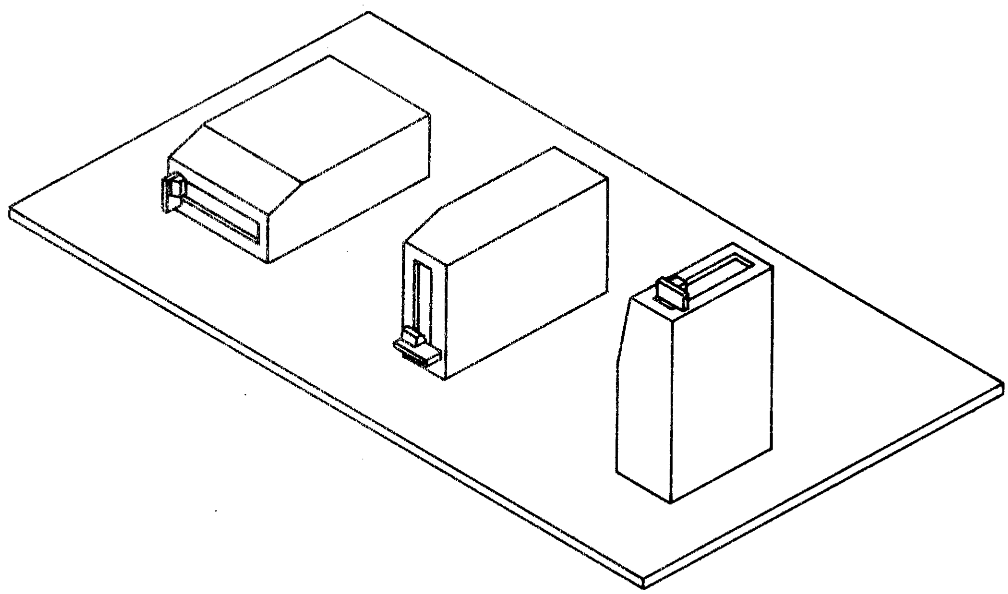
A01	+12 VOLTS	B01	+12 VOLT GND
A02	+12 VOLTS	B02	+12 VOLT GND
A03	+5 VOLTS	B03	+5 VOLT GND
A04	KEY	B04	-5 VOLTS

Note: Pin~~s~~ ~~A03~~, A04, ~~and B05 are~~ is cut off to polarize the connector. The matching positions in the cable connector housing should contain a polarizing insert.

MOUNTING

Mounting Positions

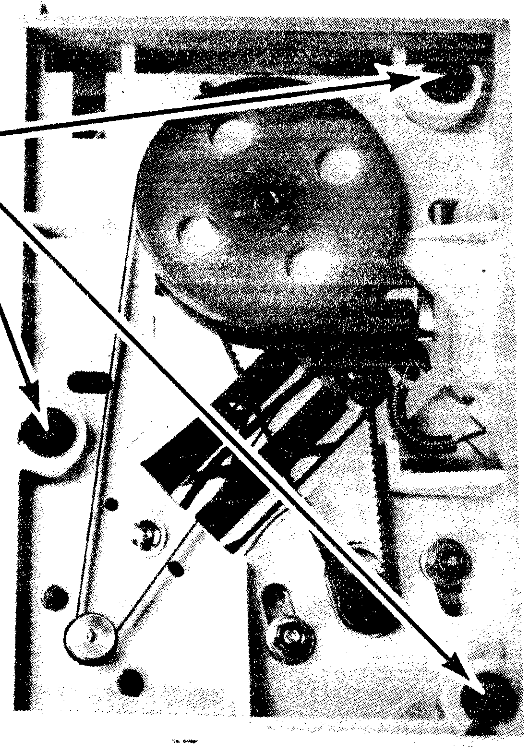
The 341 was designed to be mounted in any of the positions shown in the following illustration:



