

DC-16-C DISK CONTROLLER

TECHNICAL MANUAL

Telefile
COMPUTER PRODUCTS, INC.

DC-16-C DISK CONTROLLER

TECHNICAL MANUAL

FOR USE
WITH
DATA GENERAL PROCESSORS
AND
AMPEX, CDC, MEMOREX OR CALCOMP T302
DRIVES

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February 7, 1977
TM-610-1001-1A

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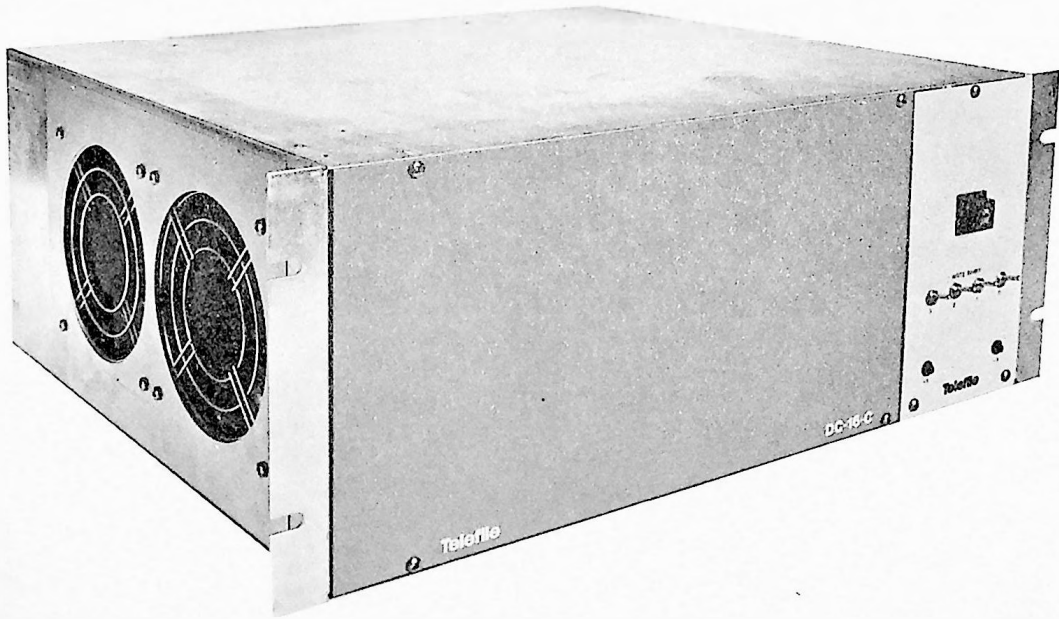
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DC-16-C Disk controller

SECTION 1

INTRODUCTION

1.1 GENERAL

This manual provides technical information required to install, operate and service the Telefile DC-16-C Disk Controller. It is intended for use by qualified field service technicians who are familiar with digital logic theory and trained in the service of digital computers and peripheral devices.

1.2 CONTROLLER DESCRIPTION

The DC-16-C Disk Controller (fronticepiece) is a self contained unit that serves as a communications link between a 16-bit minicomputer and up to four moving-head removable-media, disk drive units. Depending on the number and type of disk drive units used, the DC-16-C can provide the computer with up to 1.2 billion bytes of on-line random-access disk storage. Minicomputers that can be accommodated by the DC-16-C include:

- DEC PDP-11
- Data General Nova 800, 1200, 2/100, Eclipse, DCC Keronix
- Interdata 50, 70, 74, 80, 85, 6/16
- Hewlett Packard 2100, 3000
- Lockheed LEC16
- Microdata 1600
- Varian V70 Series

Disk drives that can be accommodated include:

- Ampex DM-940, -980, -9100, -9200, -9300
- CalComp Trident -25, -50, -80, -200, -300
- Control Data 9760, 9762, 9764, 9766
- Diablo M-410, -411, -412, -413
- Memorex 672, 677

1.2.1 PHYSICAL DESCRIPTION

The DC-16-C Disk Controller, complete with all control electronics, power supplies, fan assembly and a connector panel is housed in a 19-inch rack mount enclosure. The control electronics is provided by four plug-in modules mounted horizontally as shown in Figure 1-1. These modules are designated as:

- a) General Interface Module (GIM)
- b) Memory Address Module (MAM)
- c) Command/Timing Module (CTM)
- d) Disk Interface Module (DIM)

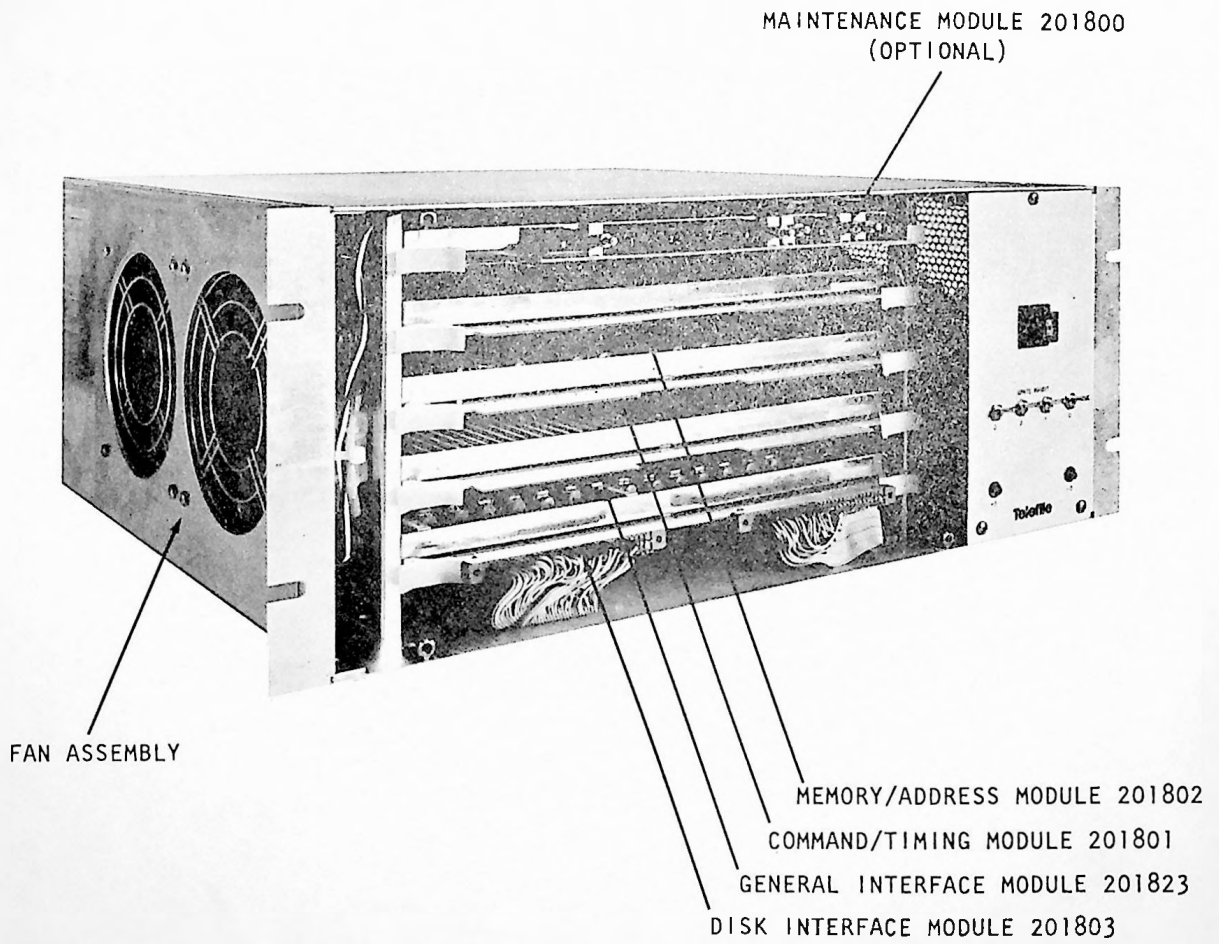


Figure 1-1. DC-16-C Circuit Card Modules.

In addition, there is a slot for the optional Maintenance Control Module (MCM). Each module plugs into a pair of 80-pin edge connector receptacles on the DC-16-C backplane assembly. The control panel located at the front of the unit contains on-line controls and indicators. Jacks for AC power, DC power distribution, computer and disk drive interface cables are mounted on the rear panel as are the power supply controls and adjustments.

1.2.1.1 General Interface Module (GIM)

The General Interface Module contains receiver/driver circuits for amplification of all data, control and interrupt signals received from or transmitted to the CPU via the externally mounted Computer Interface Module (CIM). Three binary switches provide discrete operating parameters.

1.2.1.2 Command Timing Module (CTM)

The Command Timing Module is used to decode commands received from the CPU and to provide for all internal controller operations. Four binary switch assemblies on the module are used to establish the disk data format.

1.2.1.3 Memory Address Module (MAM)

This module contains three binary address switches used to define the maximum cylinder, head and sector counts of the disk drives being used, a 256-word data buffer and buffer input output shift registers. The data register is used to compensate for timing differences between the CPU and disk drives. During a write, the shift registers are used to convert 16 bit parallel data from the CPU to the serial format required by the disks. During a Read, they convert serial data from the disks to parallel for transfer to the CPU.

1.2.1.4 Drive Interface Module (DIM)

The drive interface module is configured with transceiver and drive bus logic which permits data transfer with two disk drives. (Provisions for three and four disk drives are optional additions to the module.) In addition DIM selects the drive commanded by the computer and provides the pulses to synchronize the data exchange.

To accommodate the variety of disk drives the DC-16-C interfaces with, two types of drive interface modules have been developed. The part number of these and the disk drives they can interface with are listed below:

<u>DIM Part No.</u>	<u>Disk Drives Accommodated</u>
201803	Ampex, Control Data Corporation and Memorex
201804	CalComp and Diablo

1.2.1.5 Maintenance Module

The optional maintenance module consists of a printed circuit card containing seven 16-position (hex 0-F) thumbwheel switches, five toggle switches and 18 LED indicators. Through setting of the switches the module enables routine exercising of the DC-16-C and of computer/disk simulation for diagnostic operations.

1.2.1.6 Power Supply Assembly

DC power (± 5 VDC) (Figure 1-2) is provided for all controller logic by an independent modular power supply installed on the right side of the controller. All external DC-16-C operational controls and indicators are mounted on the front panel of the power supply assembly. They include an off-line/on-line push button switch indicator, four write inhibit toggle switches (one for each disk drive unit) and ± 5 VDC LED indicators. The rear of the power supply, which forms part of the rear panel, contains the power ON/OFF control switch, potentiometers for the ± 5 VDC adjustments and fuses. Also here are the connectors for the AC input cable and the DC power distribution cable to the controller.

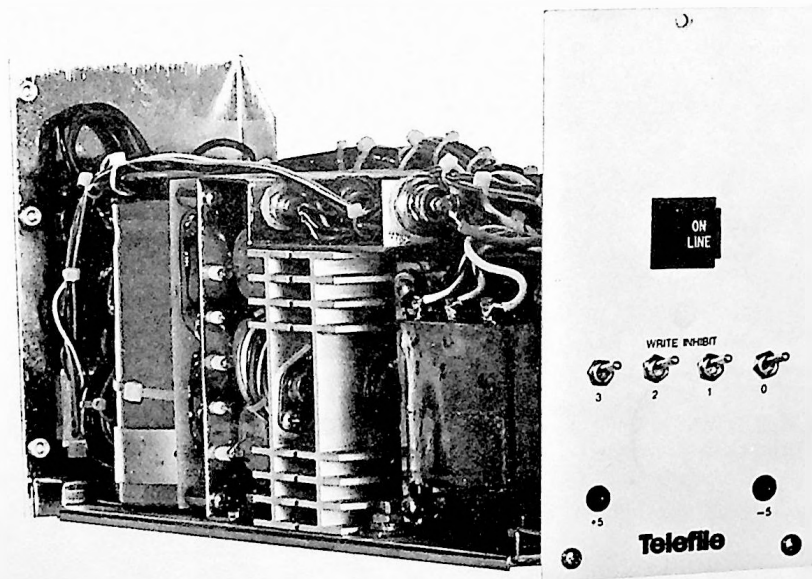


Figure 1-2. DC-16-C Power Supply Assembly.

1.2.1.7 Cooling

Two muffin fans mounted on the left side of the chassis assembly provide unfiltered air circulation for the unit.

1.2.2 CONTROLLER INTERFACE

NOTE: The DC-16-C interfaces with each mini-computer through a custom designed Computer Interface Module (CIM) mounted inside the computer equipment chassis to interface with the I/O bus, DMA or high speed channel of the minicomputer. (A physical exception to this is the PDP-11 CIM board which is mounted in the controller in place of the General Interface Module.) The function of the CIM board is to translate the computer language into a form acceptable to the controller. The CIM board is not part of the DC-16-C. It may be provided by Telefile or built by the customer using Telefile specifications.

The controller interfaces with the CIM board and disk drives through connectors mounted on the rear panel (see Figure 1-3). A single connector is provided for the disk drive signal cable which then must be daisy chained among the drives. A typical interface cabling diagram for a full DC-16-C configuration is presented in Figure 1-4.

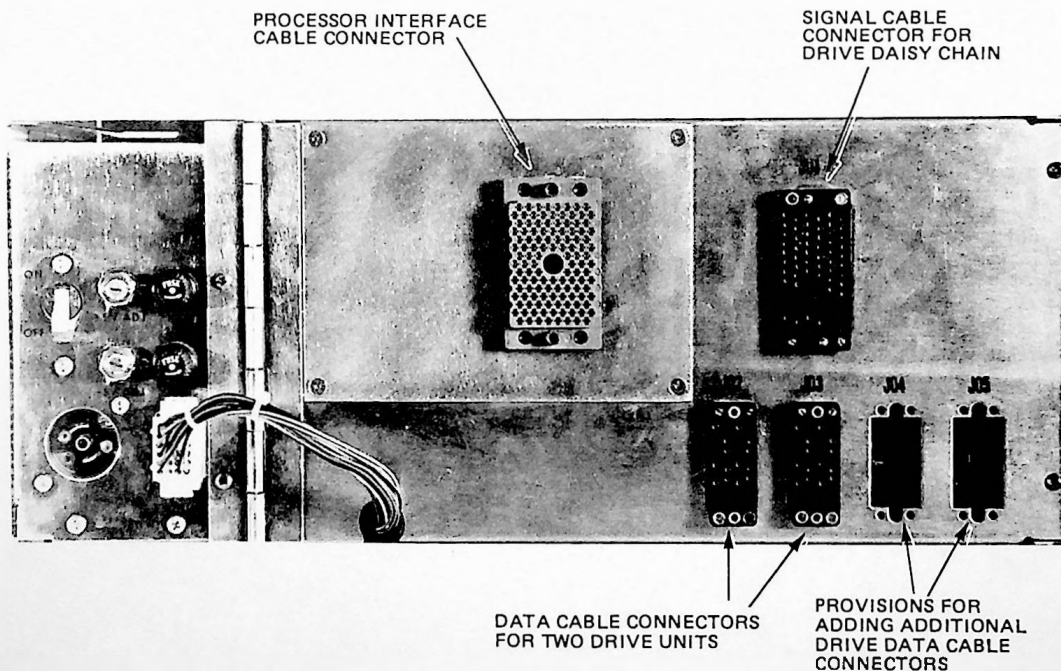


Figure 1-3. DC-16-C System Cable Connector Locations.

