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# APPLICATION NOTE

## SMD/FINCH INTERFACE ADAPTER BOARD FUNCTIONAL DESCRIPTION

MAGNETIC PERIPHERALS INC.
a subsidiary of CONTROL DATA CORPORATION

APPLICATION NOTE

# SMD/FINCH INTERFACE ADAPTER BOARD FUNCTIONAL DESCRIPTION

## 1.0 INTRODUCTION

The purpose of this document is to describe the method of using the Magnetic Peripheral Inc., (MPI) furnished SMD/FINCH interface adapter board (FIA).

This FIA is designed to adapt the model 9410-3 FINCH interface to the Control Data SMD interface standard. The FIA allows customers who do not have a controller available for evaluating the FINCH, to use their existing SMD controller. There should be no hardware changes when using the FIA, however, there will be software changes required to accommodate the data capacity of the FINCH. These differences are summarized further on in the text.

The FIA is not planned for production at MPI, but only as an evaluation tool to help the customer evaluate the FINCH.

For more detailed information in regards to these two interfaces, refer to the applicable product specifications. These are as follows:

- Product Specification for FINCH Disk Drive Model 9410-3F 77653332
- Flat Cable Interface Specification for the SMD Family 64712400

## 2.0 FUNCTIONAL DESCRIPTION

Figure 1 shows the component layout of the FIA. The design of this board makes it easy to interface the FINCH with an SMD controller. The FIA consists of the following:

1. SMD Interface Connectors
2. FINCH Interface Connectors
3. Control Logic to Translate the Signals between the Two Interfaces

## 2.1 SMD INTERFACE CONNECTORS

Figure 2 identifies the pinout nomenclature of the SMD interface connectors to which the FINCH interface is being adapted. The interface connectors provided are:

| | |
|---|---|
| J1 | 60-Pin header - SMD "A" Cable |
| J2 | 60-Pin header - Terminator Board |
| J3 | 26-Pin header - SMD "B" Cable |

J1, J2, and J3 are 3M type flat cable headers.

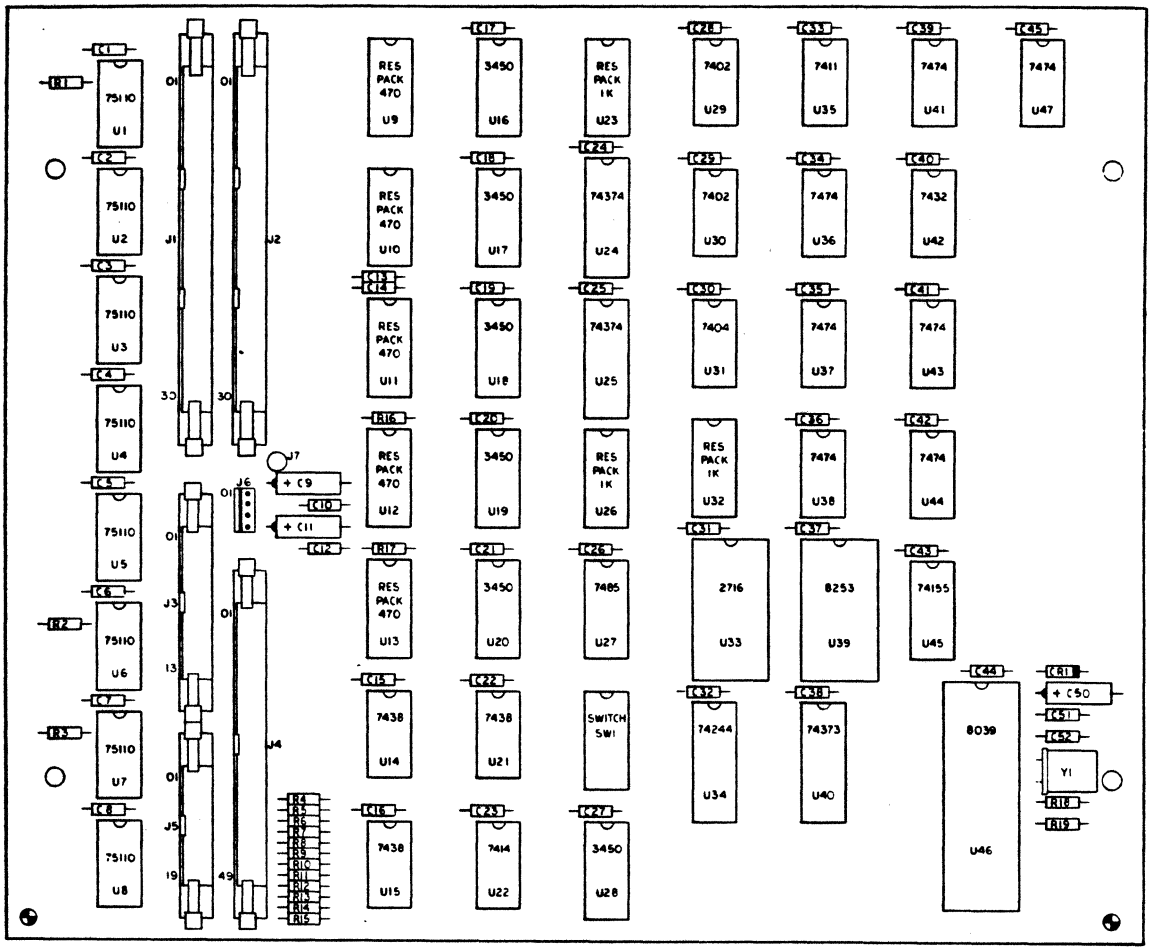
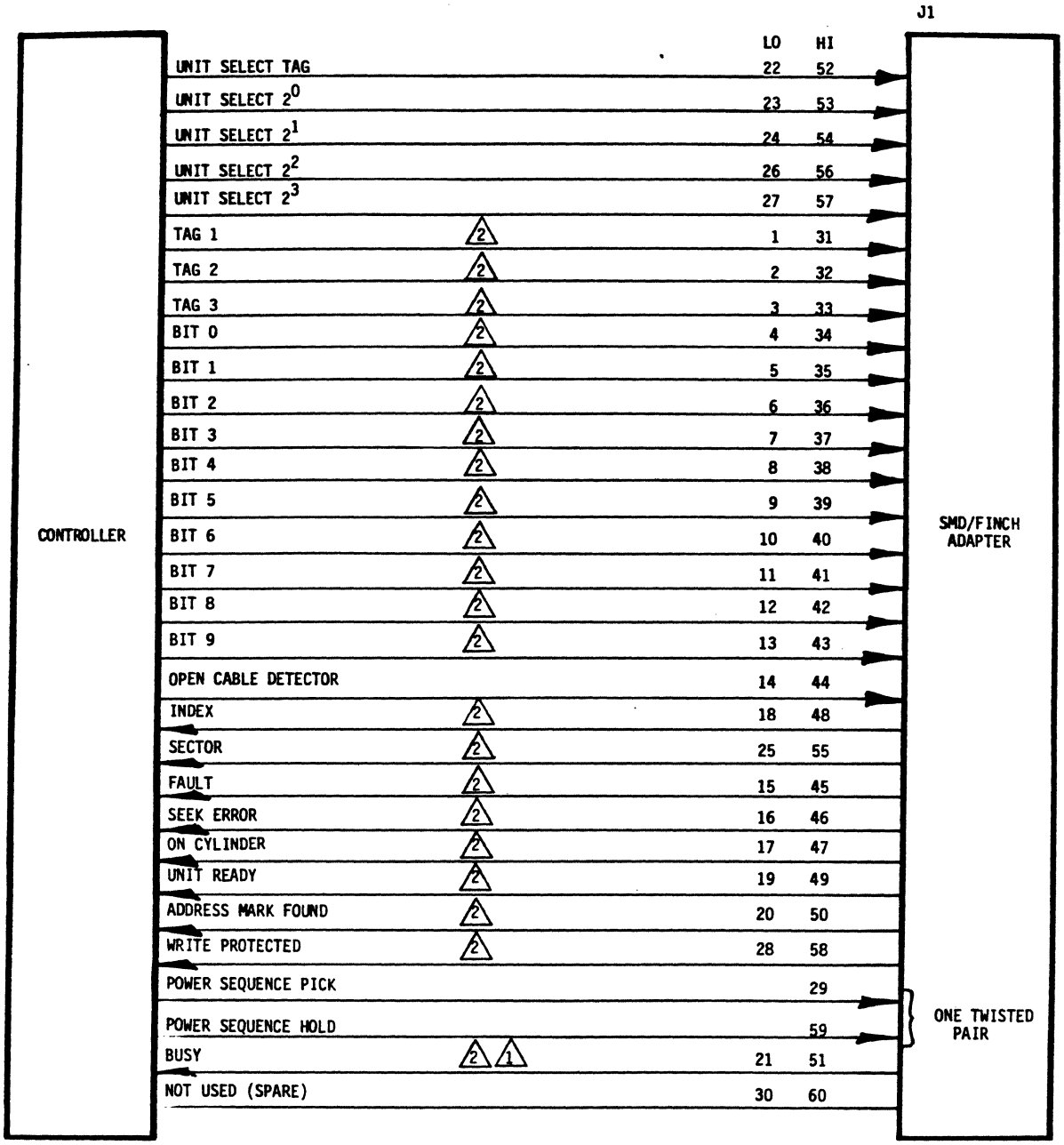