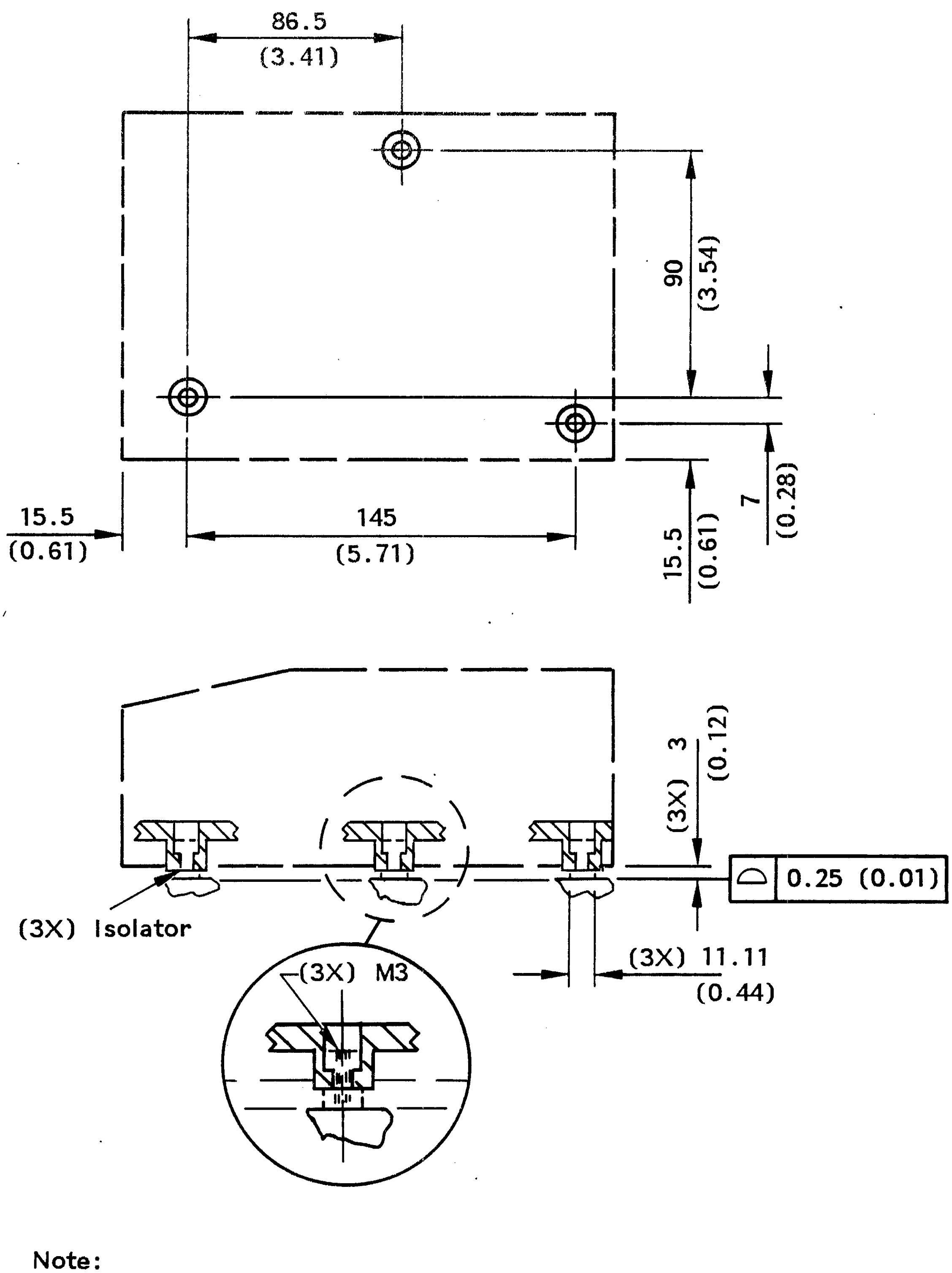
Mounting Hole Locations

The following photograph and drawings show the locations and dimensions of the threaded isolators that provide the mounting points for the drive.

Internally Threaded Isolators



The following drawings show the isolators as viewed from the top and side of the drive. As the photograph shows, the isolators are mounted on the bottom side of the drive.



Note:

Dimensions are shown in millimeters with inches below.

RESTRICTIONS

Signal and Power Cables

The tin-lead plating on all terminals must be 2.5 micrometers (100 microinches), minimum.