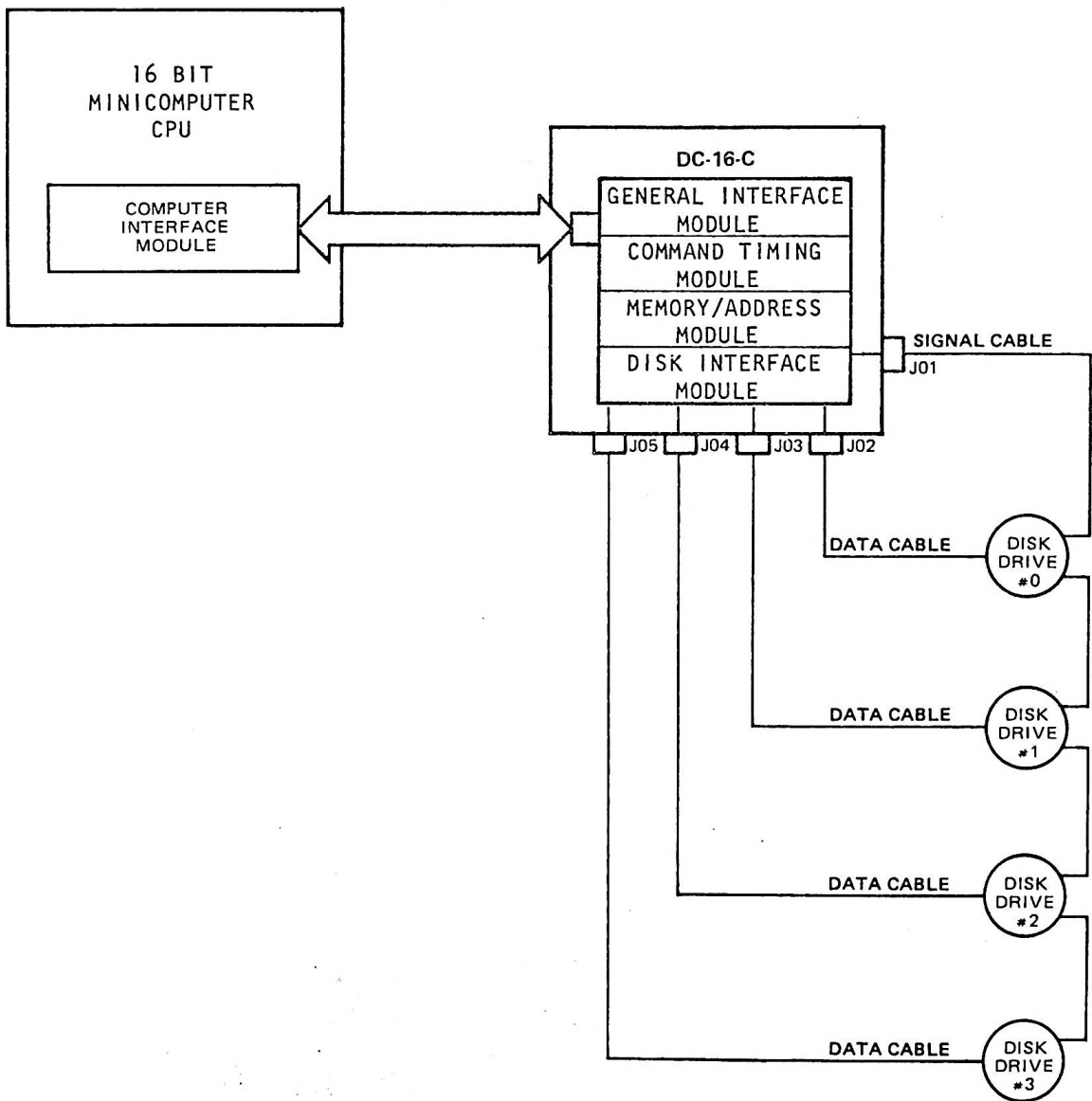


Figure 1-4. DC-16-C Controller, Full Configuration Diagram.

1.2.3 CONTROLLER SPECIFICATIONS

A summary of the DC-16-C's functional and physical specifications is listed in Table 1-1.

Table 1-1. DC-16-C Disk Controller Specifications.

Item	Specifications
Interface	
Computer Interface	Digital Equipment PDP-11 Data General NOVA 800, 1200, 2/10, Eclipse, DCC, Keronix Interdata 50, 70, 74, 80, 85, 6/16, 7/16, 7/32, 8/32 Hewlett Packard 2100, 3000 Lockheed LEC 16 Microdata 1600 Varian V70 Series
Disk Interface	Ampex DM-940, -980, -9100, -9200, -9300 CalComp Trident-25, -50, -80, -20, -300 Control Data 9760, 9762, 9764, 9766 Diablo M-410, -411, -412, -413 Memorex 672, 677
Functional Specifications	
Number of Disk Drives	1 to 4
Storage Capacity	Up to 1.2 billion bytes
Data Transfer Rate	80K or 1209K bytes per second
Record Length	Selectable
Operational Commands	16
Status Words	4
Power Supply	Internal
Interface Logic Levels	
Logical one (false)	0.0 to 0.8 VDC
Logical zero (true)	2.0 to 5.0 VDC
Physical Characteristics	
● height - 7 inches	
● width - 19 inches	
● depth - 16 inches	
● weight - 50 pounds	
Power Requirements	
Voltage	115/230 VAC ±10% single phase
Frequency	50/60 Hz
Current	3.5 amperes
Environmental Requirements	
Temperature	Operating 60°F to 90°F Nonoperating -30°F to +150°F
Humidity	Operating 20% to 80% without condensation Nonoperating 5% to 90% without condensation

1.2.4 FUNCTIONAL FEATURES

In operation the DC-16-C serves as an electronic link between the CPU and up to four disk drives. Upon command, the controller connects a drive to the CPU to provide an expandable, record addressable, selectable fixed record length, random access storage medium.

Commands are received from the CPU, interpreted by the DC-16-C and translated into a form compatible with the storage unit. The controller provides buffering and signal timing for the memory/disk data transmission. In addition, the controller monitors the status of the disk drive and the data transfers and presents this information to the processing system upon request. Salient features of the DC-16-C are described below:

- Block Transfer Capability - A 16 bit word count register on the Computer Interface Module permits a block transfer of data up to the addressing capacity of the CPU in one operation.
- Automatic Seek - Enables automatic cylinder crossing (seek) during data transfer operations by controller monitoring of the disk cylinder, head and sector address being accessed. The controller will automatically switch heads and advance to a new cylinder of the end of a track.
- Simultaneous Overlapped Seek - An overlapped seek is a seek operation by a disk unit while some other disk is selected or engaged in a data transfer operation. The DC-16-C executes seek commands to any unselected disk unit, regardless of the operational status of other disk units. This can result in a significant increase in system throughput.
- 256 Word Buffer - A 256 word buffer included in the controller logic provides a system flexibility to compensate for disk/CPU timing differences. This helps ensure smooth transfer operations with a minimum of rate errors.
- Adjacent Sector Read/Write - A feature which enables the disk operational mode to be switched during the inter-record gap between sectors, rather than waiting for an intermediate disk revolution. For systems that can utilize such rapid mode switching, the feature can reduce average effective access times.
- Staggered Sector Addressing - The DC-16-C controller offers a hardware selectable choice of sequential or staggered sector addressing. The staggered, or interlaced, sector address effectively reduces the data transfer rate to allow more processing time between sectors.
- Write Protection - In addition to the four write inhibit toggle switches that render each associated disk write protected, the DC-16-C provides for write protection of individual record level. This is accomplished by inserting a write protect bit in the header that precedes each record.
- Address Verification - The DC-16-C performs address verification before any data operation occurs. This is accomplished by reading the address from the header of the record to be accessed and comparing it with the

address specified by the CPU for the data transfer operation. If the two addresses do not compare, the data transfer will not take place. This feature protects against data loss due to positioning or timing errors in the disk unit.

- Error Detection - The DC-16-C performs conventional Cyclic Redundancy Check (CRC) error detection. During operations it generates a two-byte CRC code and writes it on the disk immediately after the data. When the data is later accessed by a read operation another CRC code is generated and is compared to the one written on the disk. If the codes do not compare the data transfer operation it is terminated and an appropriate error indicator is set.
- Search and Read - A function which enables the DC-16-C to read data from a disk and compare it bit-by-bit with a variable length data key of up to 256 words. When a match is found the remainder of the data in the sector will be read and transferred to the CPU.
- Offset Positioning and Strobe Controls - This feature permits data recovery under marginal conditions. Offset positioning enables the disk head carriage assembly to be located off-center from the nominal on-cylinder position. Data strobe controls permit a slight modification in strobe timing.

1.3 ORGANIZATION OF THIS MANUAL

The remainder of this manual has been organized in the following manner.

Section II - Installation - Provides detailed unpacking, inspection, installation, switch setting and operational verification procedures to prepare the DC-16-C and associated disk drive units for on-line operation with the CPU.

Section III - Operation - Describes cylinder sector, track and record formats used in disk packs and provides a functional block diagram discussion of a DC-16-C operation. Also describes the function and format of the 16 commands accepted by controller, and the status and interrupts generated.

Section IV - Theory of Operation - Provides a logic gate level discussion of the DC-16-C operation referencing a detailed logic diagram and supplemented by timing charts and logic schematics. Module schematics and wire lists for the General Interface, Memory Address and Command Timing modules are also included in this section.

Section V - Maintenance - Defines the maintenance procedures to be followed in keeping the controller operational.

Appendix A - Drive Interface Module - Includes the schematics and wire lists for DIM board used in the controller.

Appendix B - Computer Interface Module - A manual which contains description and operation of the CIM board. Wire lists and schematics are also included.

SECTION II

INSTALLATION

2.1 GENERAL

This section provides the procedures to install, configure and verify the DC-16-C Controller for on-line system operation. Addressing and cabling information is also provided for each model disk drive unit and computer interface module. The appropriate disk drive maintenance manual should be consulted for installation of the drive units.

2.2 PREINSTALLATION REQUIREMENTS

The following paragraphs delineate the installation requirements that should be considered before attempting to install the DC-16-C, and its associated computer interface module and disk drive units.

2.2.1 ENVIRONMENTAL REQUIREMENTS

Environmentally, the DC-16-C Disk Controller will be the least critical component in any system. Adherence to the specified environmental requirements of the CPU and the disk drive units will, in all cases, satisfy the environmental requirements of the controller:

- Temperature - Operating: 60°F to 90°F
Nonoperating: 20% to 80% without condensation
- Humidity - Operating: 20% to 80% without condensation
Nonoperating: 5% to 90% without condensation

2.2.2 POWER REQUIREMENTS

The DC-16-C is configured at the factory to operate on one of the following primary AC power sources:

- 120 VAC ±10% single phase 60 ±0.5 Hz at 4 amps.
- 230 VAC ±10% single phase 50 ±0.5 Hz at 2 amps.

CAUTION: Be sure the power source to be used agrees with the power configuration noted on the identification tag on the side of the controller. Otherwise damage to the controller may result.

For disk drive power requirements, refer to the appropriate disk drive technical manual.

2.2.3 TOOLS AND TEST EQUIPMENT

No special tools or test equipment are required to install the controller, computer interface module, and disk drives. However, once installed, the following computer equipment is required to run the DC-16-C diagnostic program.

- On-line CPU
- 16K words of available core memory
- ASR-33 or equivalent input/output device
- One scratch pack

Tools and test equipment required to perform routine alignment and service procedures on the disk drive units are specified in the appropriate drive maintenance manuals.

2.2.4 SITE PREPARATION

Normally no special site preparation is required to install the DC-16-C Disk Controller and its associated disk drive units. However, 208/220V drives shipped from Telefile require special wall outlets. Required AC power must be available, however, and space allocation for the disk system components should be made before starting installation.

The DC-16-C requires seven inches in a standard 19-inch rack assembly. AC power must be within reach of the 12-foot AC power cord.

The disk drive units that can be used with the DC-16-C include small rack-mounted units, table-top models and large free-standing floor consoles. Consult the appropriate specification sheet or technical manual for space requirements of the disk drive units.

2.2.5 PACKAGING

The DC-16-C Disk Controller, complete with all logic modules installed, is packaged in a single shipping carton along with the AC power cord and documentation package. Optional Maintenance Modules and Computer Interface Modules and cables are packaged in a separate box.

Disk drive units are shipped in the same carton provided by the Original Equipment Manufacturer.

2.3 INSTALLATION PROCEDURES

The following paragraphs provide detailed unpacking, inspection, installation and operational verification procedures to prepare the DC-16-C and associated disk drive units for on-line operation with the CPU.

2.3.1 UNPACKING

As described in paragraph 2.2.5, DC-16-C may be packaged in one or more shipping cartons depending on the configuration ordered.

Unpack the shipment as follows:

1. Carefully open and unpack each box.
2. Verify that all items listed on the packing slip have been received.
3. Check each item for signs of shipping damage. If the items received do not match those listed on the packing slip or if shipping damage has occurred, notify the Director of Operation at Telefile, Irvine, and the local agent of the carrier.

2.3.2 INSPECTION

Check each piece of equipment as follows:

- DC-16-C:

1. Remove the front cover and ensure that the two edge-connector cables are securely attached to the Disk Interface Module in the bottom module position.
2. Inspect all internal wiring and cables for loose connections or damaged pins, insulation, etc.
3. Check the entire chassis assembly for loose or missing hardware.
4. Inspect each cable receptacle for bent or pushed-in contacts.

- MODULE ASSEMBLIES:

1. Inspect the Computer Interface Module and optional Maintenance Module for loose or damaged components.
2. Ensure all contact pins are clean.

- CABLES:

1. Check both ends of each cable for loose or bent pins.
2. Check for loose or missing connector housing hardware.
3. Check for damaged connector insulator blocks.

- DISK DRIVES:

1. Remove all shipping restraints and internal packing material from each disk drive unit.
2. Check all doors, latches and switch assemblies for smooth operation.
3. Check all internal cables, wiring harnesses and connector plugs for signs of damage.

4. Inspect each unit for loose or missing hardware.
5. Refer to the disk drive maintenance manual for specific checks required by the drive manufacturer.

2.3.3 INSTALLATION

Installation and system hardware configuration procedures are provided in four segments:

- DC-16-C Logic Module Switch Configuration.
- DC-16-C Installation.
- Computer Interface Module Installation.
- Disk Drive Installation.

2.3.3.1 DC-16-C Logic Module Switch Configuration

Three of the four DC-16-C logic module assemblies have switches that must be set to establish the desired operational data format. Every effort is made to determine the desired format so that these switches can be configured at factory during System Test. Since this is not always possible, the switch positions should be set or verified before the DC-16-C is powered up.

The logic module switch assemblies shown in Figure 2-1 are miniature units that include eight single-pole, single-throw switches. When the ON side of a switch is depressed, the switch is in the closed position.

Each switch assembly is identified by an alphanumeric designation (G-13, F-08, etc.) that defines both the switch position on the module and the component designation on the logic diagram. (The logic diagrams and assembly drawings are contained in Section IV.)

Switch configuration procedures are provided in the following paragraphs.

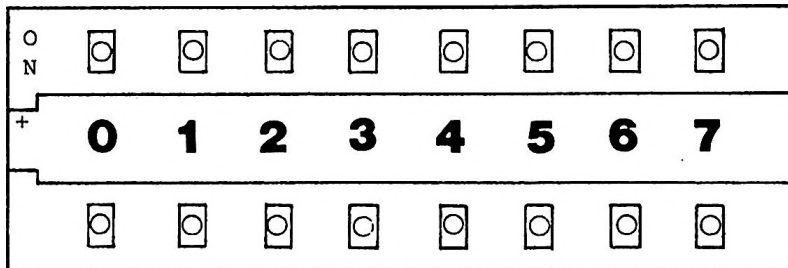


Figure 2-1. Logic Module Switch Assemblies.

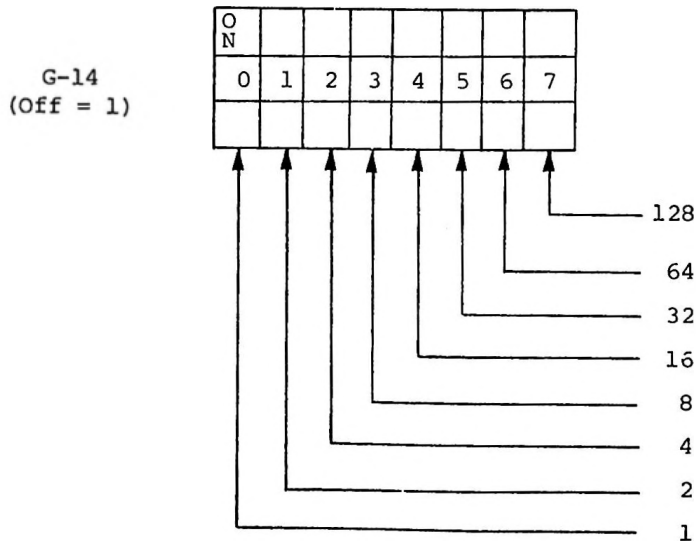
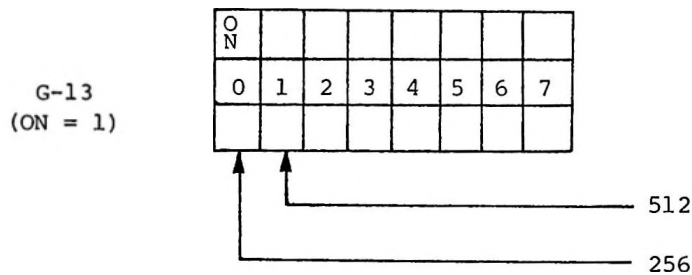
2.3.3.1.1 Memory/Address Module (P/N 201802)

Three switch assemblies on the Memory/Address Module (Figure 2-2) are used to define the maximum cylinder, head and sector counts. Remove the Memory/Address Module and set these parameters as follows:

- CYLINDER COUNT - The number of the maximum cylinder address is configured by switches 0-7 of switch assembly G-14 and switches 0 and 1 of switch assembly G-13. These switches define a 10-bit binary code for the maximum cylinder address.