Figure 1. SMD/FINCH Interface Adapter Board Layout




NOTES: 60 POSITION
22 AWG, 10 TWISTED PAIR - STRAIGHT FLAT CABLE
MAXIMUM LENGTH - 100 FEET

(1) DUAL CHANNEL UNITS ONLY.

(2) GATED BY UNIT SELECTED.

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Figure 2a. "A" Cable Interface

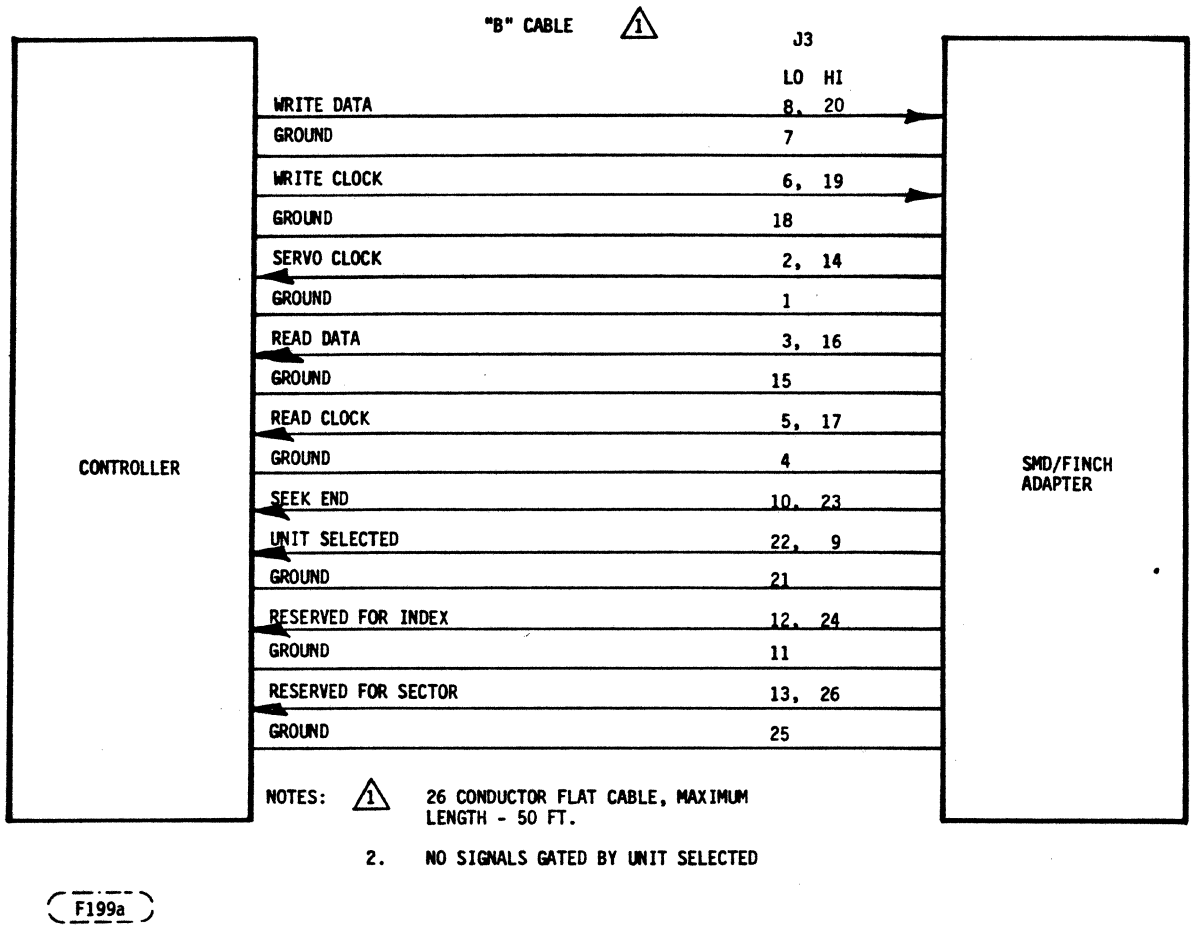


Figure 2b. "B" Cable Interface

## 2.2 FINCH INTERFACE CONNECTORS

Figure 3a and 3b identifies the pinout nomenclature of the FINCH interface connector. The pinout is configured for a 9410-3 FINCH interface. The interface connectors required are:

J4 50-Pin header - FINCH Command Cable
J5 20-Pin header - FINCH Data Cable

J4, and J5 are 3M type flat cable headers.

## 2.3 CONTROL LOGIC

The control logic contained on the FIA performs the following four maior functions:

1. Converts the SMD Bus and Tag to:

   Head Select $2^0$ and $2^1$
   Write Enable
   Read Enable
   Early and Late Strobe
   Fault Reset
   Return to Zero
   Drive Select 1

2. Convert the SMD cylinder address on SMD Bus and Tag to Step and Direction.

3. Converts FINCH Index and BYTE Clock to the SMD Index and Sector pulses.

4. Generate SMD required signals

   On Cylinder
   Seek Error
   Write Protect
   Address Mark Found
   Fault
   Seek End

5. Converts single-ended TTL signals from the FIA to differential signals for the controller.

The FIA does not support the Busy, Pick and Hold on the SMD interface and Drive Capacity on the FINCH interface.

The block diagram shown in Figure 4 identifies the interaction of the five major functions of the FIA.

## 3.0 OPERATION

The following paragraphs identify the requirements for operating the FIA.

