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FD360/CF360  
MAINTENANCE MANUAL

This maintenance manual is intended as a trouble-shooting guide for isolating faults down to the replaceable subassembly level. Schematics are supplied as an aid in examining signals. No attempt is made to explain the operation fully enough to isolate faults down to the individual component level, however, it should be possible given the right test equipment and experience.

It is recommended that OEM customers who are maintaining large numbers of FD360/CF360 systems stock the subsystem level spares for use in field repairs. A recommended Spares List is given in the Appendix.

November 1975

SYMPTOM

POSSIBLE CAUSES (See Appendix for Signal Locations)

Drive Fail Status, Drive Motor does not run

1. Drive not up to speed yet. Software should allow 6-7 seconds after closing door.
2. Diskette jammed. Open door. Reinsert Diskette. Try again. Diskette may be out of tolerance. Try another Diskette.
3. Check +24 Volt supply. Pins E (+24V return) and F (+24V) on MUX PCB power connector. Voltage with both drives running s/b 24.0 Volts  $\pm$ 10%.
4. Check cable connections. Ribbon connector. Power connector. Drive connector.
5. Try swapping MUX cards. If problem remains with drive, then check DRFAL signal. Should be low when door is open. Should go high 5 seconds after door is closed. Should hear motor start.
6. Is a valid unit selected? Check SEL 0\*, SEL 1\*, SEL2\*, SEL 3\*. Should be logic "0" for selected drive. All others should be logic "1". Check command load unit/sector and data in lines.

Head Loads, but does not seek

1. Head may be past track 76. Issue Seek 0 Command and retry.
2. Diskette may be bad. Try another.
3. Check -5V at pin A of MUX card. Check -12V supply at pin 1 of MUX card. Tolerance nominally  $\pm$ 5%.
4. Check 10ms signal. When seeking, 10ms should be high for 10-11 msec, then low for about 1 us, then high, etc. Adjust frequency if necessary.
5. In a dual (or more) drive system, if one unit seeks OK and the other doesn't, try swapping MUX's. If problem now is in the other drive, replace the MUX. If the same drive is bad, replace drive.
6. If both drives will not seek, verify that the SEEK signal goes high. If the SEEK signal does not go high, check that the SEEK command, 05, is coming from the CPU on the CPU 0\* - CPU 7\* lines.

SYMPTOM

POSSIBLE CAUSES (CON'T.)

Head Loads, but does not seek (con't.) 7. If SEEK signal does go high, check for how long. 5-10 ms indicates CRC error in ID sector. 700 ms indicates no data being read from Diskette. Replace controller

CRC Errors

- 1. Excessive wear on Diskette. Replace Diskette.
- 2. Diskette not seated. Reinsert and retry, put system in a read loop.
- 3. Sync scope on INDEX signal, positive edge. Look at two signals with two traces of the scope. On "A" trace look at the DAFLD signal. With the other trace look at CRCAZ signal. Twenty six DAFLD pulses should occur for each sync. At the end of each DAFLD, CRCAZ should go high momentarily. If the momentary high is not present, it is due to CRC error on Diskette or controller failure. Try a known good Diskette. If still bad, replace controller.

Seeks to wrong track

- 1. Bad controller. Replace.

One bit of data is bad on read

- 1. Bad controller or interface. Write a pattern of all one's and examine input and output of read buffer. Inputs should be all ones during DAFLD time. Sync on NXDFD signal. Cycle on read. Output should be all one's also. Repeat with all zero pattern.
- 2. Check data in signals DIO-DI7 with data pattern above. Sync on GASTS signal. Data in lines should be one/zero during the time GASTS is logic zero.

One bit of data is bad on write

- 1. Verify that data written previously can be read correctly.
- 2. Write all one's pattern continuously to one sector. Check inputs to write buffer D00-D07 and outputs of write buffer during NXDFD signal.