NOTE: For 815-cylinder disk drives, the maximum cylinder address is 814, because the cylinders are numbered 0-814. For 411-cylinder drives, the maximum address is 410, etc.

Binary weights for the cylinder address switches are as follows:



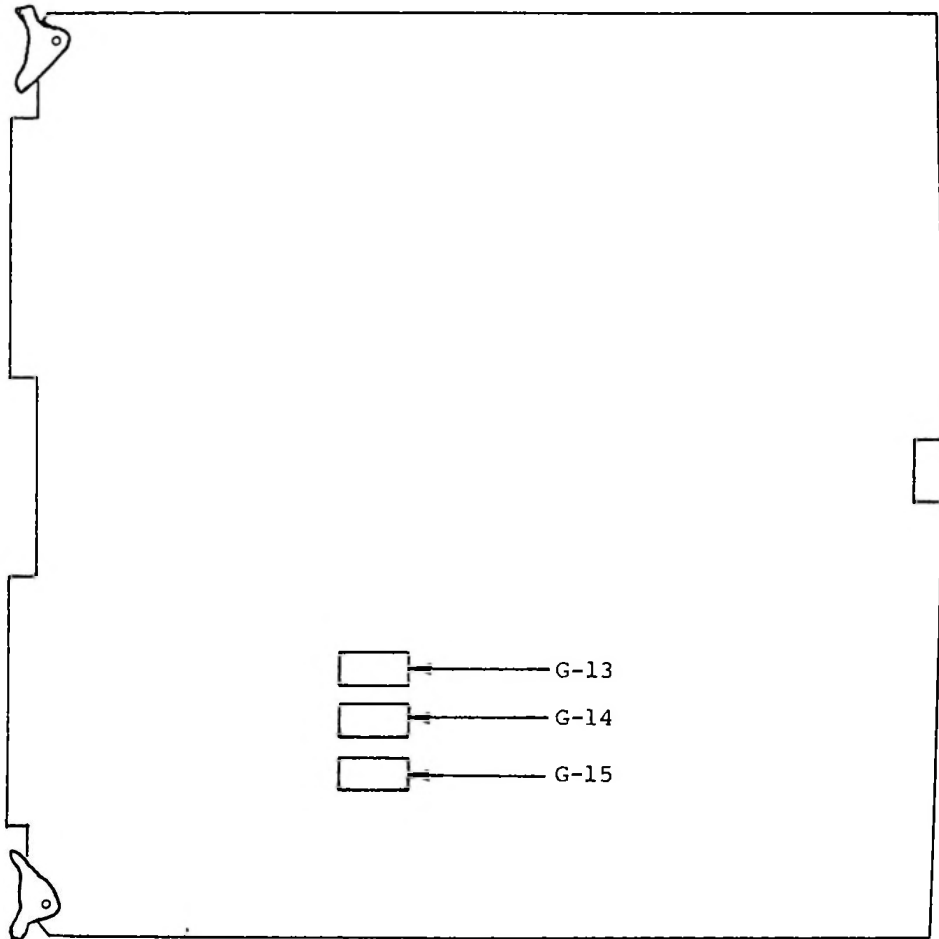


Figure 2-2. Memory/Address Module Switch Assemblies.

Note that for G-14 the off (open) position represents a "1" and for G-13 the ON (closed) position represents a "1" for switches 0 and 1 only.

In Figure 2-3, the depressed switch positions indicated by ● illustrate the G-13/G-14 configurations for 823-, 815- and 411-cylinder disk drives.

- SECTOR COUNT - The maximum sector address is set by switches 2 through 7 of switch assembly G-13. As with the cylinder count, since the first sector is numbered zero, the maximum sector number will be one less than the total number of sectors.

Figure 2-4 shows the switch binary weights and a sample sector configuration.

- HEAD COUNT - The maximum head address is set by switches 0 through 4 of switch assembly G-15. (Switches 5 through 7 of this assembly are not used; their configuration is irrelevant.) Binary weights and switch configurations for 5- and 19-head drives are shown in Figure 2-5. Observe that for switches 0 through 3, the off (open) position represents a "1" but switch 4 represents a "1" in the ON (closed) position.

Compare the G-13, G-14 and G-15 switch settings with the appropriate disk drive settings shown in Figure 2-6. After all are verified, reinstall the Memory/Address Module in module position #2 (component side up). Make sure the module is firmly seated in the backplane edge-connector receptacles.

Sector Address
Portion of Switch

G-13
(ON = 1; for
switches 0
and 1 only)

•	•						
0	1	2	3	4	5	6	7

G-14

•			•			•	•
0	1	2	3	4	5	6	7
	•	•		•	•		

823 Cylinders
Maximum Count = 822

G-13

•	•						
0	1	2	3	4	5	6	7

G-14

•				•		•	•
0	1	2	3	4	5	6	7
	•	•	•		•		

815 Cylinders
Maximum Count = 814

G-13

•							
0	1	2	3	4	5	6	7
	•						

G-14

•		•			•	•	
0	1	2	3	4	5	6	7
	•		•	•			•

411 Cylinders
Maximum Count - 410

• indicates "depressed"

Figure 2-3. Cylinder Address Configuration Examples.

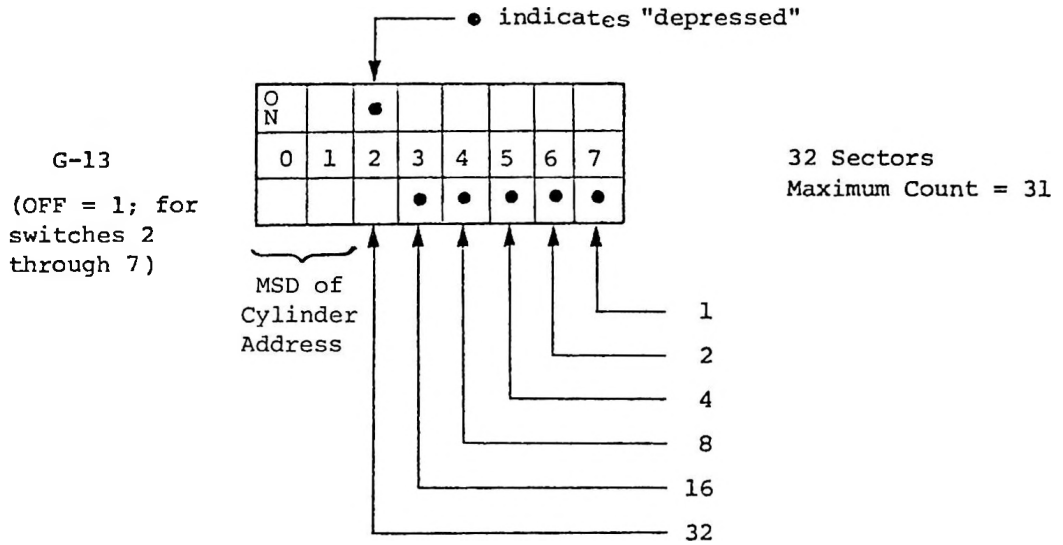


Figure 2-4. Sector Address Switch Configuration.

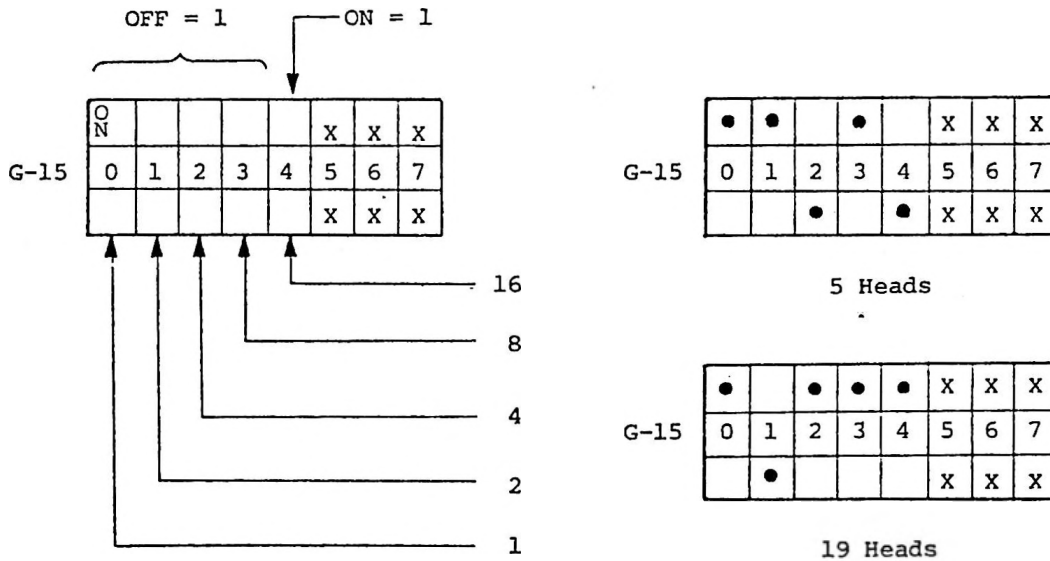


Figure 2-5. Head Address Switch Configuration.

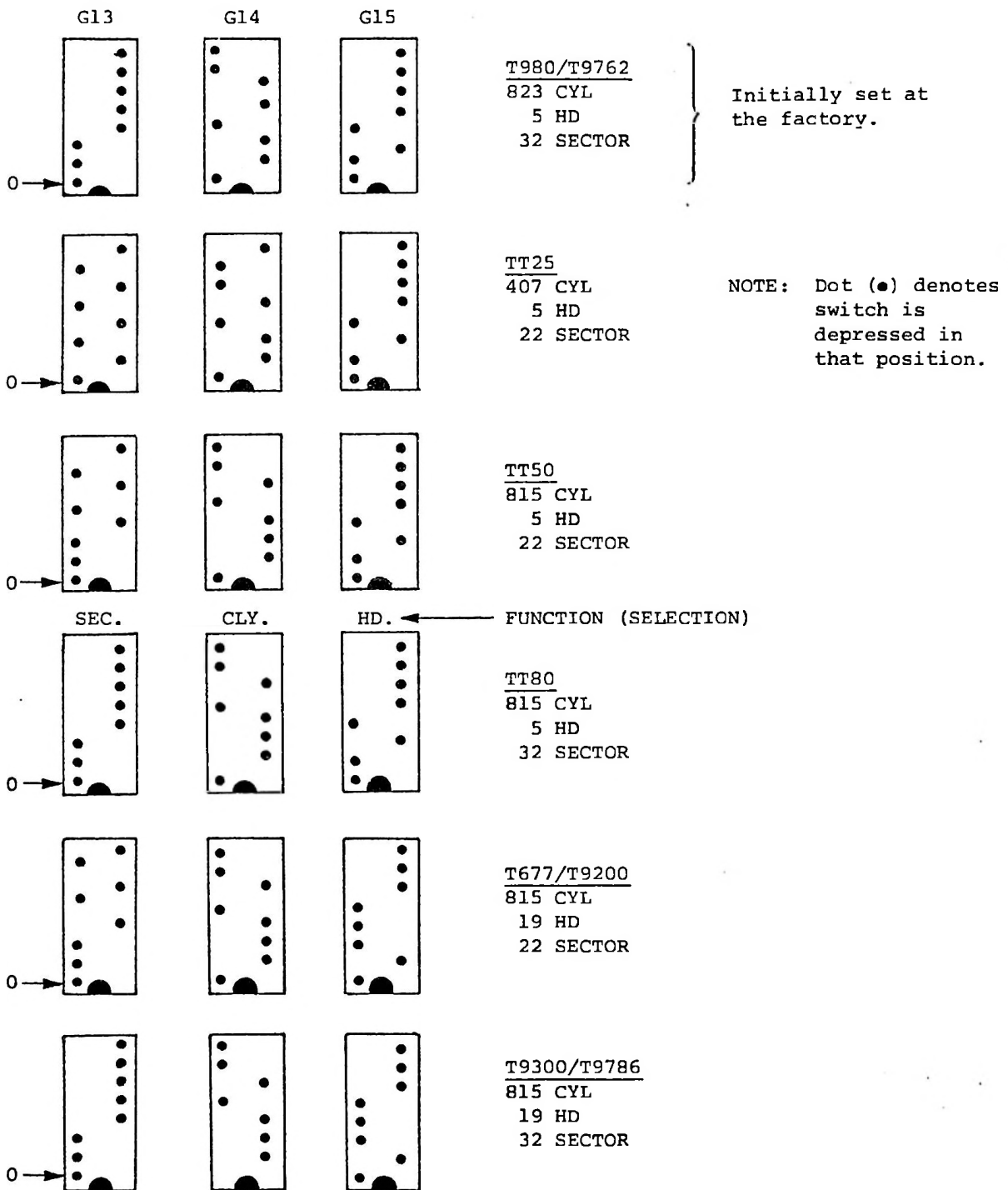


Figure 2-6. Summary of Memory Address Module Switch Settings for Various Disk Drives.

2.3.3.1.2 Command/Timing Module

Four switch assemblies on the Command/Timing Module (Figure 2-7) establish the disk data format. This is accomplished by varying the preheader and postheader gap size and the size of the data area of each sector. Remove the Command/Timing Module and configure the data format as follows.

NOTE: For verification only refer to the appropriate command/timing module switch settings in Figure 2-8 for the various drives used with the DC-16-C Controller.