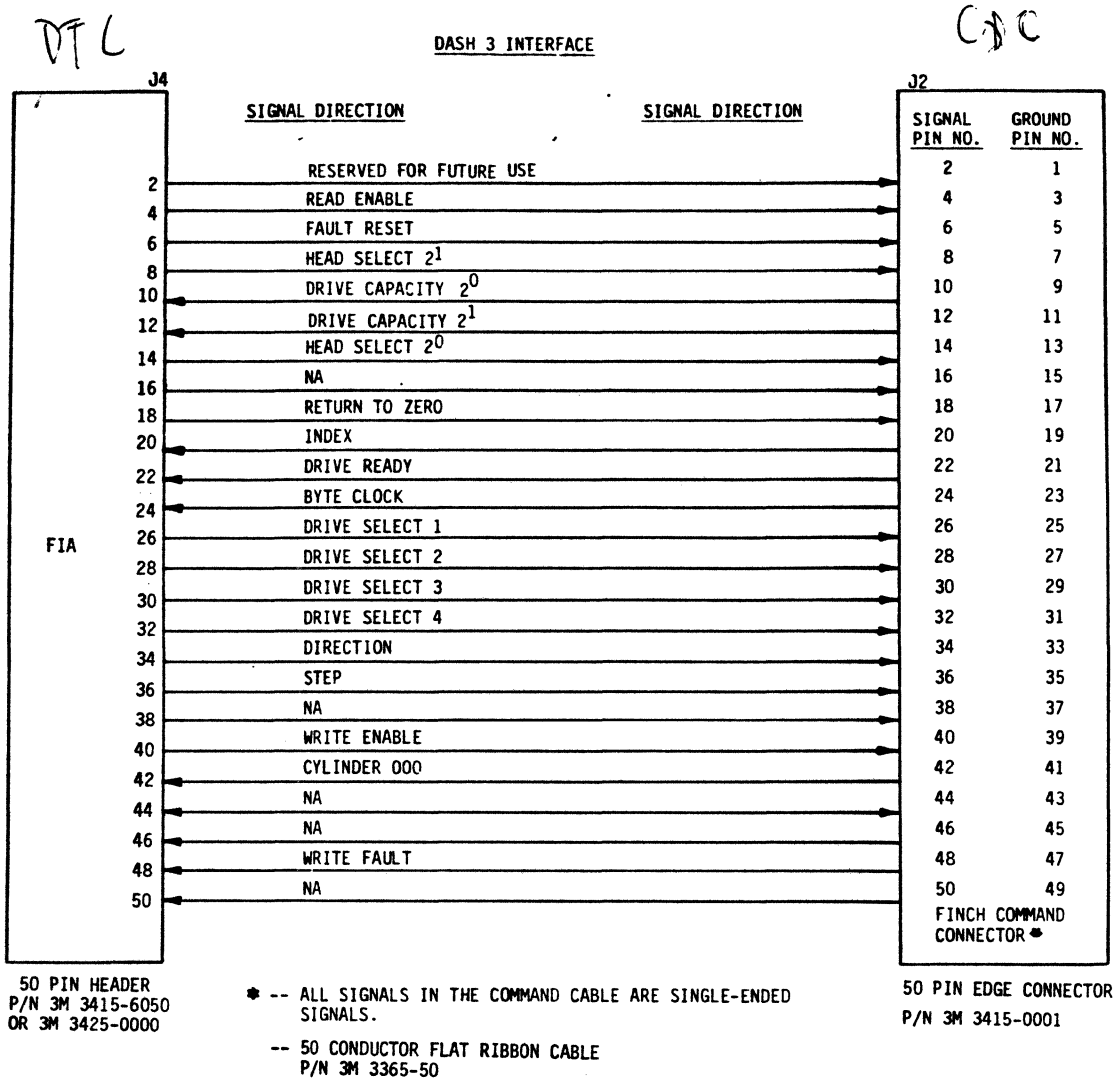


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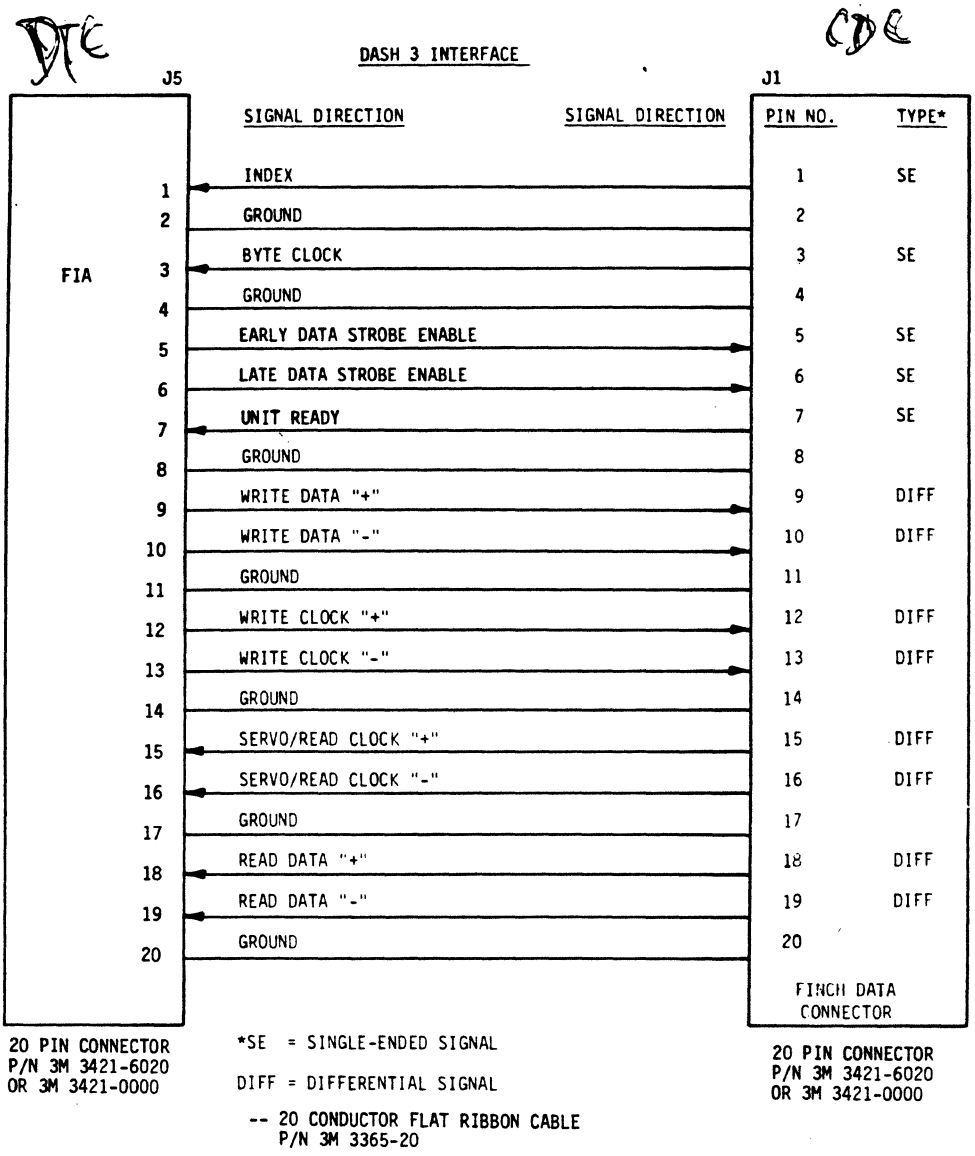
**Figure 3a. Command Cable Interface**




( F221b )