The maximum signal cable length is 1.5 meters (5 feet).

The power cable must be short enough to ensure that the voltages remain within tolerances.

Note: In determining cable lengths, be sure to consider whether or not the drive is to be removed from the system mounting position for servicing, and allow enough length for that work.

Over and Under Voltages

-5 volts:	0 to -6 volts
+5 volts:	0 to +6 volts
~~±24~~ +12 volts:	0 to ~~±27~~ +15 volts

Secondary Circuit Over-Current Protection

The diskette drive has no secondary circuit over-current protection.

Magnetic Shielding

Magnetic fields that pass through the drive can degrade the performance of the drive. Strong, low frequency fields can cause erasure and loss of data on the diskette. High frequency, or rapidly changing fields can cause soft or hard read errors. The proximity of any of the following sources of magnetic fields must be considered when installing the drive:

- Power supply transformers
- Voice coil magnets of other drives
- CRT components
- Other sources of either a.c. or d.c. fields

Vibration

The drive is supplied without mounting brackets. The system mounting hardware and frame must be such that the vibration levels listed in the following table are not exceeded. The levels listed are the average of vibrations at the drive isolator pads.

Frequency	Vibration Level *
5-17 Hz	0.90 mm (0.036 inch) maximum continuous peak to peak
	1.20 mm (0.048 inch) maximum transient
17-150 Hz	0.55 gravity maximum continuous
	0.73 gravity maximum transient
200-500 Hz	0.25 gravity maximum continuous
	0.33 gravity maximum transient

* The vibration level is the vector sum of the vibration levels measured simultaneously along three orthogonal axes.

Assume linear interpolation for vibration levels at frequencies between 150 and 200 Hz.

Diskette Format

Each diskette has 46 tracks. Flux transitions are written on the full length of each track. A transition should be read at least every 3 microseconds. The drive uses frequency modulation (FM) encoding.

Bit density is maintained at a constant level by varying the speed of the disk as the read/write head moves from track to track.

The diskette format is defined by the system. The table under "Track Capacities" provides the information the system needs to define the track format it will be using.

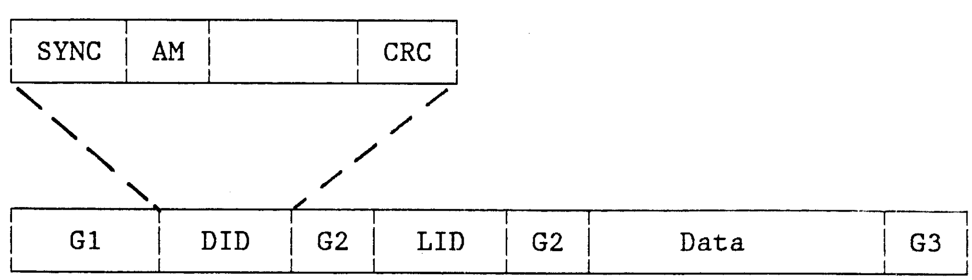
IBM has developed 256- and 512-bytes per sector formats; of these, the only preformatted DemiDiskettes available from IBM at this time have the 256-bytes per record format. The following information about the two formats provides examples of fully tested formatting schemes.

Sector Format

Each sector is divided into three fields. These fields are:

- Diskette ID (DID)
- Logical ID (LID)
- Data

Each of the three fields begins with a sync field and a specific address mark and ends with a 2-byte CRC field that is used for error detection. Following the CRC bytes is a gap written with all clock and data bytes at initialization. The gaps (shown as G1, G2, and G3) provide buffering for the slight differences in tolerances between diskette drives.



Diskette ID Field

The diskette ID field contains the 16-bit diskette ID number, track number, physical block number, and field length indicator (which specifies the size of the following data field). The diskette ID number is written when the diskette is formatted, and all diskette ID numbers are identical on any given diskette. This number can be used to verify a diskette prior to making any updates to the data.

Logical ID Field

The logical ID field contains the same information as the diskette ID field, except that it has no 16-bit diskette ID number.