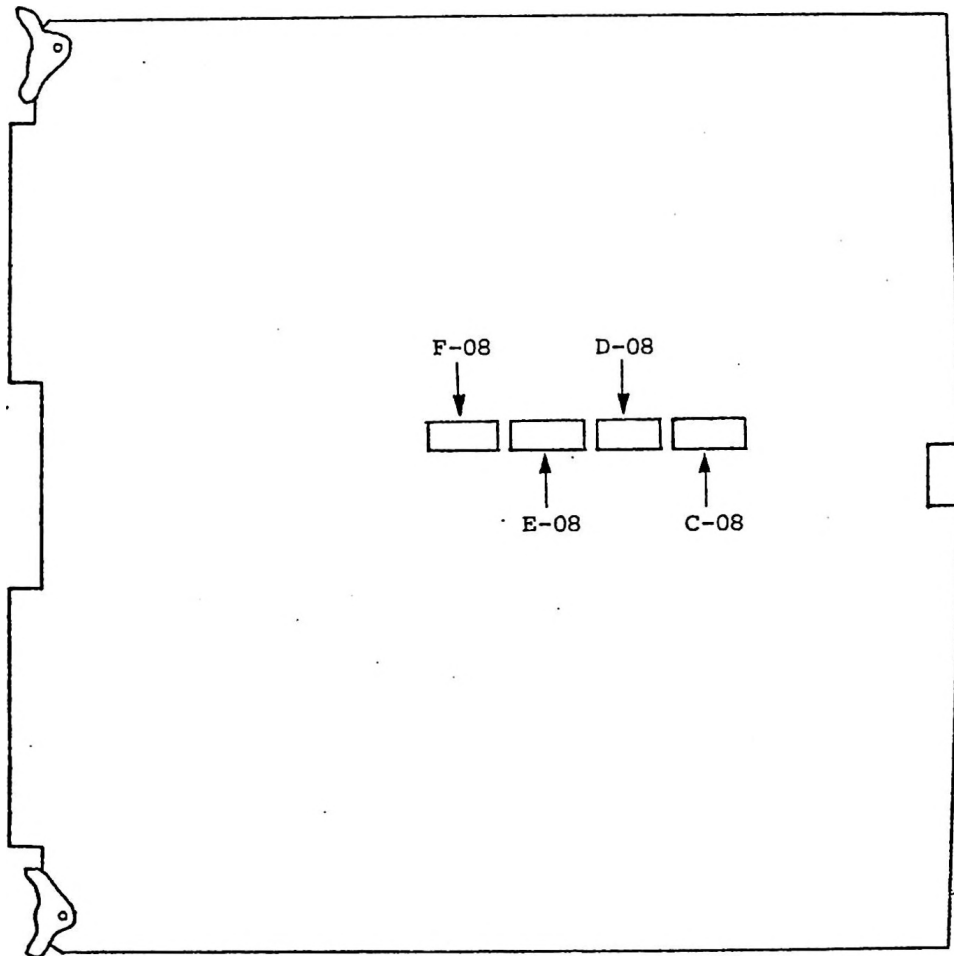
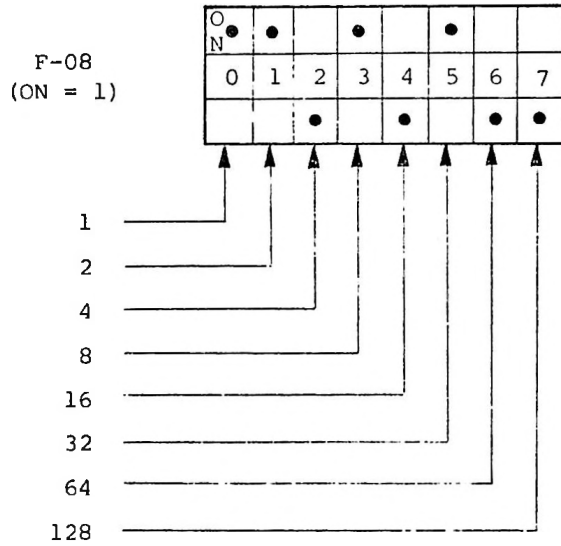


Figure 2-7. Command/Timing Module Switch Assemblies.

- PREHEADER GAP - The preheader gap size is established by configuring binary 43 or 57 (for the last byte of the gap) on switch assembly F-08.

IMPORTANT: Set F-08 for preheader gap as follows:

- CDC, Ampex, Memorex = 43 bytes.
- Trident T-50 = 47 bytes.
- Trident T-80 = 57 bytes (0 to 57).



Example:

Maximum Count = 43

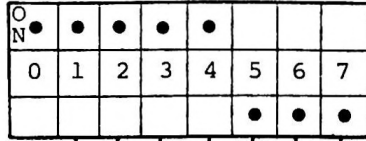
One shot timing and postheader gap size settings will vary according to the drive configuration. Refer to Table 2-1 for details.

Table 2-1. Command Timing Module Settings for Associated Drives

Drive	TT25	TT50	TT80	9760 T940	9762 T980	9200	9300	T677	T601 (75 Mb)
Data Rate (Byte)	806 Kb	806 Kb	1.2 Mb	1.2 Mb	1.2 Mb	806 Kb	1.2 Mb	806 Kb	885 Kb
Cylinders	407	815	815	411	823	815	815	815	350
Heads	5	5	5	5	5	19	19	19	6
Bytes/Track	13,440	13,440	20,160	20,160	20,160	13,440	20,160	13,440	17,920
512 Byte Sectors/Track	22	22	32	32	32	22	32	22	29
256 Byte Sector/Track	38	38	56	56	56	38	56	38	
<u>SET SWITCHES</u>									
F8 MC1 (Bytes)	47	47	57	43	43	43	43	43	
E8 MC3 (Bytes)	31	31	21	31	31	31	31	31	
<u>SET POTS.</u>									
MC1DEL	30 us	30 us	30 us	24 us	24 us	10 us	24 us	32 us	
RDEN	8 us	8 us	8 us	8 us	8 us	30 us	8 us	14 us	
M3ØS	5 us	5 us	5 us	5 us	5 us	5 us	5 us	<u>8 us</u>	

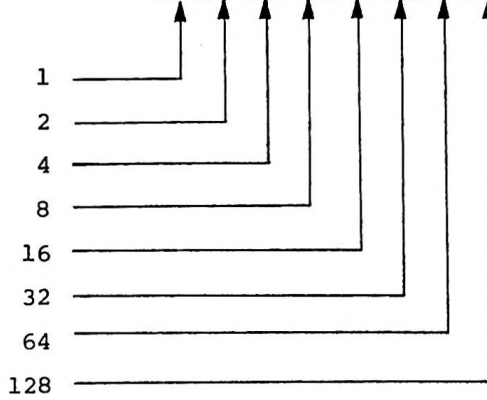
2-13

E-08
(ON = 1)

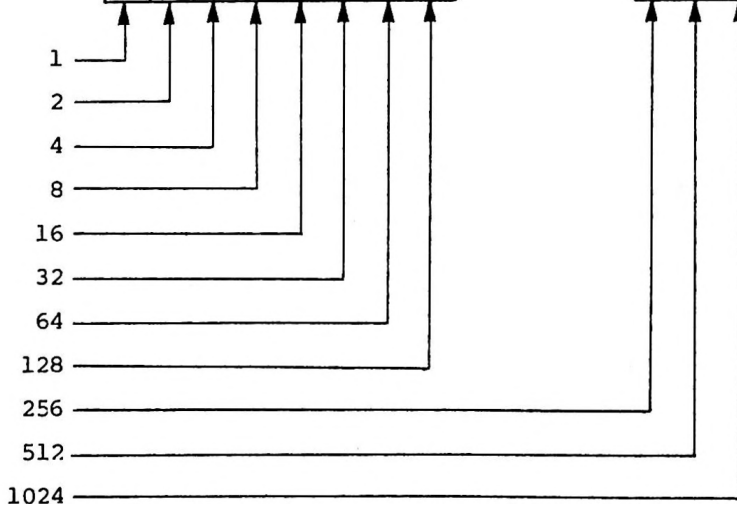
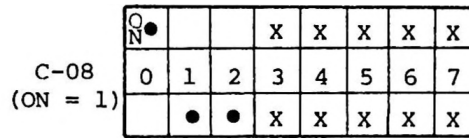
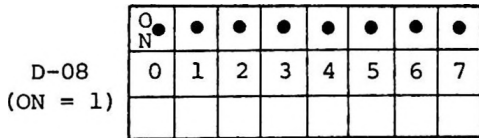


Example:

Maximum Count = 31



- DATA AREA - The size of the data area of each sector is established by switch assembly D-08 and switches 0 through 2 of switch assembly C-08. (Switches 3 through 7 of C-08 are irrelevant and their configuration is ignored by the DC-16-C logic.) Binary weights and the switch configuration for a 512-byte sector length is as follows:



512 Bytes

Maximum Count = 511

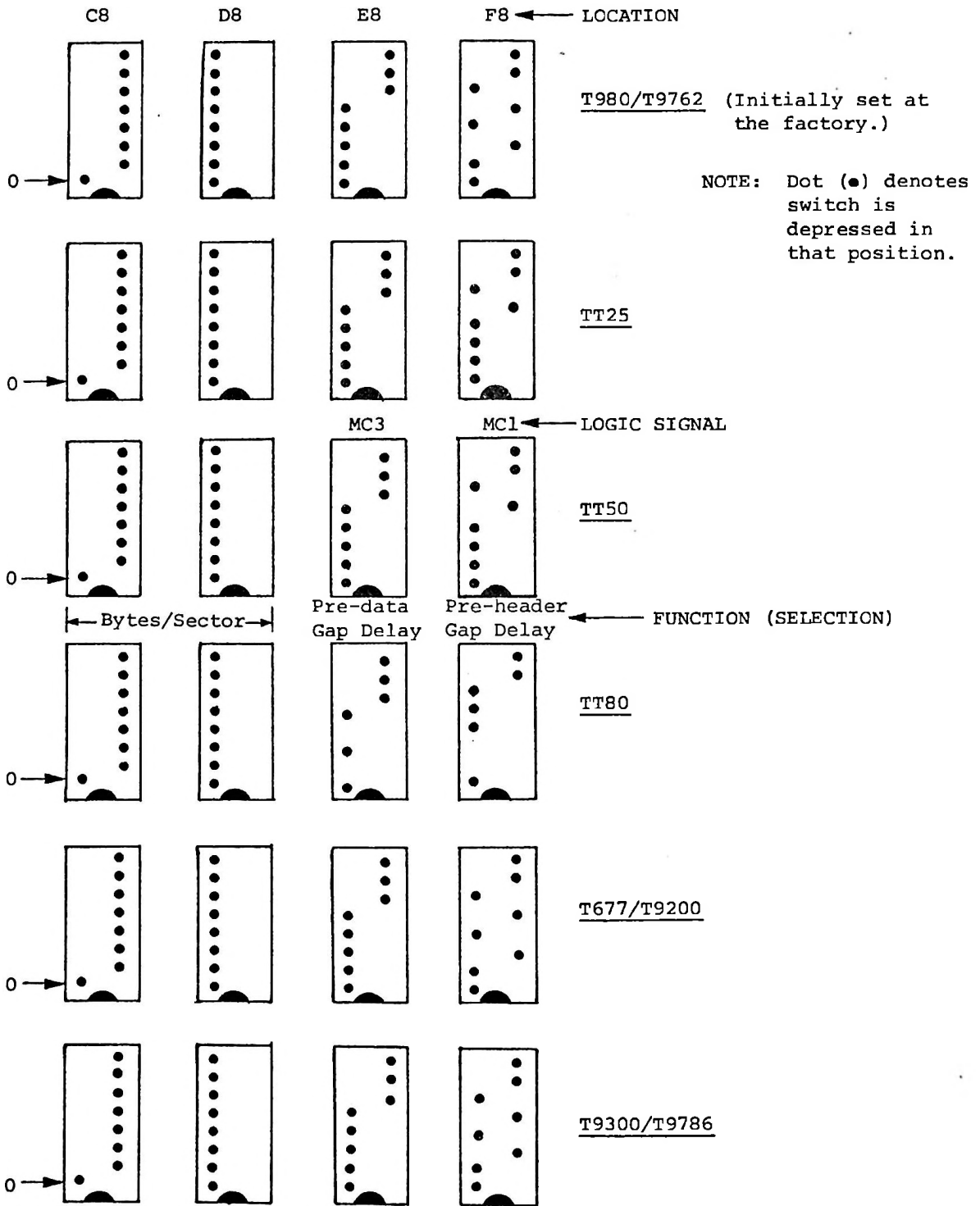


Figure 2-8. Command/Timing Module Switch Settings for Various Disk Drives.

After all four switch assemblies have been configured or verified, reinstall the Command/Timing Module in module position #3 (component side up). Make sure the module is firmly seated in the backplane edge-connector receptacles.

2.3.3.1.3 General Interface Module

One switch assembly on the General Interface Module (Figure 2-9) is used to select certain interface characteristics between the DC-16-C and the Computer Interface Module. Remove the General Interface Module and configure F-02 according to the CPU interface requirements.

Following is a brief description of the functional segments of the General Interface Module switch assembly F-02. (Switches 3 through 6 are not used.)

- SWITCH 0 - Switch 0 determines whether the DC-16-C will accept a command in the busy state. When this switch is in the ON (closed) position, the DC-16-C will not accept a command if it is busy; in the off (open) position, commands will be accepted at any time.
- SWITCHES 1 AND 2 - Switches 1 and 2 control the timing of the DMA end-of-transfer signal. When switch 1 is in the off (open) position and switch 2 is in the ON (closed) position the end-of-transfer signal will be delayed approximately 250 usecs. When switch 1 is in the ON (closed) position and switch 2 is in the off (open) position there is no delay in the issue of the end-of-transfer signal.
- SWITCH 7 - Switch 7 determines whether a command acknowledge signal is issued for all commands accepted or only for commands that cause the DC-16-C to go busy. When switch 7 is in the ON (closed) position, command acknowledge is issued only when the DC-16-C goes busy; in the off (open) position, command acknowledge is issued for all commands accepted.

F-02 switch configurations for Data General, Microdata, Interdata, Hewlett Packard and Varian processors are as follows:

NOTE: When the CPU being used is a PDP-11, the General Interface Module is replaced by the PDP-11 CIM board.

DATA GENERAL								MICRODATA								INTERDATA									
●		●	X	X	X	X	●	●											●		X	X	X	X	
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
	●		X	X	X	X			●	●	X	X	X	X	●	●		●	X	X	X	X	●		

HEWLETT PACKARD								VARIAN							
●		●	X	X	X	X	●	●	●		X	X	X	X	
	●		X	X	X	X			●	●	X	X	X	X	●

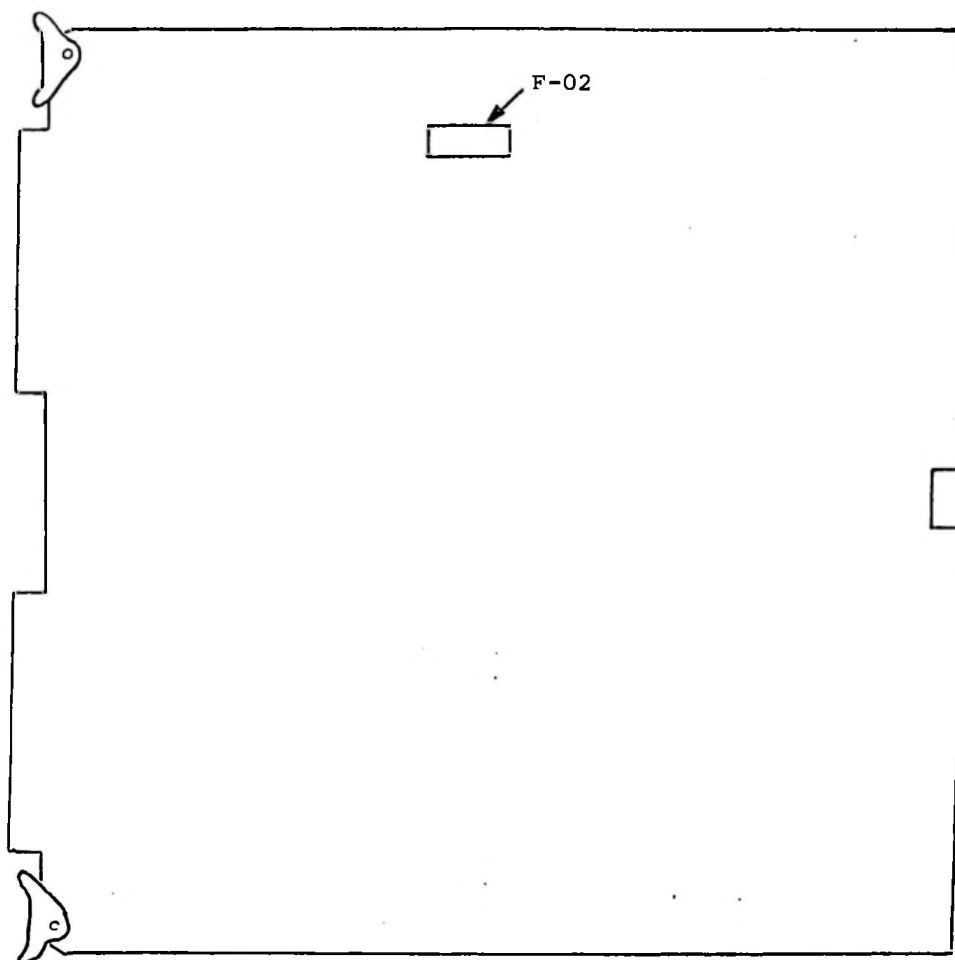


Figure 2-9. General Interface Module Switch Assembly.

After the F-02 switch assembly has been configured or verified, reinstall the General Interface Module in module position #4 (component side up). Make sure the module is firmly seated in the backplane edge-connector receptacles.