Reads wrong sector

- 1. Put system into continuous read loop on the correct sector. Examine NXDFD signal. It should be about 5 msec long. If it does not go high at all then the sector cannot be decoded from any ID field. Check SEC 0\* - SEC 4\* signals (negative true) to verify sector is being loaded correctly.

SYMPTOM

POSSIBLE CAUSES (CON'T.)

Reads wrong sector  
(con't.)

2. If NXDFD is only about 100 us long, there is a CRC error in the ID field. Try a new Diskette.
3. If NXDFD is about 10 ms long, then the address mark at the beginning of the data field is not being detected. Try writing the sector again.
4. NXDFD is correct period but still wrong sector, check SEC 0\* - SEC 4\* (negative true)

Head seeks, but moves in two  
or more stages

1. Put system into continuous loop of Seek 0 and Seek to track 4C (HEX). Check timing of 10MS signal. When seeking 10MS should be high for 10-11 ms and low for 1 us. Adjust timing if necessary.
2. Bad Diskette, try another.
3. Bad drive, check wear and friction of head stepper stage.
4. Check connectors, MUX to controller, MUX to drive.

Busy does not set

1. Check that Read, Write or Seek commands are being received.
2. Check 10MS signal. It should be a 10 MHz signal.

APPENDIX A  
GLOSSARY OF SIGNALS

<u>SIGNAL</u>	<u>DESCRIPTION</u>	<u>SOURCE</u>
SEEK	Seek Command Latch	B1-10
SEEK 0	Seek 0 Command Latch	B1-12
READ	Read Command Latch	B1-2
READ CRC	Read CRC Command Latch	B1-7
WRITE	Write Command Latch	B1-5
WRDDA	Write Deleted Data Address Mark Command Latch	B1-15
Clear*	Clear Signal (Neg true)	C3-6
Gasts	Gate Status if True, Gate Read Data if False	A3-12
LDTRA	Load Track Address	B2-10
LDU.S	Load Unit/Sector	B2-8
LDWRD*	Load Write Buffer (Neg true)	B3-6
RBOUT*	Shift Read Buffer (Neg true)	A6-11
CLREF*	Clear Error Flags	A5-1
BUSY	Controller Busy	D4-5
DONE	Controller Done Pulse (2 us)	D1-13
IDFLD	ID Field Time	F12-3
GAP2	Gap between ID and Data	F12-5
DAFLD	Data (Sector) Time	E9-3
Index	Index Hole Time	F14-1
GAP3	Gap between Data and ID	G15-10
WRTEN	Write Enable Time	F4-8
CO,1*	Write Clock Time	G4-6
C20,21*	Write Data Time	G4-8

APPENDIX A  
GLOSSARY OF SIGNALS (CON'T.)

<u>SIGNAL</u>	<u>DESCRIPTION</u>	<u>SOURCE</u>
SDIN	Serial Data into CRC Register	E3-3
SDOUT	Serial Data out of CRC Register	D7-12
WDATA*	Write Data Composite (Neg true)	F1-13
ID*	ID Field Address Mark Detect	C12-12
Data*	Data Field Address Mark Detect	C6-8
Sep Clock*	Separated Clock (Neg true)	E7-3
Sep Data*	Separated Data (Neg true)	E16-6
HIGHI*	High Current Adjust Above Track 43	C13-10
10M	10 Megahertz Clock	C3-11
WBO-WB7	Write Buffer Output	A16,B16-14,4,12,7
P8DO-P8D7	Read Buffer Output	D14,D15-14,4,12,7
FDDAM	Found Deleted Data Address Mark Latch	D6-5
10MS	10 msec Timing Signal for Head Step	A7-13
SLEW	Head Slew one shot	D1-5
STOUT*	Step Head out towards Track 0 (Neg true)	B7-3
STIN*	Step Head in towards Track 76 (Neg true)	B8-12
TRO	Track 0 Switch	E7-4
SEC 0*- SEC 4*	Sector Latch (Neg true)	A13-1, 14,11,8 A12-1
UN0	Unit Select Bit 0	A12-10
UN1	Unit Select Bit 1	A12-9
NXDFD	Next Data Field	D6-3
QHDL	Head Load Latch	D4-3

APPENDIX A

GLOSSARY OF SIGNALS (CON'T.)