Uses of the ID Fields

The dual-ID format provides two functions that have not been previously available on diskette drives:

- A diskette change indicator
- The relocation of defective sectors.

A diskette change indicator: The 16-byte ID number provides a method for the system to use in determining if the diskette has been changed. When a diskette is first inserted in a drive, the system sends a Read Any DID command to the diskette drive adapter. This command reads the 16-bit ID number. On succeeding drive operations, the system sends a Read Any DID command first, and then compares the 16-bit number read with the number stored after the first Read Any DID command. If the numbers compare, the diskette operation continues; if the numbers do not compare, the system assumes that the diskette has been changed, and takes the appropriate action.

The relocation of defective sectors: This function is a method of handling data when the drive encounters a hard write error. When this error occurs, the drive writes the data into one of five reserved alternative sectors instead of using the defective area on the recording surface. The system takes the following actions:

Rewrites the LID of the alternate, or relocated, sector with the LID information of the defective sector.

Rewrites the LID of the defective sector with the LID of the relocated sector.

Sets bits in the ID areas to indicate that the relocation has taken place.

This method of defective sector handling provides hard error data handling without requiring a map of the defective sectors.

The IBM Adapter Module supports both the defective sector relocation and the diskette change indicator functions.

Data Field

The data field contains information being stored on or read from the diskette.

Formatting Considerations

The only preformatted DemiDiskettes available from IBM at this time have the 256-bytes per sector format. On this diskette, track 0 is designated as a system track, and the last five sectors on track 45 are reserved for the relocation of defective sectors. The remaining capacities of the 256- and 512-bytes per sector formats are:

Bytes per Sector	Number of Sectors	Capacity in Bytes
256	937	239,872
512	510	261,120

Requirements

The IBM DemiDiskette does not have a mechanical or electrical index, therefore, a track format can begin at any point on the track. The formatting operation has two requirements:

- Write each track across its entire length.
- Do not overwrite one sector with another.

Formatting Procedure

1. Write gap 1, which is a long gap
2. Write the formatted data
    - Identifier fields
    - Data fields
    - Gaps

The lengths of gap 1 and the formatted data fields are pre-calculated for each track to ensure meeting the requirements listed previously.

The following table shows the standard formatting variables for 256- and 512-byte sectors. (Track 0 is the inner track.)

	256-Byte Records*		512-Byte Records**	
Track Number	Records per Track	Gap 1 (Minimum)	Records per Track	Gap 1 (Minimum)
0	16	672	9	605
1	16	754	9	687
2	16	837	9	770
3	16	920	9	853
4	17	649	9	935
5	17	732	9	1018
6	17	815	9	1101
7	17	897	9	1183
8	17	980	9	1266
9	18	709	10	713
10	18	792	10	796
11	18	875	10	879
12	18	957	10	961
13	18	1040	10	1044
14	19	770	10	1127
15	19	852	10	1209
16	19	935	10	1292
17	19	1018	11	740
18	20	747	11	822
19	20	830	11	905
20	20	912	11	987
21	20	995	11	1070
22	20	1078	11	1153
23	21	807	11	1235
24	21	890	11	1318
25	21	973	11	1401
26	21	1055	12	848
27	21	1138	12	931
28	22	868	12	1014
29	22	950	12	1096
30	22	1033	12	1179
31	22	1115	12	1261
32	22	1198	12	1344
33	23	928	12	1427
34	23	1010	13	874

	256-Byte Records*		512-Byte Records**	
Track Number	Records per Track	Gap 1 (Minimum)	Records per Track	Gap 1 (Minimum)
35	23	1093	13	957
36	23	1176	13	1040
37	24	905	13	1122
38	24	988	13	1205
39	24	1071	13	1288
40	24	1153	13	1370
41	24	1236	13	1453
42	25	965	13	1535
43	25	1048	14	983
44	25	1131	14	1066
45	25	1213	14	1148

* For the 256-byte format:

The size of each data area (including IDs and gaps) is 353 bytes.

The required gap 3 length is 42 bytes.

** For the 512-byte format:

The size of each data area (including IDs and gaps) is 635 bytes.

The required gap 3 length is 68 bytes.