2.3.3.2 DC-16-C Installation

After the three logic modules have been configured and reinstalled, install the DC-16-C as follows:

1. Slide the DC-16-C into place in the 19-inch rack assembly and secure with four mounting screws.
2. If the optional Maintenance Module is available, slide it into place (component side up) in the top module position.
3. Verify or place the primary AC power breaker/switch to the OFF (down) position and connect the AC power card between J1 on the DC-16-C power supply and the primary AC power source receptacle.
4. Connect disk drive data cable(s) and signal cable to controller back panel.

2.3.3.3 Computer Interface Module Installation

Generally, installing the Computer Interface Module requires setting up the device address, preparing the chassis for the board and installing the computer interface cable between the CPU and the DC-16-C.

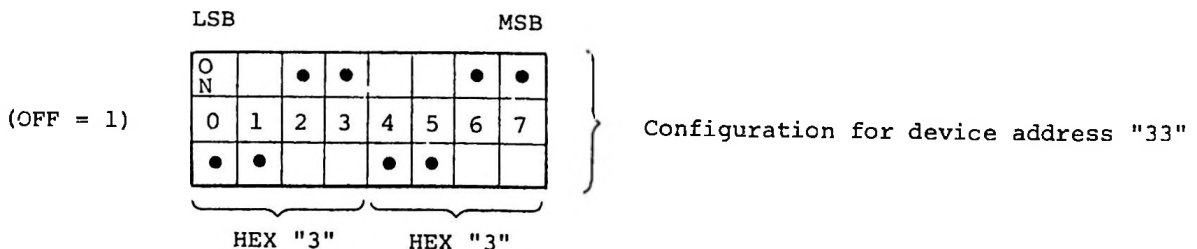
The following paragraphs provide detailed installation procedures for each Computer Interface Module supplied by Telefile.

2.3.3.3.1 Interdata Computer Interface Module

The DC-16-C/Interdata Computer Interface Module interfaces with the CPU via the Selector Channel. The Selector Channel option must be properly installed and configured before attempting to install the Computer Interface Module.

Assuming that the Selector Channel is properly configured, install the Computer Interface Module as follows:

1. Verify or configure the setting of the switch assembly on the Computer Interface Module to the proper Selector Channel address. Switches 0-3 and 4-7 define the two-digit hex address as follows:



2. Power down the CPU and slide the Computer Interface Module into the proper board location and seat the module into the backplane receptacles.
3. Remove the RACK-0/TACK-0 jumper between pins 01-02-22 and 01-01-22 at the Computer Interface Module backplane board location.
4. Route the P2 and P3 ends of the computer interface cable through the slots on the right side of the CPU chassis and connect them to the P2 and P3 edge connectors on the Computer Interface Module as shown in Figure 2-10.
5. Route the cable through the chassis to the DC-16-C and connect it to the processor interface cable connector block on the back of the DC-16-C chassis.
6. If not already done, verify proper configuration of the DC-16-C General Interface Module switch assembly for operation with the Interdata CPU (paragrph 2.3.3.1.3).

2.3.3.3.2 Data General Computer Interface Module

The DC-16-C/Data General Computer Interface Module interfaces with the CPU via the high-speed data channel. Install the Computer Interface Module as follows:

1. Verify or configure the setting of the switch assembly on the Computer Interface Module to the proper I/O device address.

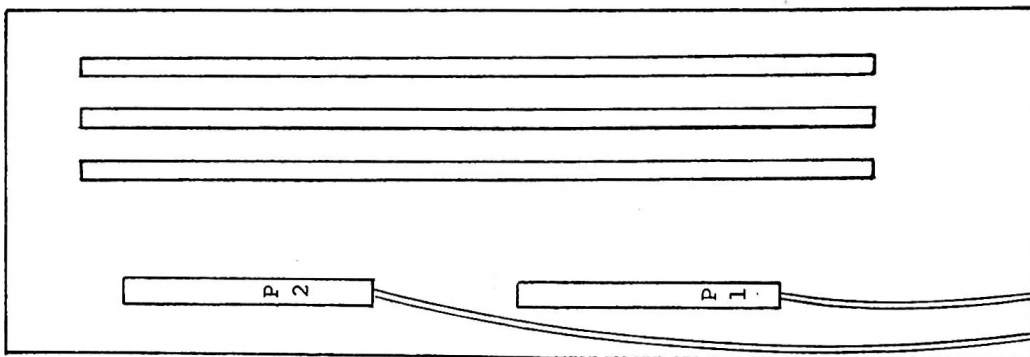
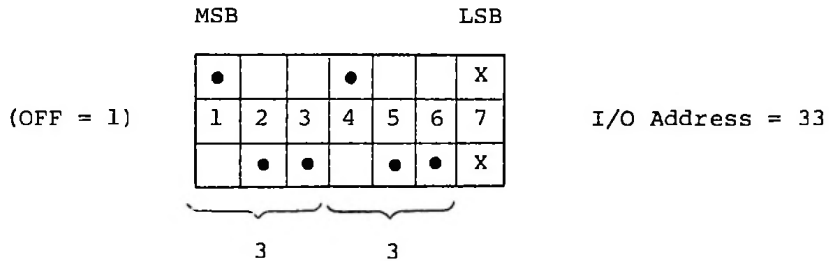


Figure 2-10. Interdata Computer Interface Module Cable Connections.

Switches 1-3 and 4-6 define the two-digit address as follows (switch 7 is not used):



2. Power down the CPU and slide the Computer Interface Module into place. It is recommended that the DC-16-C be assigned the highest physical position available in the Data General chassis. This will give the disk system the lowest priority and prevent it from dominating the I/O bus during data transfer operations.
3. Verify or configure the proper data channel priority in/out jumper scheme on A-93/-94 of the Computer Interface Module location. (Consult the Data General reference manual.)
4. Route the computer interface cable in from the rear of the Data General chassis and install the three connectors over the pins at the Computer Interface Module location as shown in Figure 2-11. JA1 mates with pins A-68 through A-100; JB1 mates with pins B-02 through B-34; and JB2 mates with pin B-36 through B-70.

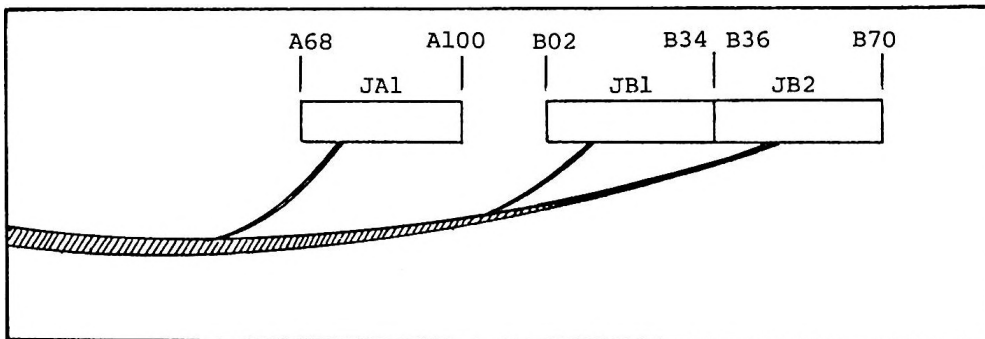
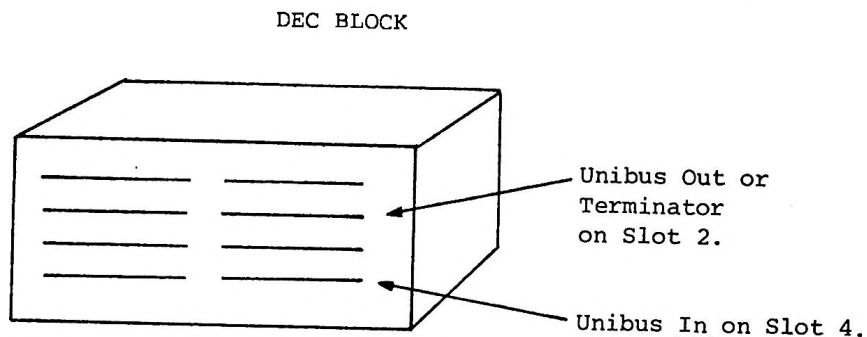


Figure 2-11. Data General Computer Interface Module Cable Connections.

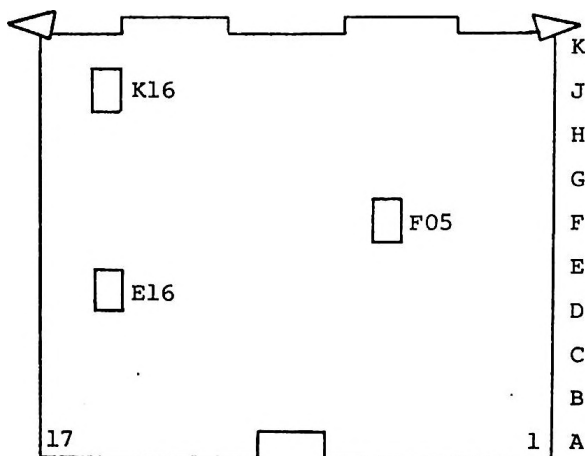
5. Route the cable through the chassis to the DC-16-C and connect it to the processor interface cable connector block on the back of the DC-16-C chassis.
6. If not already done, verify proper configuration of the DC-16-C General Interface Module switch assembly for operation with the Data General CPU (paragraph 2.3.3.1.3).

2.3.3.3.3 Digital Equipment PDP-11 Computer Interface Module

The DC-16-C/PDP-11 Computer Interface Module connects with the CPU via the Unibus. The DC-16-C is configured with a DEC connector block on the rear backplate. The Computer Interface Module is installed within the DC-16-C replacing the General Interface Module. After rack mounting the DC-16-C chassis, the Unibus ribbon cable is connected as follows:

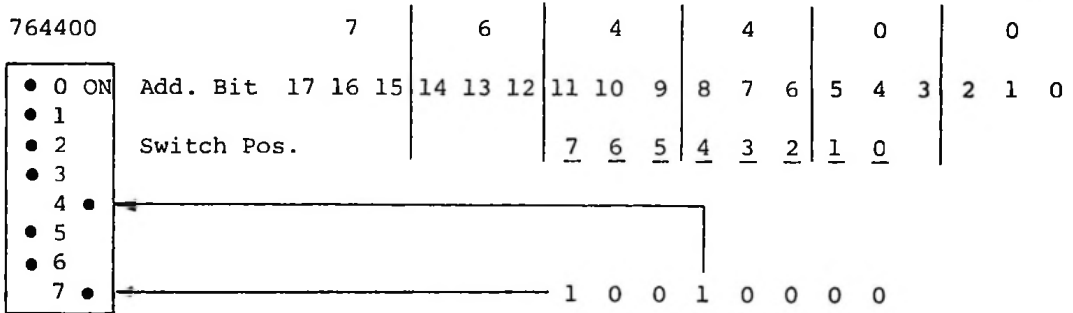


The PDP-11 Computer Interface Module has three dip switches which are used to select: 1) the device register set, 2) vector interrupt address, 3) "DMA THROTTLE" which defines the maximum number of DMA cycles per bus connection.

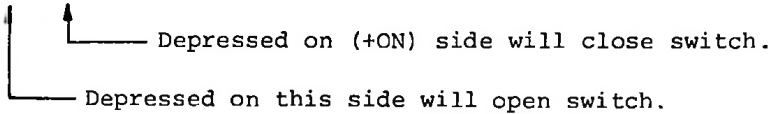


A description of the switches is as follows:

- SWITCH E16, Device Address - Factory set to 764400_8 through 764416_8 . Switch E16 may select different address set as follows: $76WXYZ_8$ WX are selectable, YZ must be zero, i.e. can use 761200_8 or 767700_8 (switch E16 selects first group of 8 addresses).

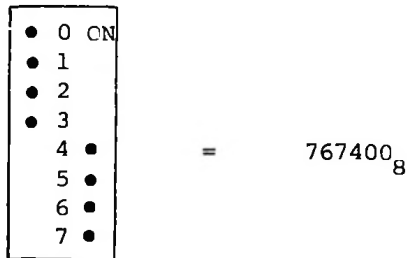


- Indicates Depressed.



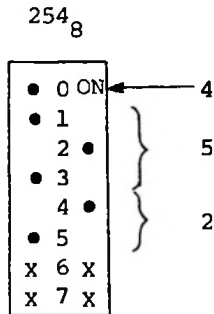
Therefore close switch for a "1".

i.e.



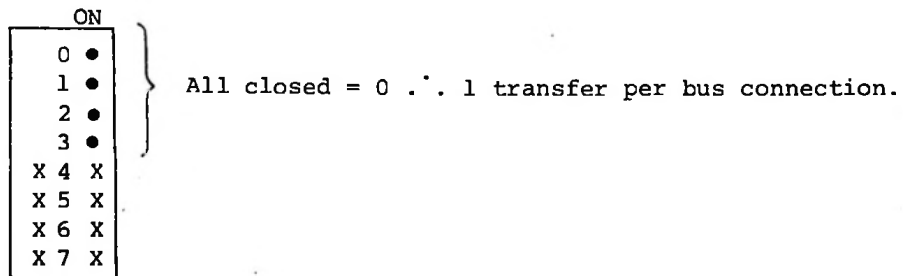
- SWITCH F05, Interrupt Vector Address - Factory set to 254_8 .

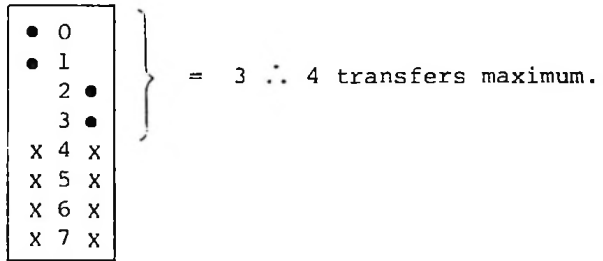
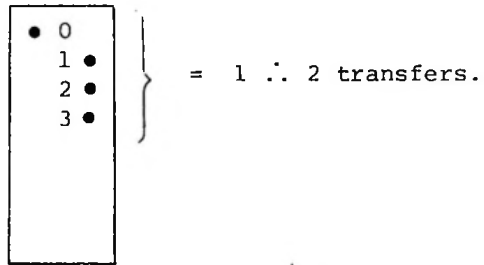
Add. Bit	Vector Add															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Switch Pos.								5	4	3	2	1	0			
254_8								0	1	0	1	0	1	1	0	0



NOTE: Open for a "1".

- SWITCH K16, DMA Throttle - Allows maximum of 1, 2 . . . through 16 DMA cycles at a time when DC-16-C becomes Bus Master. Factory set to maximum of 2 cycles/connection. (This is required when using 80MB 980 drive.) Switch K16 is set to one less than the number of consecutive transfers required.





Factory settings of the PDP-11 CIM board are shown in Figure 2-12.