Figure 3b. Data Cable Interface

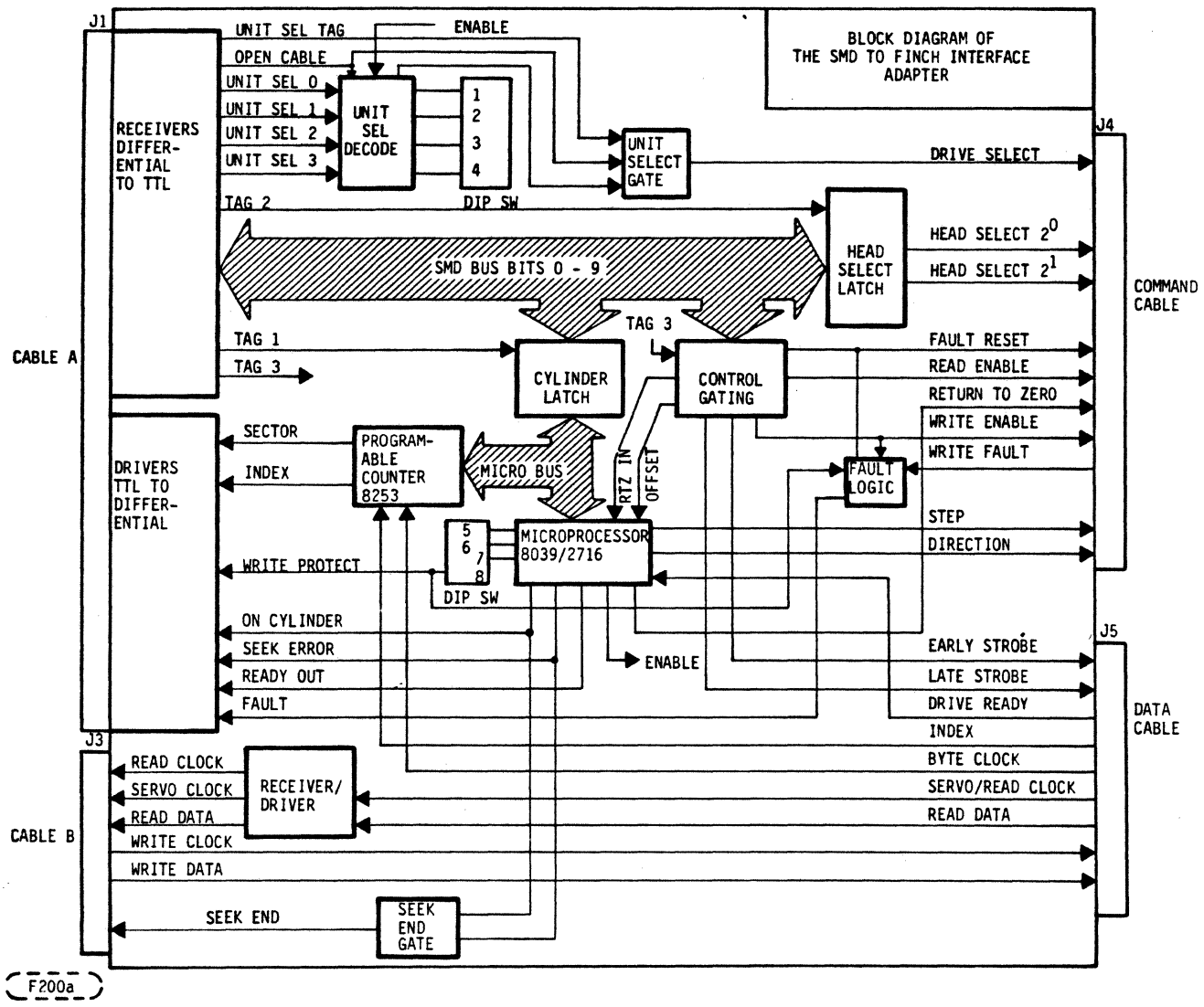



Figure 4. SMD/FINCH Interface Adapter Board Block Diagram

## 3.1 DC POWER

The FIA requires ± 5VDC to power the control logic. This power is supplied to J6 (4-pin header) which has Pin No. 3 keyed. The power requirements are summarized in Table 1.

| PIN NUMBER | POWER TYPE | CURRENT RATING |
|---|---|---|
| 1 | -5VDC | 300 MA |
| 2 | GND | -- |
| 3 | KEY | -- |
| 4 | +5VDC | 750 MA |

Table 1. DC Power Requirements

The recommended mating connector is AMP series MTA-100, No. 640440-4 using 22 gauge wire.

## 3.2 SIGNAL CABLES

There are two configurations that the FIA may be cabled; radial or daisy chain.

RADIAL - In the radial configuration, one FIA is required for each FINCH. In this mode the terminator board is required in connector J2 and the ground lead must be connected to the ground lug provided on the FIA.

DAISY CHAIN - In the daisy chain mode the SMD "A" cable can be daisy chained by removing the terminator board and inserting the daisy chain cable into the J2 connector. The FINCH side of the FIA cannot be daisy chained, therefore, for each FINCH in the daisy chain, a FIA is required.

## 3.3 MODE OF OPERATION

The FIA contains an eight (8) position DIP switch which is used to select the mode of operation. The following options are available:

1. One of sixteen (16) possible unit addresses
2. One of eight (8) sector sizes
3. Write protect

The identification of the options with the switch settings on the DIP switch are detailed in Figure 5.

UNIT ADDRESS (SMD IF) (1.)

SWITCH POSITION

| 1 | 2 | 3 | 4 | |
|---|---|---|---|---|
| UN3 | UN2 | UN1 | UN0 | ADDRESS |
| 0 | 0 | 0 | 0 | 15 |
| 0 | 0 | 0 | 1 | 14 |
| 0 | 0 | 1 | 0 | 13 |
| | | ⋮ | | |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

. WRITE PROTECT

SWITCH POSITION 8

| WP | PROTECTED |
|---|---|
| 0 | YES |
| 1 | NO |

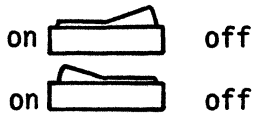
SECTOR SIZE

SWITCH POSITION

| 5 | 6 | 7 | | | |
|---|---|---|---|---|---|
| SS2 | SS1 | SS0 | SECTOR LENGTH | SECTORS/ TRACK | DATA BYTES/ SECTOR |
| 0 | 0 | 0 | 187 | 71 | 128 |
| 0 | 0 | 1 | 315 | 42 | 256 |
| 0 | 1 | 0 | 571 | 23 | 512 |
| 0 | 1 | 1 | 1083 | 12 | 1024 |
| 1 | 0 | 0 | 189 | 71 | 128 |
| 1 | 0 | 1 | 320 | 42 | 256 |
| 1 | 1 | 0 | 584 | 23 | 512 |
| 1 | 1 | 1 | 1120 | 12 | 1024 |

(2) (3)

0 = ON
1 = OFF




(1.) THE FINCH ITSELF MUST BE CONFIGURED AS UNIT 0.

(2.) BYTES PER SECTOR BASED ON HAVING 59 BYTES OF FORMAT HEADER.

(3.) BYTES PER SECTOR BASED ON ELIMINATING REMAINDER (PARTIAL SECTOR) AT THE END OF A TRACK.

FIGURE 5. DIP SWITCH OPERATION

## 3.4 SYSTEM/CONTROLLER CHANGES

### 3.4.1 SOFTWARE CHANGES

Because the FINCH is not identical to a member of the SMD family, some software constants may require changes. The following items are listed to aid in making the necessary changes.

| | |
|---|---|
| BYTES PER TRACK | 13440 |
| TRANSFER RATE | 6.45 MBITS/SEC |
| TRACKS PER SURFACE | 605 |
| SURFACES (FIXED) | 1, 3, OR 4 |
| SURFACES (REMOVABLE) | 0 |
| SINGLE TRACK SEEK | 10 MS MAX |
| AVERAGE SEEK | 50 MS |
| MAXIMUM SEEK | 100 MS MAX |
| SECTORS PER TRACK | SEE Figure 5 |

### 3.4.2 HARDWARE CHANGES

No hardware changes should be required.

## 3.5 MOUNTING

The FIA design included mounting holes which are compatible with the hole pattern on the top of the FINCH Power Supply. Therefore, it is possible to mount the FIA on top of the FINCH Power Supply using standoffs as shown in Figure 6.