Track Capacities

This information is for those who wish to develop their own formatting scheme; it is not needed by those who plan to use the standard formatting tables.

The following table gives the minimum, nominal (that is, the center of the design specifications) and maximum unformatted capacity of each track. The tracks are numbered from 0 (inner) through 45 (outer).

Track Number	Minimum	Nominal	Maximum
0	5733	6017	6332
1	5808	6096	6415
2	5882	6174	6498
3	5957	6253	6580
4	6032	6332	6663
5	6107	6410	6745
6	6182	6489	6828
7	6257	6567	6911
8	6331	6646	6993
9	6406	6724	7076
10	6481	6803	7159
11	6556	6881	7241
12	6631	6960	7324
13	6706	7038	7407
14	6780	7117	7489
15	6855	7195	7572
16	6930	7274	7654
17	7005	7353	7737
18	7080	7431	7820
19	7155	7510	7902
20	7229	7588	7985
21	7304	7667	8068
22	7379	7745	8150
23	7454	7824	8233
24	7529	7902	8316
25	7604	7981	8398
26	7678	8059	8481
27	7753	8138	8563
28	7828	8216	8646
29	7903	8295	8729
30	7978	8374	8811
31	8052	8452	8894
32	8127	8531	8977
33	8202	8609	9059
34	8277	8688	9142

Track Number	Minimum	Nominal	Maximum
35	8352	8766	9225
36	8427	8845	9307
37	8501	8923	9390
38	8576	9002	9472
39	8651	9080	9555
40	8726	9159	9638
41	8801	9237	9720
42	8876	9316	9803
43	8950	9395	9886
44	9025	9473	9968
45	9100	9552	10051

Note: To meet the requirements for each track, use the following formulas:

Σ(IDs + gaps + data fields) $\leq$ (minimum unformatted capacity)

Gap 1 $\geq$ (maximum unformatted capacity) - Σ(IDs + gaps + data fields)

Maintenance personnel need neither an oscilloscope nor a multimeter, because all problem determination can be done using the problem-determination procedures provided by the system.

This method of maintenance assumes that the system provides diagnostic and exercise routines to aid in the isolation of failing parts. The routines must be able to access the read/write head to any specified track and:

- Do repetitive read and write operations using standard retry procedures
- Do the following repetitive drive exercise procedure using standard retry procedures:
  - Read or Write a sector
  - Move the read/write head to a specified track
  - Turn the spindle motor on and off.

The parts removal and replacement procedures in this manual assume that the 341 drive has been removed from the using system.

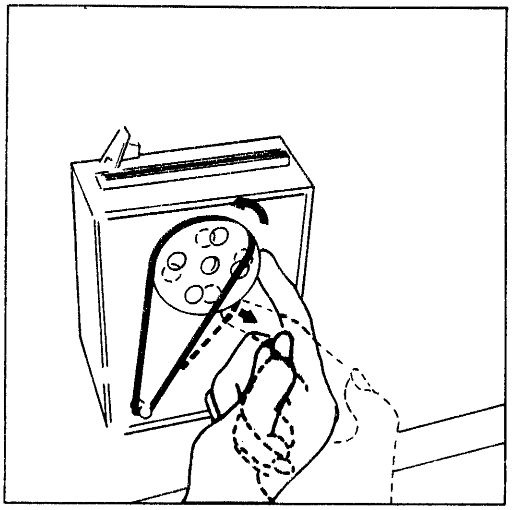
Removals and Replacements

The part numbers of the replaceable parts are included in the replacement procedures. No separate parts catalog is provided with the 341.