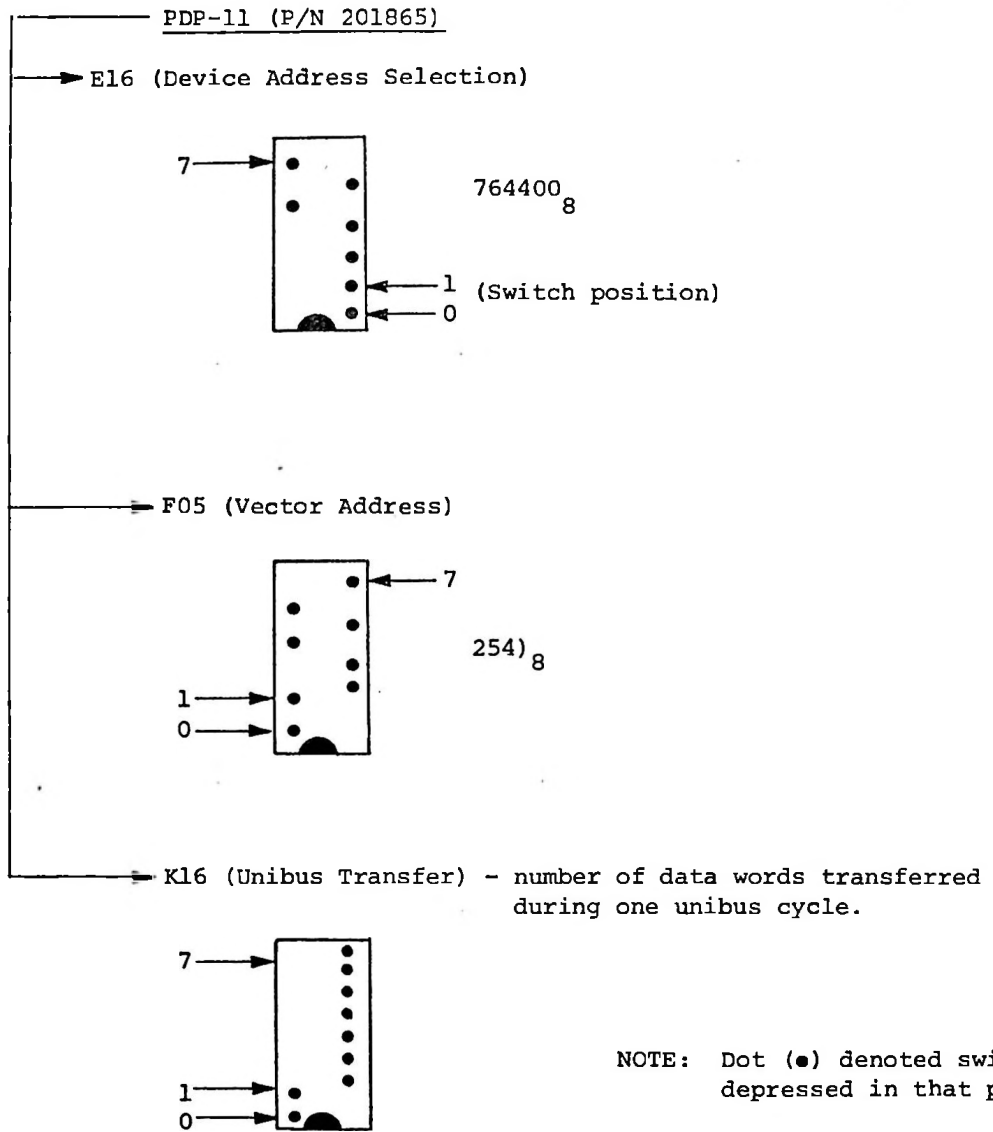


Figure 2-12. Factory Settings of the PDP-11 CIM Board.

2.3.3.3.4 Microdata Computer Interface Module

The DC-16-C/Microdata Computer Interface Module (CIM) interfaces with the CPU via the Microdata byte I/O bus and DMA channel. It is designed to connect to the Microdata Multiplexer, Model 2515, which must be in place at the time the CIM board is to be installed. The CIM board fits inside the Microdata 1600 CPU or expansion chassis. Edge connectors on the board mate with backplane receptacles to provide the CIM/Microdata I/O bus, data and memory address interfaces. Assuming the multiplexer is installed, proceed with the installation of the Computer Interface Module as follows:

- a. Power down the CPU and mount the Computer Interface Module into the proper board location (see Figure 2-13) and seat the module into the backplane receptacles (these provide the CIM/Microdata I/O bus, data and memory address interfaces).
- b. Connect the ribbon cable from DMA Multiplexer Model 2515 to the bottom connector on the CIM board. (This provides DMA control and priority signal interface.) A second cable passes these signals to the next device.
- c. DC-16-C interface is provided by installing plugs P04 and P05 of the Telefile supplied cable to the middle and top connectors of the Computer Interface Module, respectively.
- d. Connect the other end of the Computer Interface Module cable to the processor connector block on the back of the DC-16-C controller.

The system is now ready for verification.

2.3.3.3.5 Hewlett Packard Computer Interface Module

The DC-16-C/Hewlett Packard Computer Interface Module (CIM) connects the DC-16-C to the CPU using the standard I/O system and the DMA option.

NOTE: Telefile does not supply the DMA option —
it is a Hewlett Packard product.

The CIM is a single plug-in circuit card designed to fit inside the CPU or HP2155A I/O Extender. The edge connector on the CIM mates with a backplane receptacle to provide the I/O system and DMA interface. Interface to the DC-16-C is accomplished by a cable that mates to an edge connector on the opposite edge of the CIM. To install the CIM/DC-16-C interface proceed as follows:

- a. Verify or configure the setting of the switch assembly on the Computer Interface Module as indicated in Appendix B.
- b. Power the CPU and insert the CIM board into the CPU or the HP2155A I/O Extender. Ensure that the module is seated firmly.

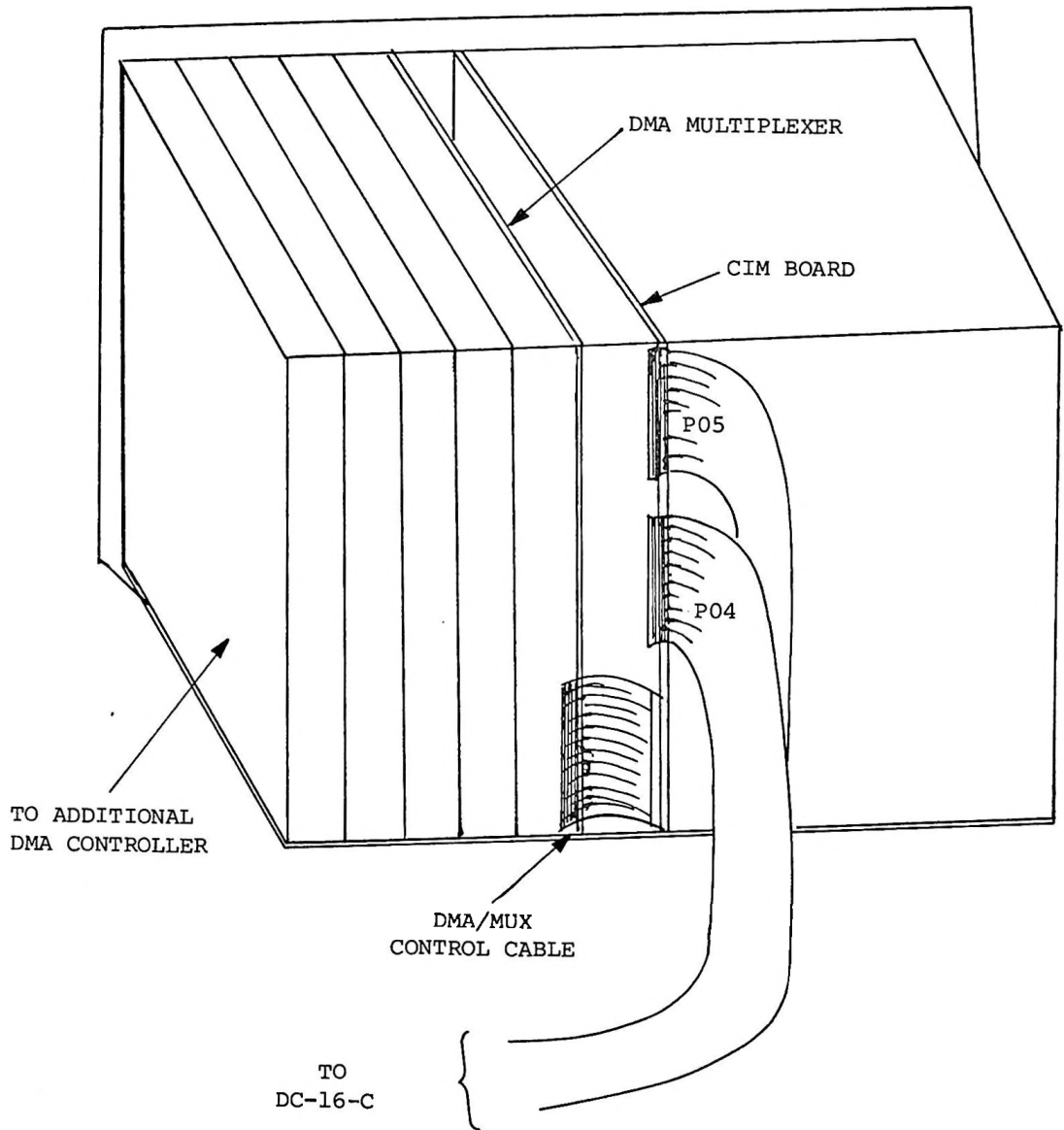


Figure 2-13. Typical Microdata CIM Board Installation.

- c. Connect the Telefile supplied cable to the edge connector on the CIM board. Connect the other end of the cable to the PROCESSOR CONNECTOR block on the rear of the DC-16-C controller.

The system is now ready for verification.

2.3.3.3.6 Varian Computer Interface Module

The DC-16-C/Varian Computer Interface Module (CIM) is designed to connect the DC-16-C with Varian V70 series processors through the processor's IO system and the Priority Memory Access (PMA) option (See Figure 2-14).

The CIM is a single plug-in circuit card assembly that is inserted in the Varian V70 series expansion chassis. Edge connectors on the CIM mate with backplane receptacles to CIM/Varian IO bus connections. To install the CIM proceed as follows:

- a. Set or verify that the switch settings on the CIM are as indicated in Appendix B.
- b. Insert the CIM board into the prescribed location in the I/O expansion chassis. Be sure the module is seated firmly.
- c. Connect the PMA cable from the CPU to the J1/J2 edge connectors of the CIM.
- d. Connect the Telefile supplied cable to the J3 of the CIM. Connect the other end to the PROCESSOR CONNECT block on the rear of the DC-16-C controller.

The system is now ready for verification.

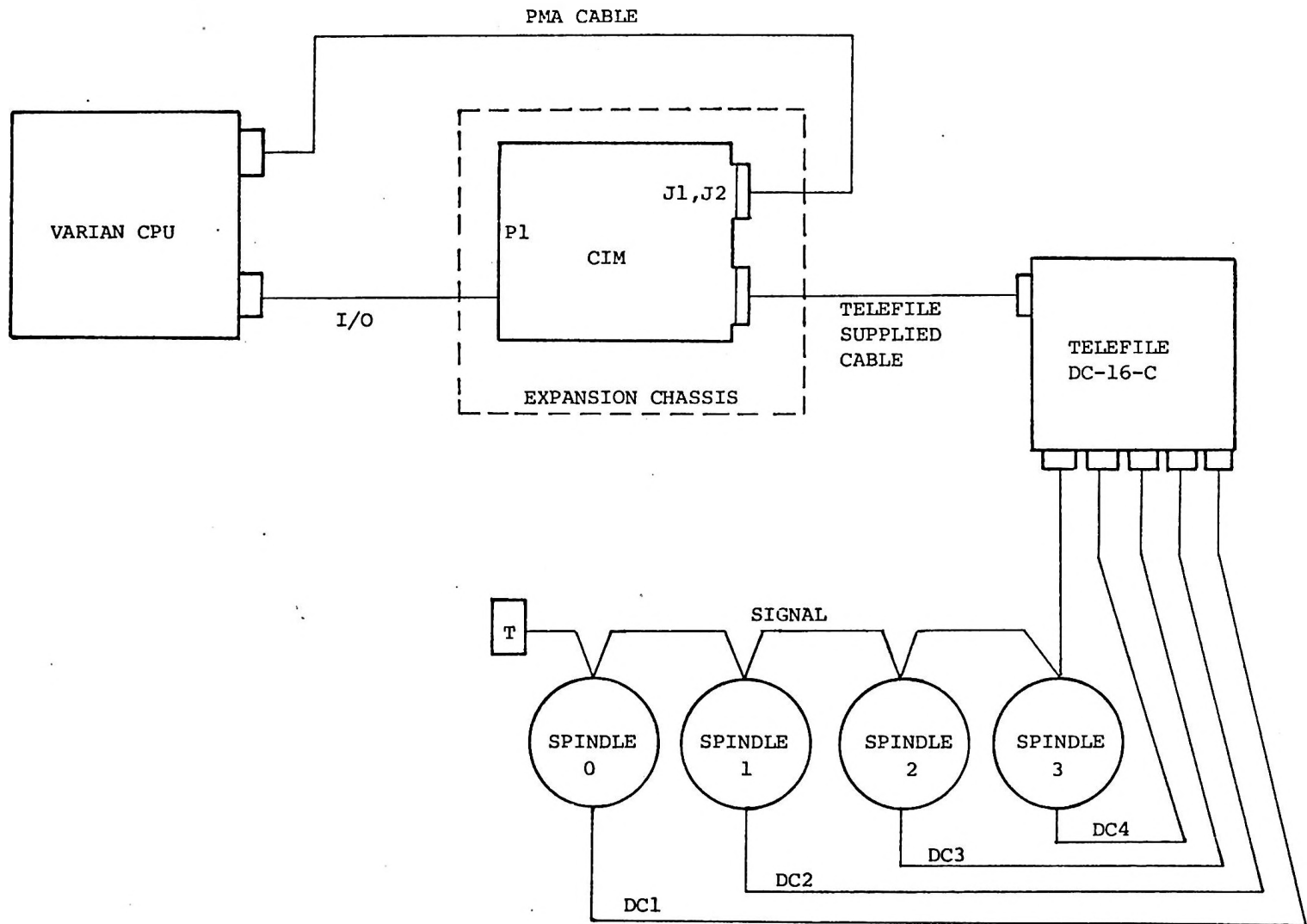
2.4 TEST AND VERIFICATION

The following paragraphs denote the procedures to be followed in the test, and verification of the controller, the CIM, and associated disk drives.

2.4.1 APPLICABLE DOCUMENTS

Documents needed or helpful during the performance of these tests are noted below.

- a. Applicable disk drive technical manual.
- b. One of the following:
 - 1. DC-16-C/PDP-11 Diagnostic Operating Instructions, TM-200-0026-1A.
 - 2. DC-16-C/Interdata Diagnostic Operating Instructions, TM-200-0007-1C.



2-29

Figure 2-14. Typical Varian CIM Board Installation.

3. DC-16-C/Microdata Diagnostic Operating Instructions, TM-200-0028-1A.
4. DC-16-C/Nova Diagnostic Operating INstructions, TM-200-0020-1A.
5. DC-16-C/HP Diagnostic Operating Instructions, TM-200-0027-1A.
6. DC-16-C/Varian Diagnostic Operating Instructions, TM-200-0029-1A.

2.4.2 TEST EQUIPMENT REQUIRED

Equipment required for test and verification is as follows:

- 1 - Digital Multimeter, Fluke Model 8000A or equivalent.
- 1 - Teletype Model 3320 3JC.
- 1 - Disk Drive with error free packs.
- 1 - Minicomputer.

2.4.3 POWER-OFF TEST

2.4.3.1 Ground

Using ohm scale of Fluke meter check for continuity (less than 1 ohm) between cabinet frame and ground etch on controller back plane.

2.4.3.2 +5V and -5V

Disconnect the DC power supply at J2 and verify resistance measurement of greater than 100M ohm between the following points on the controller back plane.

- a. E1 (GND) and E8 (+5V).
- b. E1 (GND) and E5 (-5V).
- c. E5 (-5V) and E8 (+5V).

NOTE: If the controller fails these checks, notify Telefile Field Service Department before applying power.

- d. Reconnect DC power cable to J2.

2.4.4 POWER-ON VOLTAGE CHECKS

- a. Turn AC circuit breaker on power supply back panel to ON. Verify that fans function properly.
- b. Depress ONLINE switch on controller front panel and verify that lamp is lit.

2.4.4.1 Power Supply Voltage Checks

- a. With Fluke meter verify that +5.00V is present at E8 of controller back plane. Adjust trimpot (+5.0V ADJ) as necessary.
- b. Verify that +5.00V is present at E5 of controller back plane. Adjust trimpot (-5.0V ADJ) as necessary.

2.4.5 DIAGNOSTIC TEST PROGRAMS

Using the diagnostic operating instruction manual, load and run the appropriate DC-16-C diagnostic program.

<u>Minicomputer</u>	<u>Diagnostic Test Program</u>	<u>Rev.</u>
PDP-11	PT-200-0022-1A	0.0
Interdata	PT-200-0007-2A	4.5
NOVA	PT-200-0020-1A	1.6
Microdata	PT-200-0028-1A	1.1
HP	PT-200-0027-1A	0.0
Varian	PT-200-0029-1A	0.0

SECTION III

OPERATIONAL DESCRIPTION

3.1 GENERAL

The intent of this section is to provide general information necessary to the understanding of the operation of the DC-16-C and the methods employed in writing and reading data from the various models of disk drives.

3.2 TERMS AND DEFINITIONS

Definitions of general terms used in this section are provided below.