## 3.6 FIA FLOWCHARTS

Section 2.3 described the conversions that the FIA performs to adapt the FINCH interface to the SMD Interface. Some of the conversions are performed using hardware, however, most of the conversions are performed in the firmware. The following flowcharts are provided to give some insight into the firmware operation. The following routines are shown:

| | |
|---|---|
| Main Routine | Figure 7 |
| Initialize | Figure 8 |
| Event | Figure 9 |
| RTZ | Figure 10 |
| Seek | Figure 11 |
| Offset | Figure 12 |
| Change Sector Size | Figure 13 |
| Ready Lost | Figure 14 |

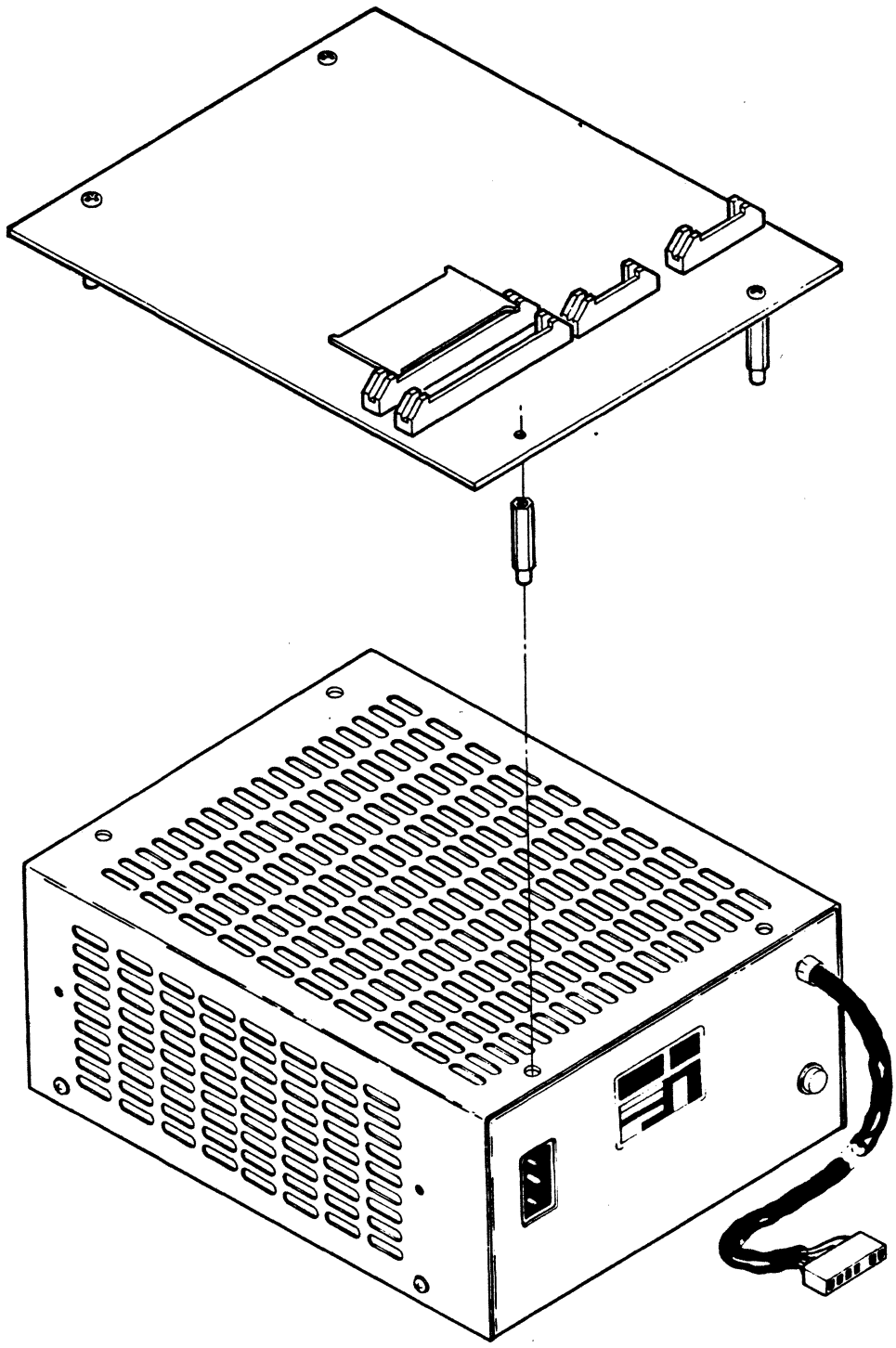


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Figure 6. SMD/FINCH Interface Adapter Board Mounting

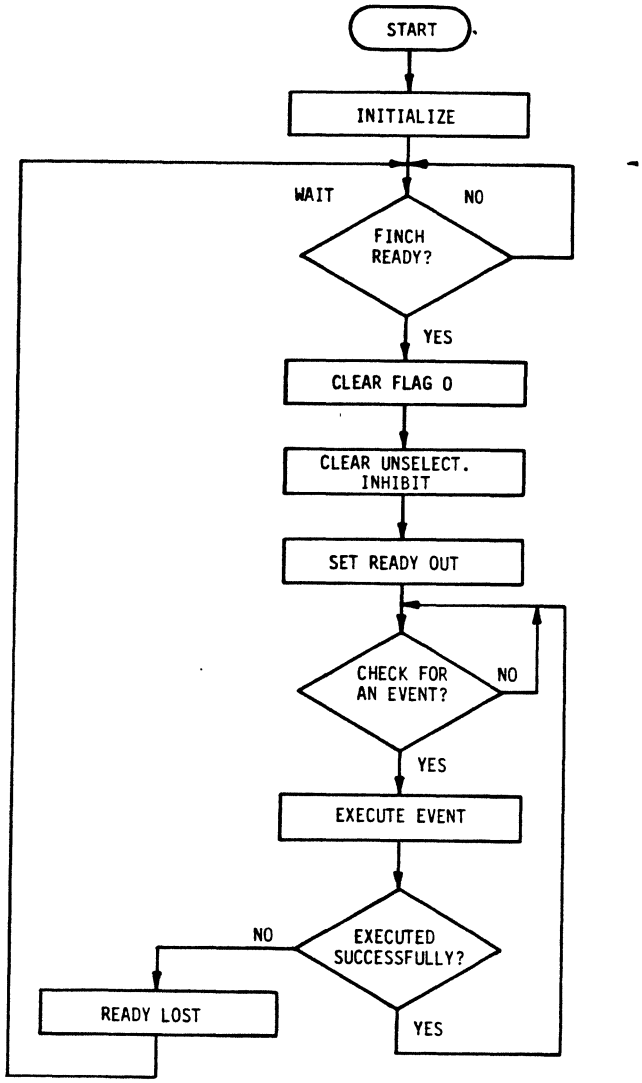


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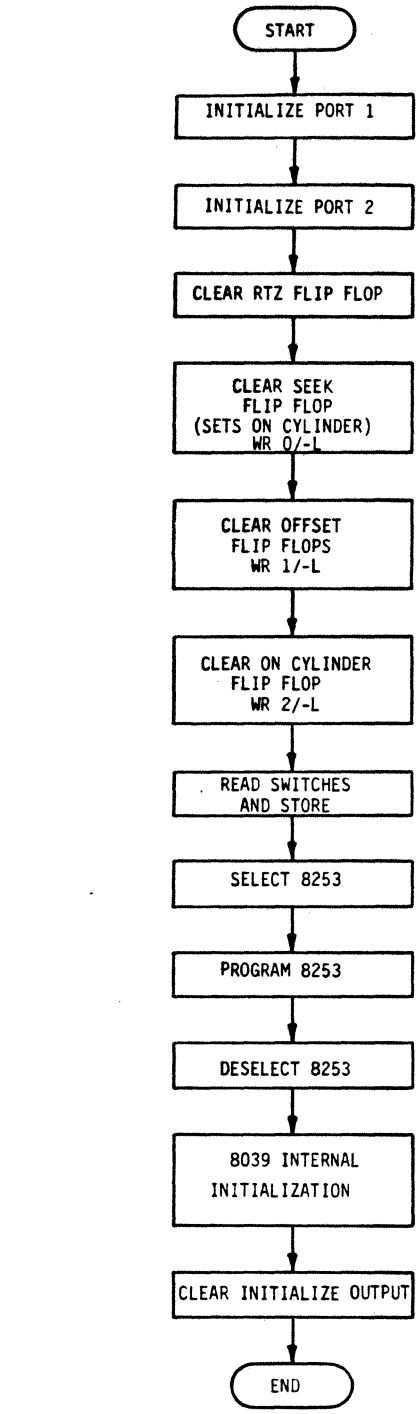
**FIGURE 7. FINCH/SMD IF ADAPTER MAIN ROUTINE**

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RAM REQUIREMENTS:
PORT 1. DESIRED TIMER COUNT REGISTER
PORT 2. TIMER OVERFLOW COUNTER REGISTER