Removal and replacement procedures for the drive frame do not appear in this manual because each system may have unique requirements. However, the drive frame is available from IBM, either with or without the electronics card:

- With the electronics card, part ~~8330883~~. 1674281
- Without the electronics card, part ~~8330883~~. 1674230

Drive Belt Removal



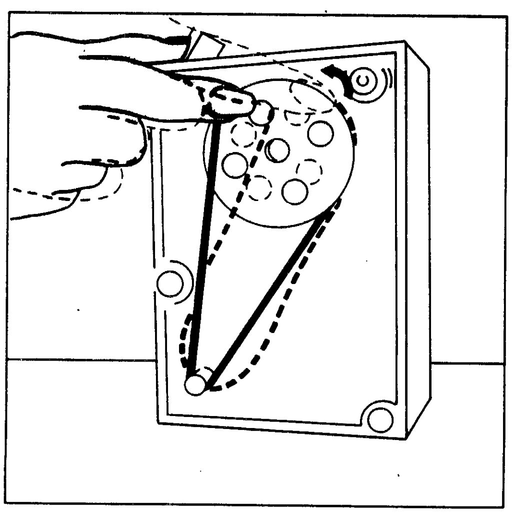
1. Place your finger behind the belt.

2. Gently pull the belt toward the front edge of the spindle pulley and rotate the pulley.

   The belt will roll off the pulley.

Drive Belt Replacement

(Part Number 8330905)



Note: One side of the belt is marked with one or more stripes. Make sure the stripes are on the outside of the belt when installing the belt in the drive.

1. Place one end of the belt over the spindle motor pulley.

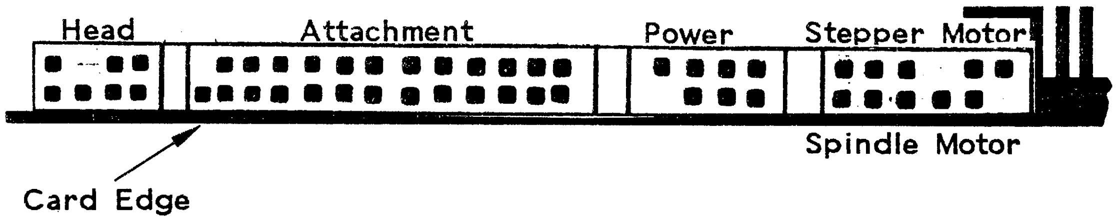
2. Hold the other end of the belt near the top edge of the spindle pulley with one finger.

3. Rotate the spindle pulley with your finger.

   The belt will roll onto the spindle drive pulley and center itself.

Card Assembly Connectors

The card has five connector locations. The connectors are keyed to prevent plugging them incorrectly. The following figure shows the connector locations, and the keyed positions. Note that the stepper motor connector is above the spindle motor connector.

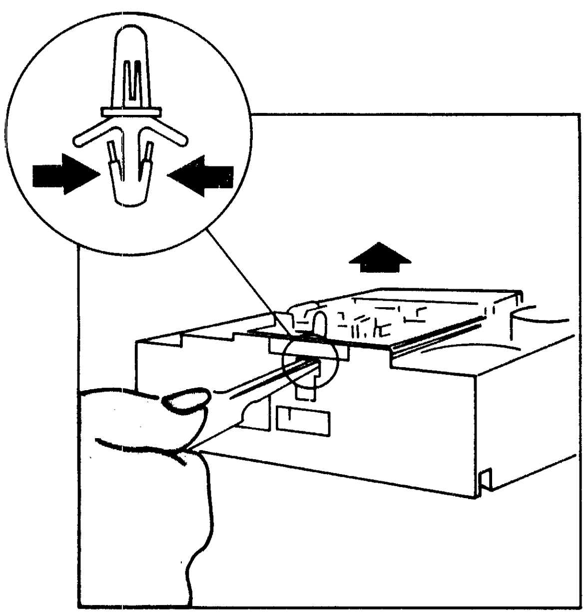


Notes:

1. The small bars in the drawing are pin positions. Blank pin positions indicate keys in the cable connectors.

2. Only the attachment and power connectors need to be unplugged to remove the diskette drive from the system.

Card Assembly Removal



1. Remove all power from the drive.

2. Remove all connectors from the card assembly.

3. While lifting gently on the card, squeeze the wings on the card-support studs with needle-nose pliers.

4. Lift the card assembly from the drive frame.

Card Assembly Replacement

(Part Number ~~8331213~~) 1674282

1. Locate the card-support studs in their holes in the frame.
2. Press down on the card until both wings on each card-support stud lock the card to the frame.
3. Reinstall all the connectors.
4. Return power to the drive.