DISK DRIVE	An electrical/mechanical peripheral device, consisting of a drive spindle, a removable disk pack recording medium and read write heads, that is used to provide random access memory to a computer system.
CYLINDER	The total block of data available at each position of the head carriage assembly. On a five surface disk pack a cylinder consists of five tracks.
TRACK	A concentric path around the rotating disk surface. The heads read and write along this path.
HEAD	The device that is in near contact with the rotating disk surface. The heads perform the data read and write functions.
INDEX	A pulse generated by a physical notch on the disk pack. There is one index notch about the circumference of the disk pack.
SECTOR	A physical unit of data consisting of gaps, header information and data. Often referred to as a "Record".
HEADER	A label written before the data record on a disk pack that identifies the track status, the cylinder number, the head number and the record number.
SECTOR MARK	A signal from the disk drive that allows the controller to identify the beginning of each record.

3.3 DISK PACK FUNCTIONS

Each disk drive unit interfaced by the DC-16-C drives one removable disk pack assembly. The disk pack consists of five or ten magnetic recording disk platters mounted on a common hub to provide 5 or 19 data recording surfaces (depending on the model disk drive).

In operation, the pack is mounted on the disk drive spindle and rotated at a high speed (3600 or 2400 rpm). Data is recorded on disk and accessed by a set of read/write heads mounted on a common carriage and driven by an electro mechanical positioning system.

When the head carriage assembly is extended, the heads are positioned between the rotating disk platters and in near contact with the disk surface as shown in Figure 3-1. The head positioning assembly stops the read/write heads at a specific number of recording positions between the outer and inner circumferences of the disk. Each position of the read/write heads defines a complete data cylinder that includes all information recorded on each disk surface at that position of the read/write heads. The outermost cylinder is always identified as cylinder zero; the innermost cylinder is the maximum provided by the disk drive unit.

Each disk surface is further formatted into a specific number of pie-shaped sectors (see Figure 3-2) to identify individual data records. As described in Section 1, the DC-16-C provides either sequential or staggered sector addressing.

The concentric path around the entire disk surface, cutting across all sectors, is called a track. Each cylinder could be thought of as a vertical stack of tracks.

By specifying a particular cylinder number to determine the position of the head carriage assembly, a head number to select the disk platter and a sector number to identify the individual record, any portion of the disk pack can be accessed. To facilitate data access operations and assure orderly retrieval operation, a specially coded 3-byte header field is pre-recorded (formatted) before each data record to identify the disk data address.

3.3.1 DISK DATA FORMAT

The disk pack is divided into 407, 411, 815 or 823 cylinders (depending on the disk drive model), one for each position of the disk drive head carriage assembly. Each cylinder consists of nineteen tracks, one for each of the read/write heads numbered from 0 to 19 - or 5 tracks depending on type of drive.

In the standard T-9760 or -9762 configuration, each track contains 32 data records and each data record includes 256 words of data. This format is variable within the hardware and can be changed to meet a customer's specific needs.

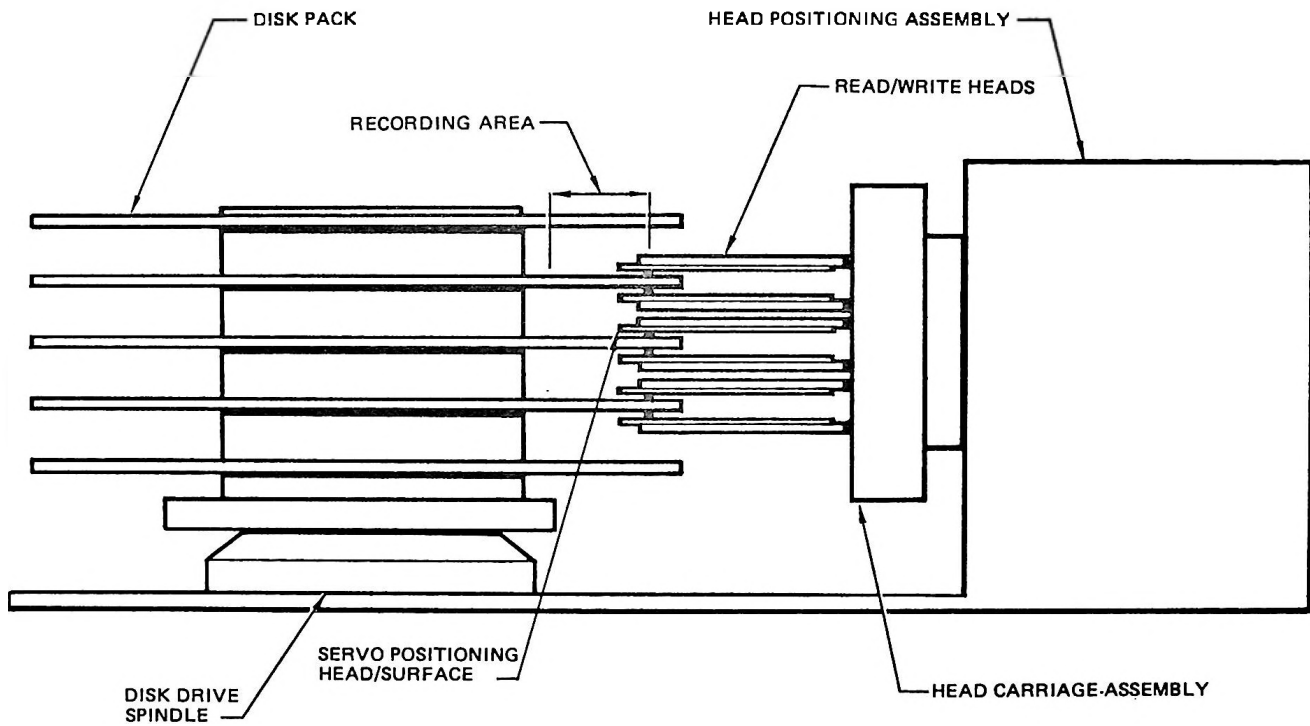


Figure 3-1. Typical Disk Drive Assembly.

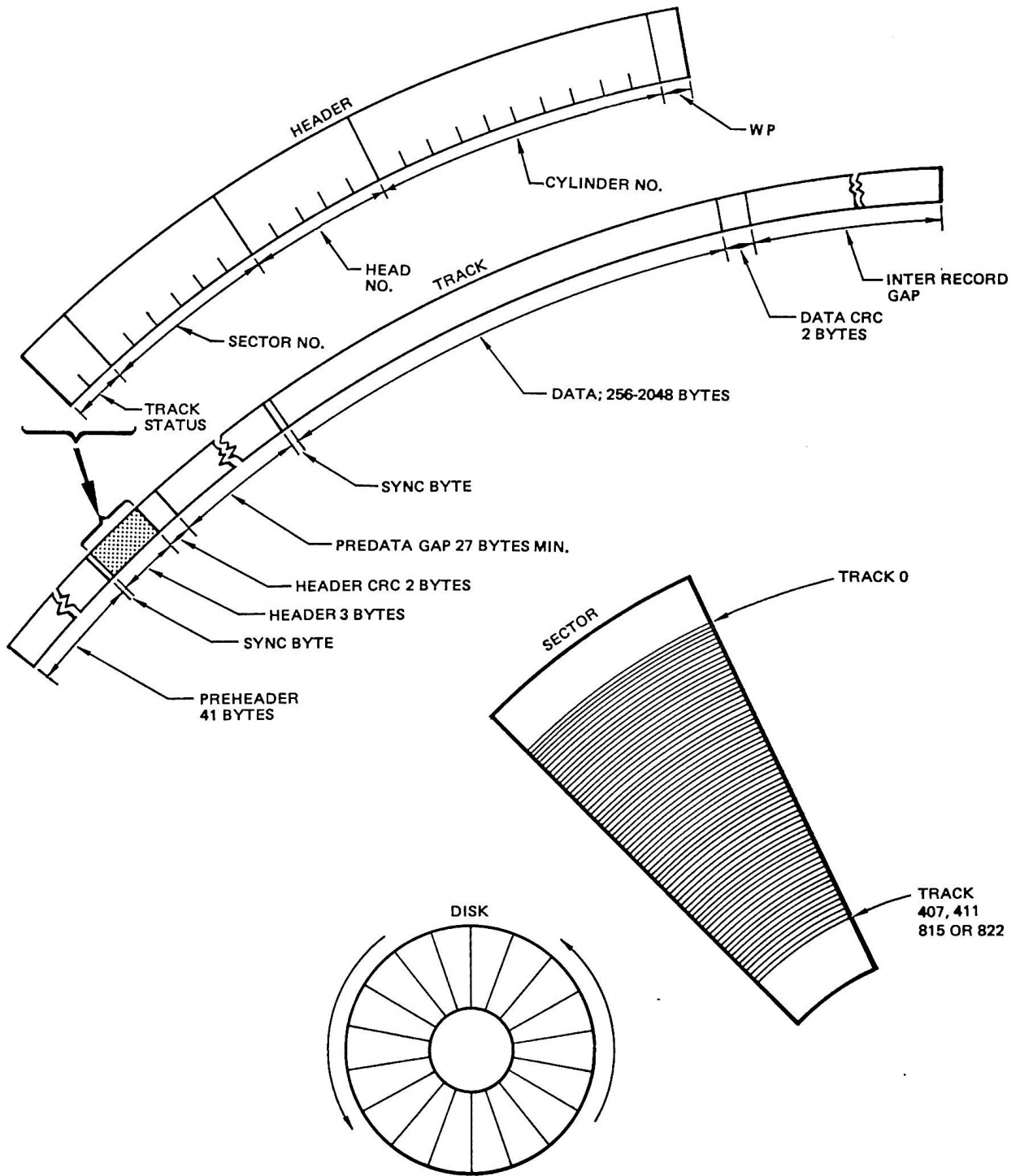


Figure 3-2. Disk Data Format.

The disk controller sector format is shown in Figure 3-3. Each data area is preceded by a header identifying track status, the cylinder, head and sector number. For a read or write operation to take place, the header must agree with the specified location and status, and have the proper check bytes.

Sector addresses may be either sequential as illustrated in Figure 3-4 or staggered (interlaced) as illustrated in Figures 3-5 and 3-6. This is selectable at time of manufacture. The staggered format permits reduction in the data transfer rate between the DC-16-C and the processor, to allow more processing during DMA functions. Typical track formats for the various drives are as follows:

<u>Words/Sector</u>	<u>Maximum Sectors per Track</u>	
	<u>T-9760, T-9762</u>	<u>TT-25, TT-50, TT-75</u>
128	56	38
256	32	22
512	18	12
1024	9	6

3.3.2 DATA CAPACITY

The data capacities of a disk pack for the track formats listed above are as follows:

<u>Words/Sector</u>	<u>Disk Pack Capacity (M Words)</u>				
	<u>T-9760</u>	<u>T-9762</u>	<u>TT-25</u>	<u>TT-50</u>	<u>TT-75</u>
128	14.95	30	9.7	19.4	30
256	16.85	33.7	11.45	23	33.7
512	18.9	38	12.5	25.1	38
1024	18.9	37.9	12.5	25.1	37.9

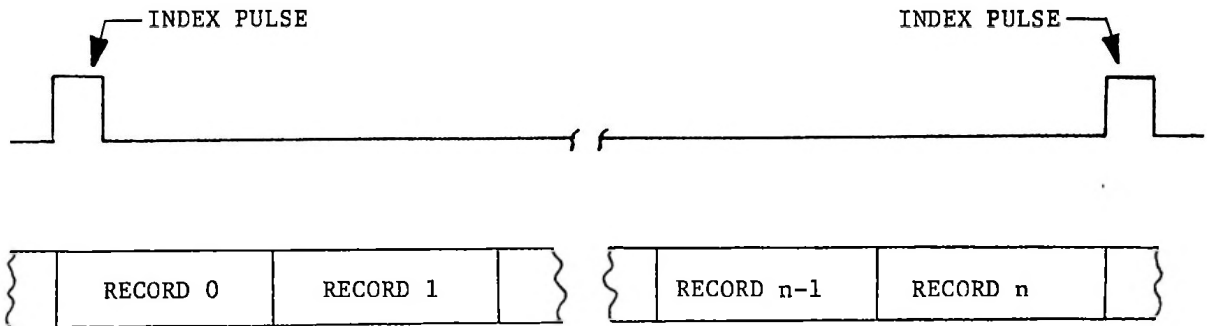
3.3.3 DATA TRANSFER RATE

Data will be transferred between the processor and the controller at a word rate of 625 kilohertz for the T-9760 and T-9762 drives and at a word rate of 403 kilohertz for the TT-25 and TT-50 drives.

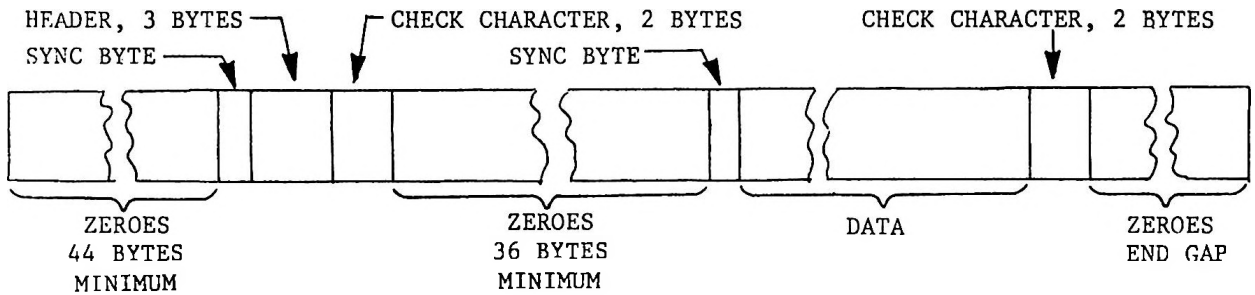
3.4 DISK SYSTEM STRUCTURE

The basic controller consists of a General Interface Module (GIM), Command Timing Module (CTM), Memory Address Module (MAM), Disk Interface Module (DIM), and an optional Maintenance Panel plug-in module. Directly associated but not part of the controller is the Computer Interface Module (CIM) as shown in Figure 3-7. The CIM varies with each different CPU, therefore its operation is discussed separately in Appendix B. The DIM interfaces with the disk drive to accommodate the various drives available. Two types of DIM board have been developed. The type used in this system is discussed in Appendix A.

TRACK LAYOUT



RECORD FORMAT



HEADER FORMAT

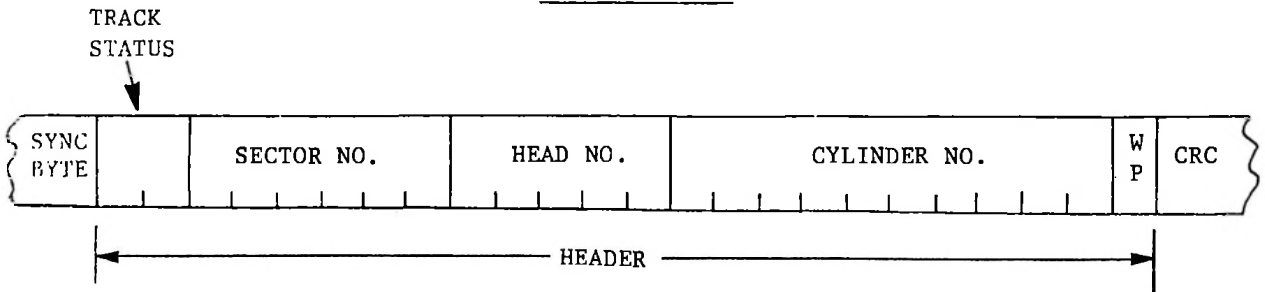


Figure 3-3. DC-16-C Disk Controller Format.

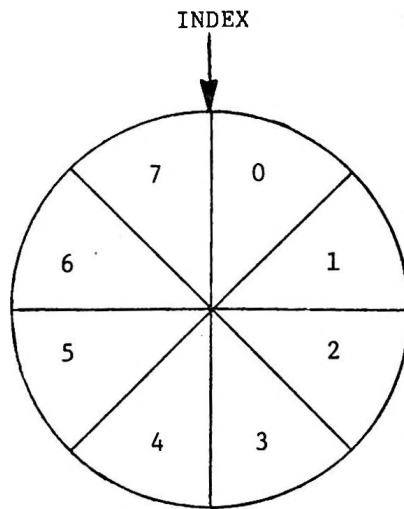


Figure 3-4. Sequential Sector Addressing.