**FIGURE 8. INITIALIZE**

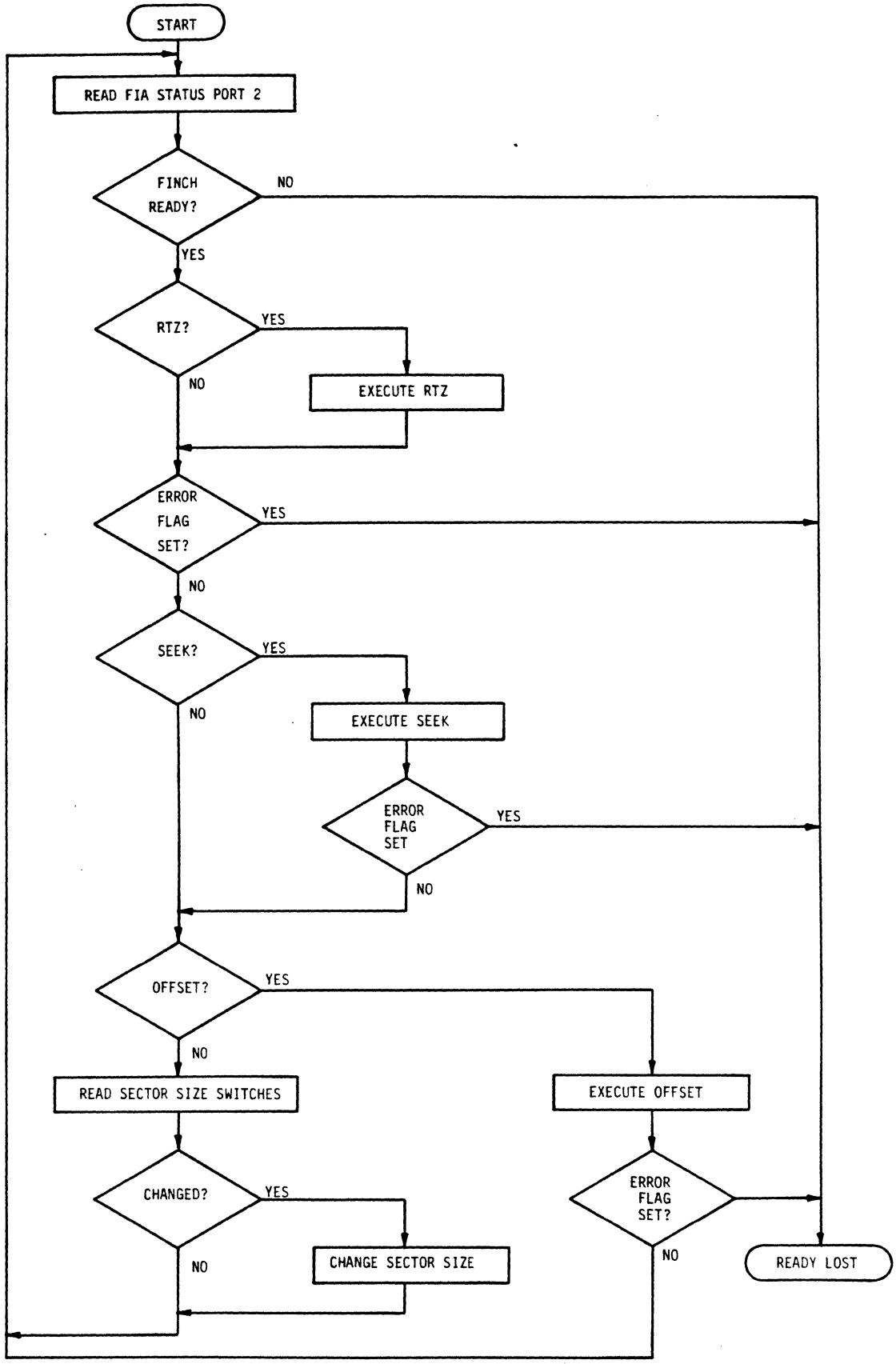


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**FIGURE 9 EVENT**

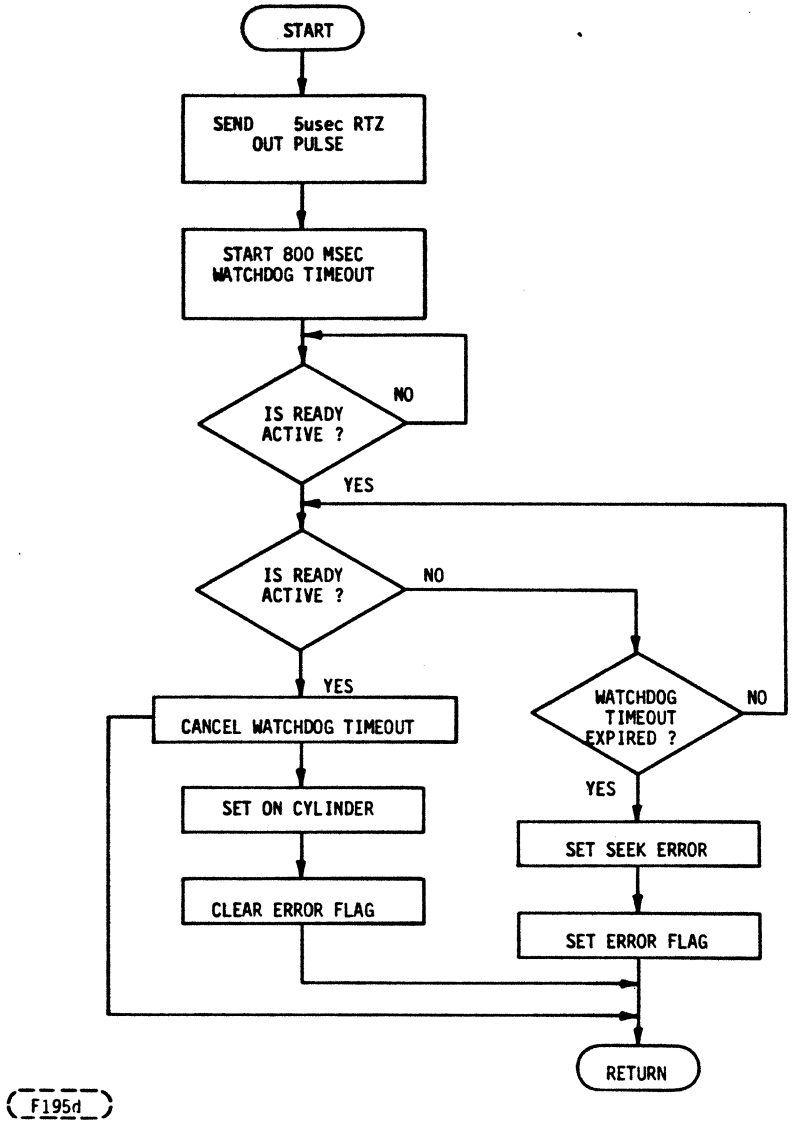


FIGURE 10. RTZ

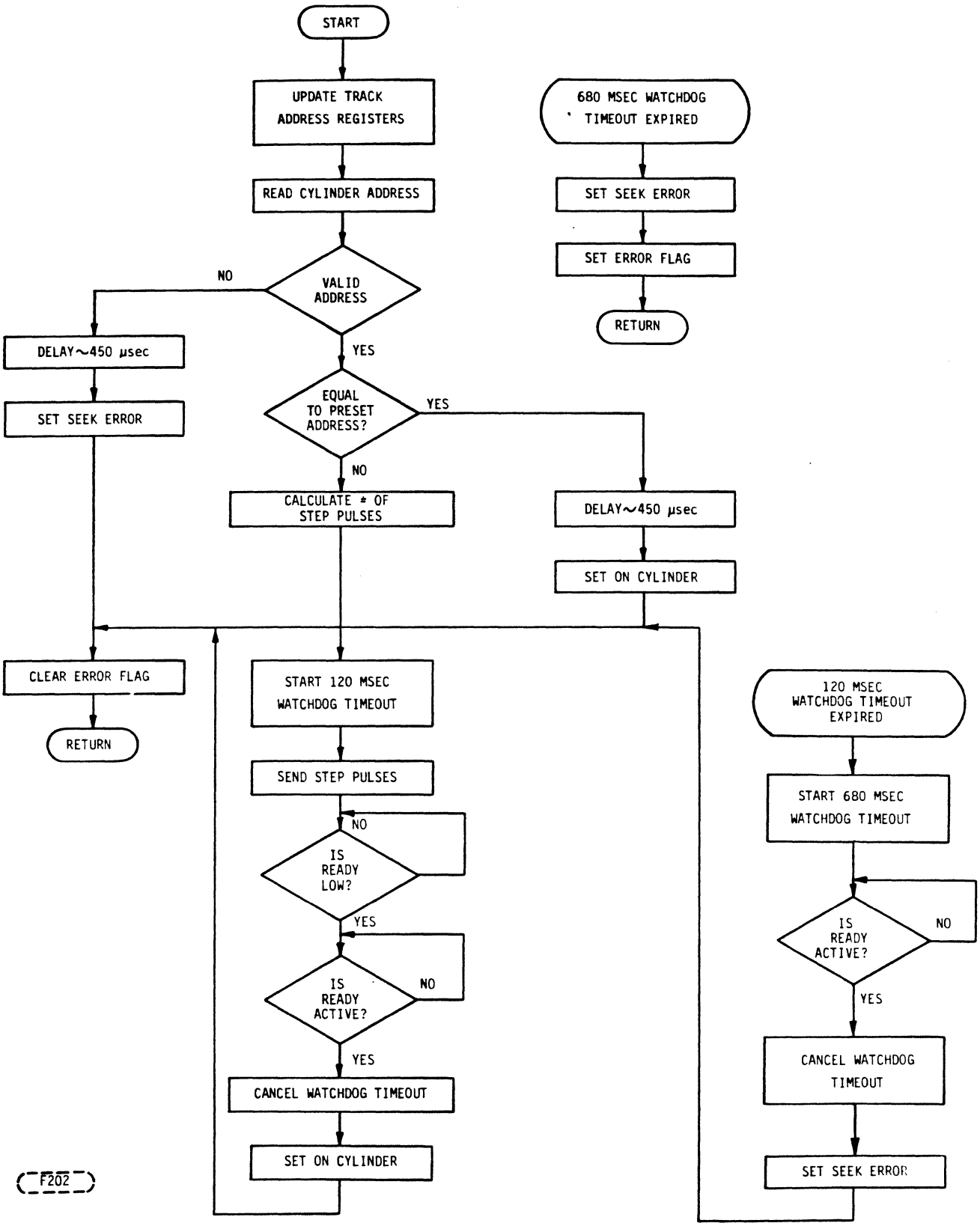


FIGURE 11. SEEK

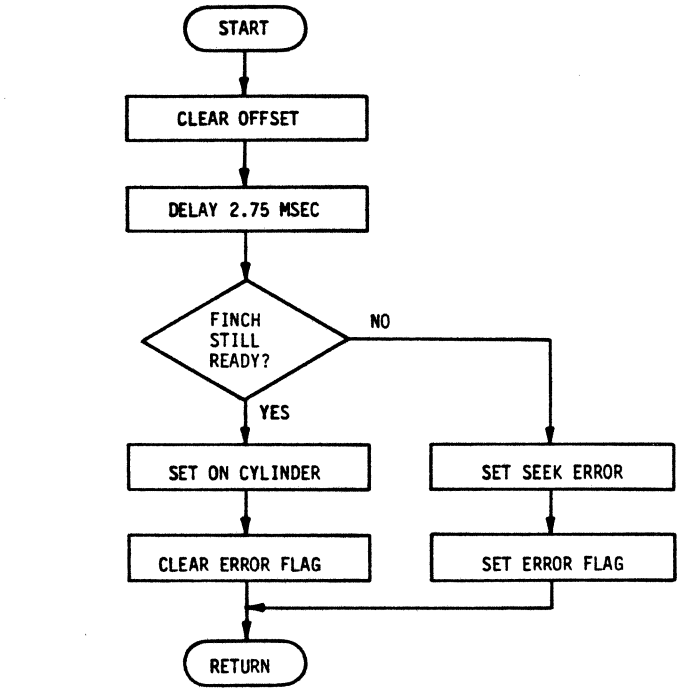


FIGURE 12. OFFSET

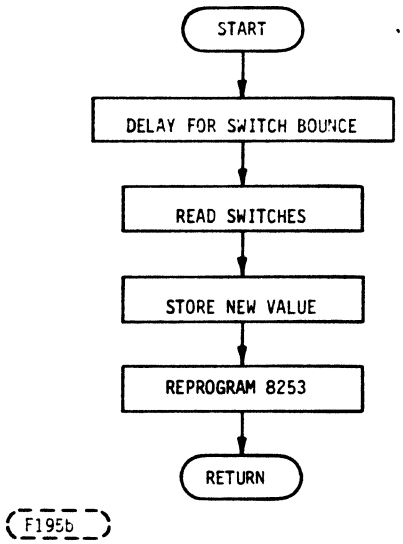


FIGURE 13. CHANGE SECTOR SIZE

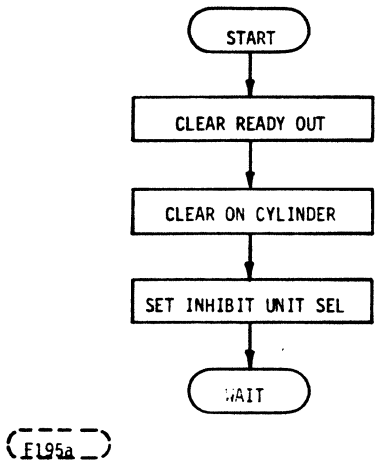


FIGURE 14. READY LOST

# APPENDIX A

# INTERFACING THE 9410 FINCH WITH the CDC Field Test Unit (TB216)

## A1.0 GENERAL

The 9410 FINCH can be exercised with the CDC Field Test Unit (TB216) using the SMD/FINCH Interface Adapter Board (FIA). There are no hardware changes required and the necessary