<u>SIGNAL</u>	<u>DESCRIPTION</u>	<u>SOURCE</u>
SELO*	Select Unit 0 (Neg true)	E13-11
SEL1*	Select Unit 1 (Neg true)	E13-9
SEL2*	Select Unit 2 (Neg true)	E13-7
SEL3*	Select Unit 3 (Neg true)	E13-5
CRC	Cyclic Redundancy Check Latch	E9-5
WRPRO	Write Protect	E2-8
DRFAL	Drive Fail	E2-13
CRCAZ	CRC Register Equals Zero	D8-10
CPU0*- CPU7*	Command Output Bits 0-7 (Neg true)	A9-1,2,4,9,11,13 B9-11,13
CDO0*- CDO7*	Data Output Bits 0-7 (Neg true)	B9-1,3, A11-1,3,5, 9,11,13

APPENDIX B

RECOMENDED SPARES

iCOM MODEL FD360 FLOPPY DISK SYSTEM

<u>ITEM</u>	<u>MODEL</u>	<u>DESCRIPTION</u>	<u>UNIT PRICE</u>	<u>*</u>
1.	FD400	Pertec Floppy Disk Drive	\$ 650.00	4
2.	CF360	Controller/Formatter P.C. Board Set	850.00	2
3.	360-20	Multiplexer P.C. Card (MUX)	50.00	2
4.	360-22	2 Drive Cable from Controller to Drives	50.00	2
5.	360-24	4 Drive Cable	80.00	1
6.	360-25	50 Pin Jumper Cable between Controller Boards	30.00	3
7.	360-26	40 Pin Jumper Cable between Controller Boards	30.00	3
8.	360-27	Computer to FD360 Cable Assembly	50.00	5
9.	360-101	Power Supply Assembly +24V, +5V, -12V prewired	250.00	2
10.	225-20621-401- 117	Connector - MUX power	5.00	10
11.	225-21021-401- 117	Connector - Controller power	5.00	10

\* Recommended inventory quantity per 100 installed FD360 units

NOTE: Prices shown valid at time of publication, but subject to change without notice.

Please ask for price quotation before ordering.





## DISK DIAGNOSTICS

COMMAND	ACTION	COMMENTS	POSSIBLE ERROR MESSAGE
A	Send clear pulse to Floppy Disk Drive electronics.	May be used to halt disk operation provided key board response is available.	None
Bu,t	Seek to specified track and verifies proper track was attained.	Time required = 0 to .75 seconds (approximate)	None
Du,s	Reads from specified sector on current track to buffer.	Time required = .2 to 1 seconds (approximate)	01
Fu,s	Writes from buffer to specified sector on current track.	Continuous test - no physical indication of test progress	
Gu,s	Writes from buffer to specified sector on current track, then, checks by reading written data and compares to buffer.	Continuous test - no physical indication of test progress	02 03 07
Hu	Seeks track 0 to track 76 verifying that respective tracks were attained.	Continuous test - repetitive head movement to and from extremes of travel	None
I	Selects each of the four drives.	Checks electronics regardless of physical drives installed. No physical indication of test progress.	04
Ju	Seeks each track (0 to 76) on unit specified. Writes track and sector number in each sector. Then reads to verify.	Approx. time required = 9 seconds per track for write cycle, 5 seconds per track for read cycle - total time = 17 minutes (approx.)	01 02 05
Ku	Repetitive J test.	Continuous test.	01 02 05
Lu	Repetitive J test read cycle only.	Continuous test.	01 05
Mu	Writes deleted data mark on each sector of current track, then, checks by reading.	Approx. time required = 15 seconds.	06