software changes required, can be entered through the front panel switches. Figure A-1 shows the interconnect cabling required.

This appendix will identify the software inputs required via the keyboard to make the TB216 configuration compatible with the 9410 FINCH. For any further operation information, refer to:

> CDC FIELD TEST UNIT (TB216) Hardware Maintenance Manual 83323370.

## A2.0 SOFTWARE CHANGES

Software changes are required to configure the TB216 with the 9410 FINCH parameters. These parameters are entered using the Data Entry switch on the front panel shown in Figure A-2.

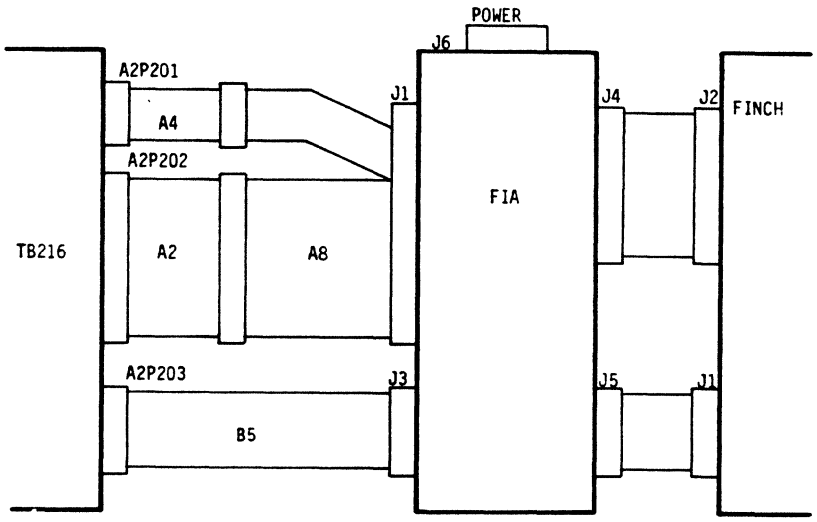


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Figure A-1. TB216/FIA Interconnect Diagram

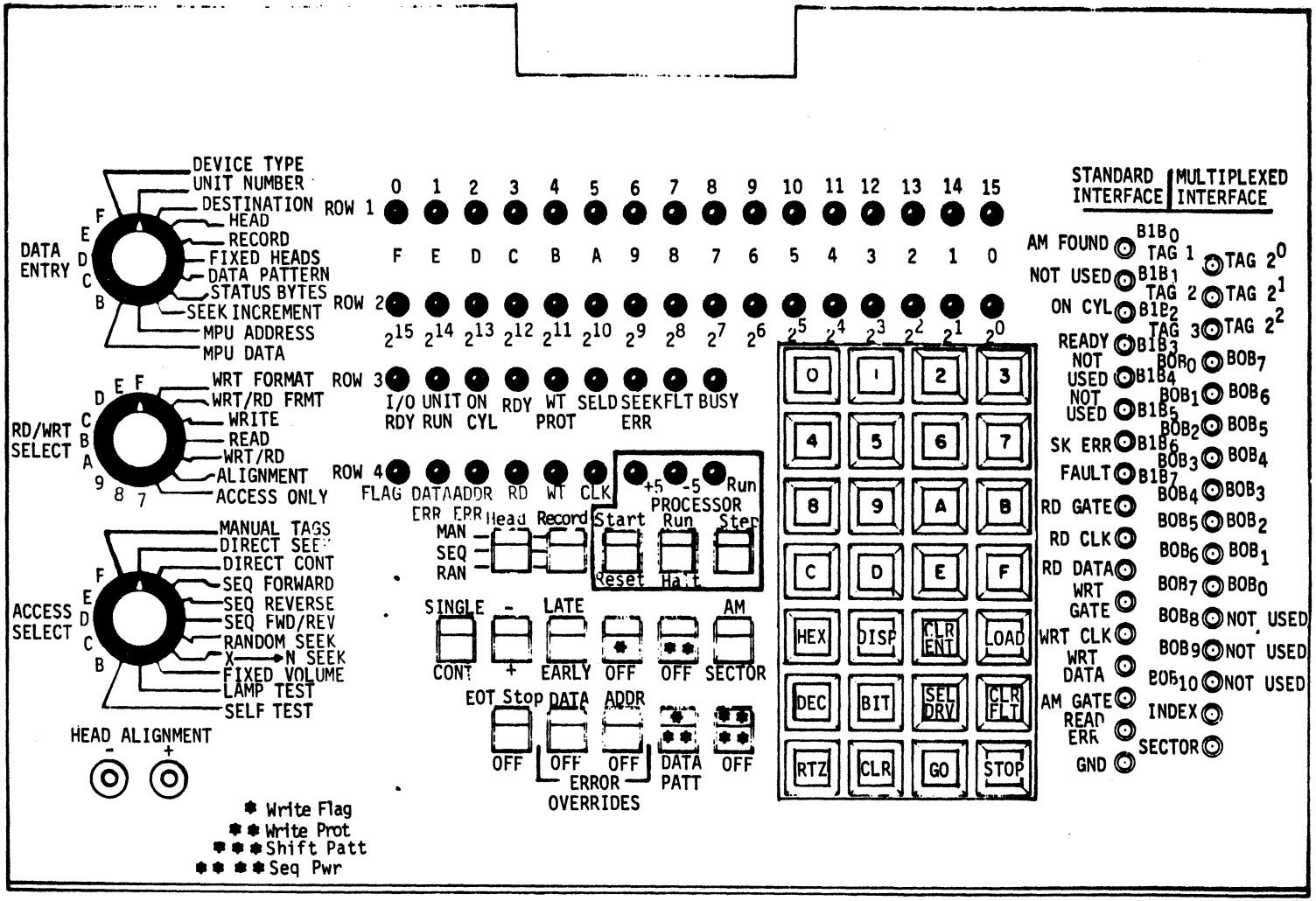


Figure A-2. FTU Front Panel

The following paragraphs explain the necessary FINCH inputs.

## A2.1 HEADS

The 9410 FINCH has three data capacities; eight Mbyte, twenty-four Mbyte and 32 Mbyte. The number of heads must be entered into the TB216 using the "Device Type" on the data entry switch as shown in Table A-1.

TABLE A-1

| DRIVE CAPACITY | NUMBER OF HEADS | DEVICE TYPE |
|---|---|---|
| 8 Mbyte | 1 | $0001_{16}$ |
| 24 Mbyte | 3 | $0003_{16}$ |
| 32 Mbyte | 4 | $0004_{16}$ |

## A2.2 NUMBER OF SECTORS

The number of sectors which the TB216 must be configured, is determined by the sector size set by the DIP Switch located on the FIA. The number of sectors is entered in switch Position "C" on the entry switch. Table A-2 summarized the number of sectors.

TABLE A-2

| DIP SWITCH POSITION | | | SECTOR SIZE | NUMBER OF SECTORS TO BE ENTERED POSITION C |
|---|---|---|---|---|
| 5 | 6 | 7 | | |
| 0 | 0 | 0 | 187 | 71 ($0047_{16}$) |
| 0 | 0 | 1 | 315 | 42 ($002A_{16}$) |
| 0 | 1 | 0 | 571 | 23 ($0017_{16}$) |
| 0 | 1 | 1 | 1083 | 12 ($000C_{16}$) |
| 1 | 0 | 0 | 189 | 71 ($0047_{16}$) |
| 1 | 0 | 1 | 320 | 42 ($0024_{16}$) |
| 1 | 1 | 0 | 584 | 23 ($0017_{16}$) |
| 1 | 1 | 1 | 1120 | 12 ($000C_{16}$) |

### A.2.3 DATA FIELD LENGTH

The FIA counts byte clocks and outputs sector pulses based on a 59-byte header. The TB216 data field is based on a 100 byte header. Therefore, the data being transferred from the TB216 will not fit between the sector marks established by the FIA. To solve this problem the data field in the TB216 can be shortened by entering a new data field length into Position D on the data entry switch. The data field length is summarized in Table A-3.

NOTE

The number of sectors must be entered before the data field is modified.

| SECTOR SIZE | DATA FIELD LENGTH |
|---|---|
| 187 | $1A07_{16}$ |
| 315 | $3A07_{16}$ |
| 571 | $7A07_{16}$ |
| 1083 | $FA07_{16}$ |
| 189 | $1D07_{16}$ |
| 320 | $3E07_{16}$ |
| 584 | $8007_{16}$ |
| 1120 | $E908_{16}$ |

Table A-3

### A.2.4 MAXIMUM NUMBER OF TRACKS

The maximum number of tracks is normally entered when the "device type" is entered. However, since the number of tracks for the 9410 FINCH does not meet the coding set up in the "device type" format, it is necessary to set the maximum number of tracks for the 9410 FINCH (605) into the F position on the data entry switch. See Table A-4.

| DATA ENTRY SWITCH | MAXIMUM NUMBER OF TRACKS | |
|---|---|---|
| | DECIMAL | HEX |
| POSITION F | 605 | 025C |

Table A-4

## A3.0 SUMMARY

After cabling the FIA, FINCH and TB216 per Figure A-1, the following steps must be performed on the Data Entry switch on the TB216.

1. Enter the "device type" per Table A-1.
2. Enter "write protect code" $5754_{16}$ - Position B.
3. Enter "number of sectors" per Table A-2 - Position C.
4. Enter "data field length" per Table A-3 - Position D.
5. Enter "maximum number of tracks" per Table A-4 - Position F.
6. Select the drive - Position E.

   For TB216 Testers with modified PROMS it may be necessary to perform a display bit selection after pushing Position E in order to select the drive.

   The display bit selected must agree with the unit number set on the DIP switches located on the FIA.

# TECHNICAL INQUIRY

FROM: NAME _____

_____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

For additional information contact:

Control Data Corporation
10321 West Reno Avenue
Oklahoma City, OK 73130

ATTN: APPLICATIONS ENGINEERING

DOCUMENT: TITLE/NUMBER/REVISION _____

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