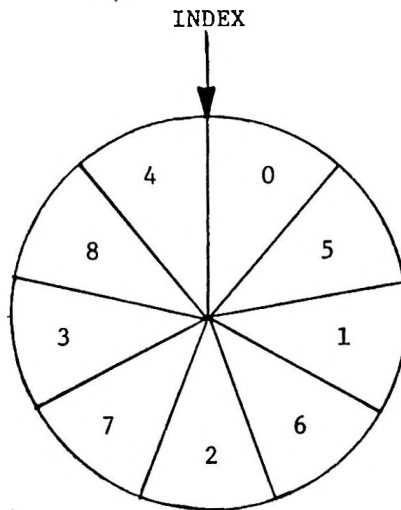
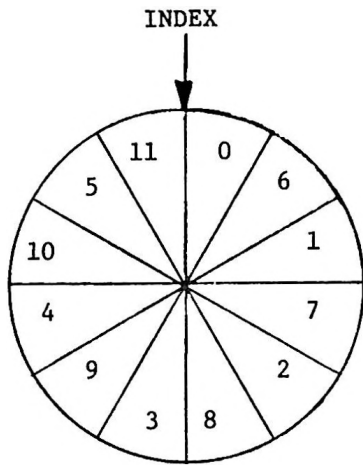
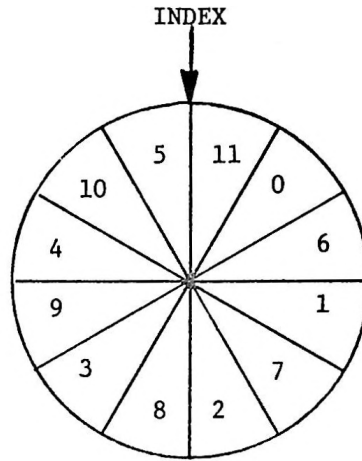


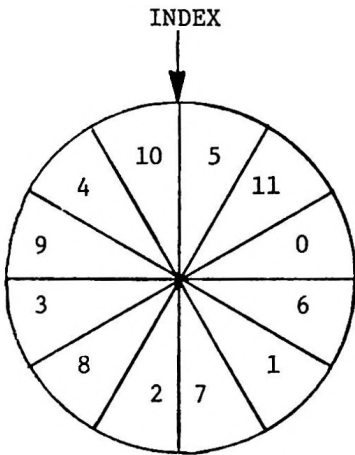
Figure 3-5. Staggered Sector Addressing - Odd Number of Sectors.



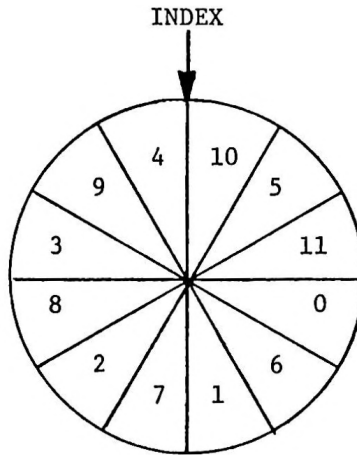
HEAD 0



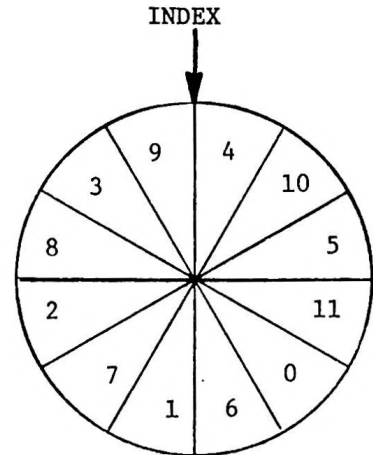
HEAD 1



HEAD 2



HEAD 3



HEAD 4

Figure 3-6. Staggered Sector Addressing - Even Number of Sectors.

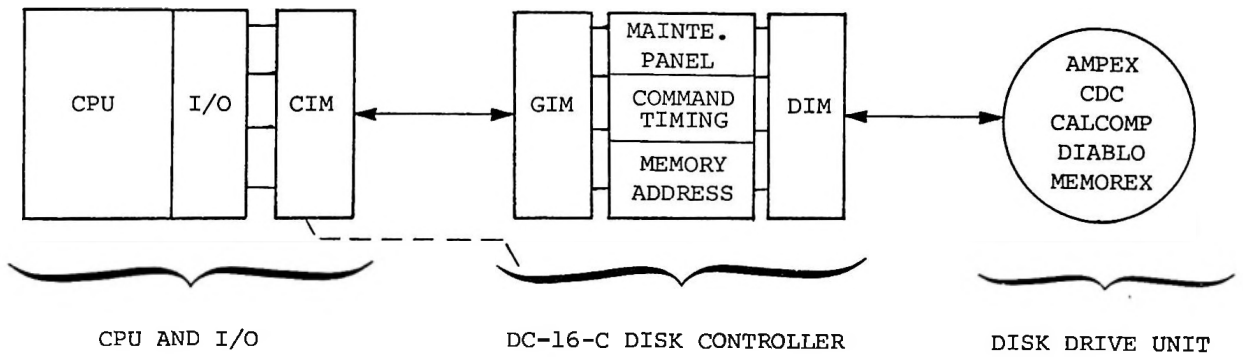


Figure 3-7. Basic DC-16-C System Configuration.

3.5 BASIC INTERFACE

There are basically two interface areas of concern. One, the CIM to GIM signals, and two, the DIM to disk drive unit. These are shown respectively in Figures 3-8 and 3-9. The mnemonic of each interface signal is described in the following paragraphs.

3.5.1 CIM/GIM SIGNALS

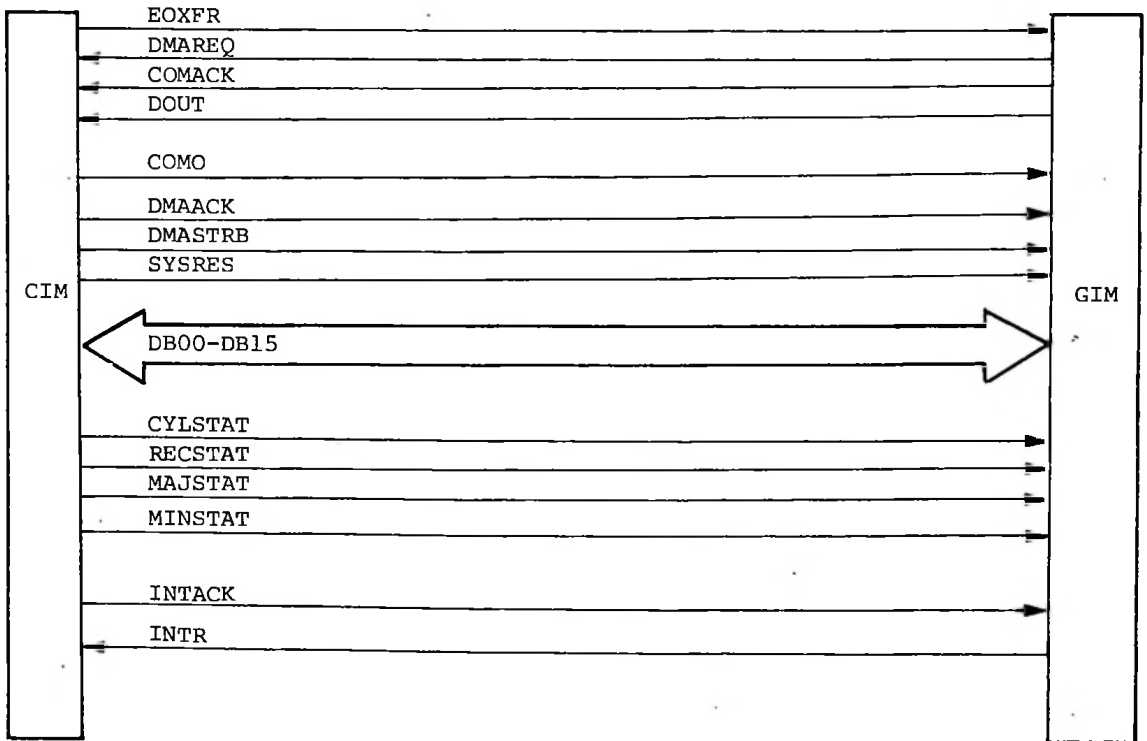


Figure 3-8. CIM/GIM Interface.

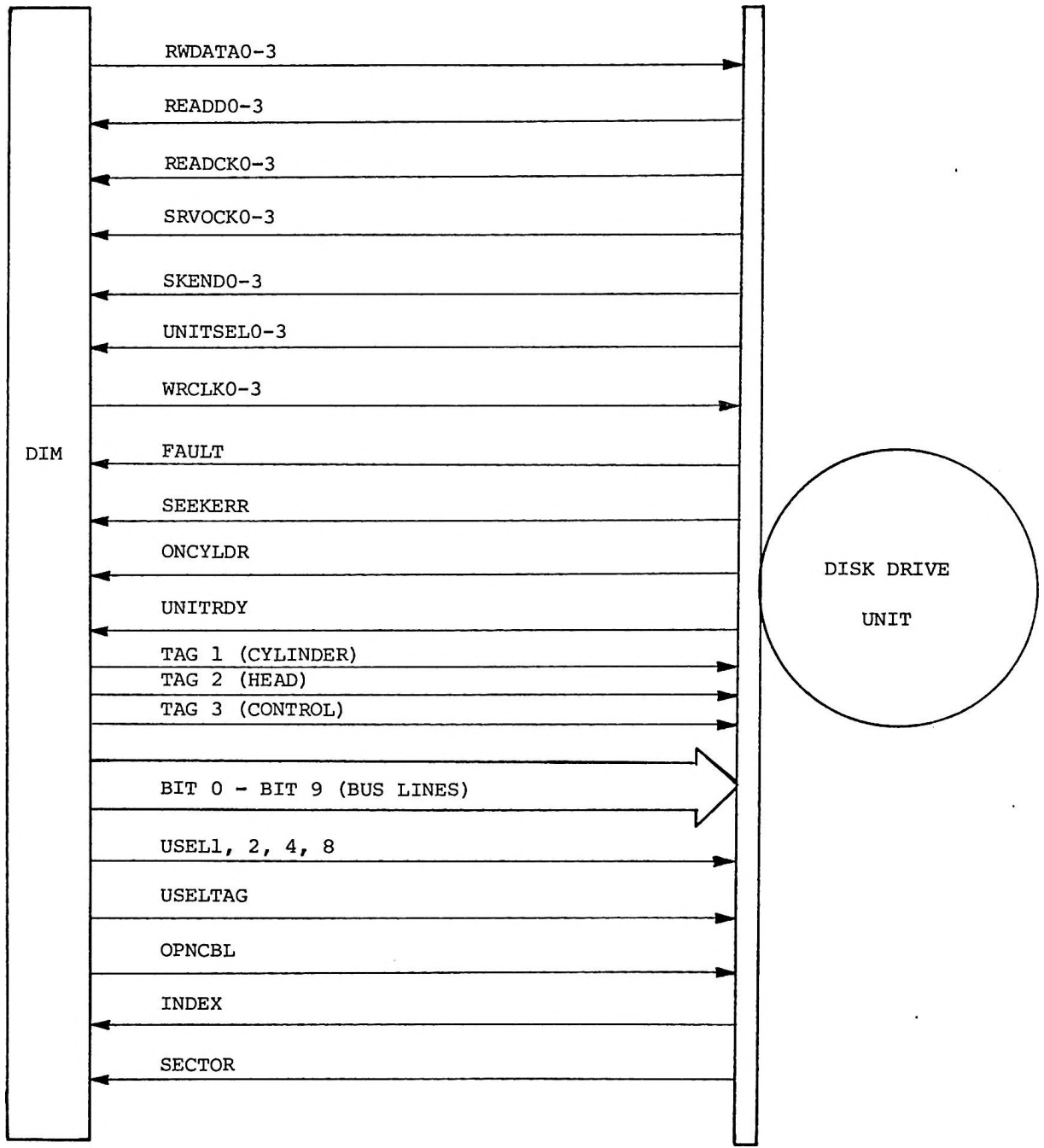


Figure 3-9. Disk Drive Interface.

EOXFR, End of Transfer; generated by the CPU to inform the DC-16-C that the last word has been read from or written to memory during a data transfer operation.

DMAREQ, DMA Request; issued by the DC-16-C to inform the CPU of a pending request for a DMA request.

COMACK, Command Acknowledge; generated by the DC-16-C to acknowledge receipt of a command that has been issued by the CPU.

DOUT, Data Out; generated by the DC-16-C prior to a data transfer operation from the CPU to the DC-16-C.

COMO, Command Out; generated by the CPU to inform the DC-16-C that a command is being placed on the data bus, DB00 through DB15.

DMAACK, DMA Acknowledge; generated by the CPU to indicate initiation of a DMA operation.

SYSRES, System Reset; generated by the CPU to reset the DC-16-C logic circuits.

DB00-DB15, Data Bus; the bi-directional data bus used to transfer data, commands and status information between the DC-16-C and the CPU.

CYLSTAT, Cylinder Status; generated by the CPU to gate the current status of the cylinder counter onto the data bus via the cylinder, head and sector multiplexor.

RECSTAT, Record Status; generated by the CPU to gate the current status of the sector and head counters onto the data bus via the cylinder, head and sector multiplexor.

MAJSTAT, Major Status; generated by the CPU to gate the current operational major status word onto the data bus.

MINSTAT, Minor Status; generated by the CPU to gate the current operational minor status word onto the data bus.

INTACK, Interrupt Acknowledge; generated by the CPU to acknowledge receipt of an interrupt request from the DC-16-C and to reset the interrupt logic.

INTR, Interrupt Request; generated by the DC-16-C to request service by the CPU.

3.5.2 DIM/DISK SIGNALS

RWDATA0-3, Write Data; one line for each disk drive unit to transfer serial write data from the DC-16-C to the disk.

READDO-3, Read Data; one line for each disk drive unit to transfer serial read data from the disk to the DC-16-C.

READCK0-3, Read Clock; one line from each disk drive unit to supply the DC-16-C with a read clock signal synchronized with data read from the disk.

SRVOCLK0-3, Servo Clock; one line for each disk drive unit to supply the DC-16-C with a phase-locked 9.677 MHz. Clock signal generated by the servo track of the disk drive unit.

UNITSELO-3, Unit Select; one line from each disk drive unit to convey unit selection to the DC-16-C.

WRCLK0-3, Write Clock; one line for each disk drive unit to convey the write data clock from the DC-16-C to the disk. Actually, this is the SRVOCLK turned around and sent back to the unit.

FAULT, Fault; signal indicating that one or more of the following conditions occurred:

- a) DC power failure.
- b) Head selection error.
- c) Write error.
- d) Data transfer attempted while drive is off cylinder.
- e) Write gate occurred during a read operation.

SEEKERR, Seek Error; informs the DC-16-C that the disk drive unit was unable to complete a seek operation within the specified time limit. The seek error status will also be set if an invalid cylinder address is specified.

ONCYLDR, On Cylinder; informs the DC-16-C that the disk drive unit has positioned its head carriage assembly over the previously specified data track.

UNITRDY, Unit Ready; issued by the selected disk drive to inform the DC-16-C that the unit is up to speed, the heads are extended and no error conditions exist.

TAG1 THROUGH TAG3, Tag Bus Lines; generated by the DC-16-C to define the information on the ten-bit drive bus.

- a) TAG 1 - Cylinder Tag.
- b) TAG 2 - Head Tag.
- c) TAG 3 - Control Tag.

BIT0 THROUGH BIT8, Drive Bus Lines; ten bit bus that conveys control information to the selected disk drive in coordination with the three tag lines (TAG 1, 2, 3). When TAG 1 is active, BIT 0 through BIT 9 convey, the binary coded cylinder address (1 through 512) for a seek operation. When TAG 2 is set, Bits 0 through Bit 8 convey the following control information:

BIT 0	WRITE GATE
BIT 1	READ GATE
BIT 2	SERVO OFFSET PLUS
BIT 3	SERVO OFFSET MINUS
BIT 4	FAULT CLEAR
BIT 5	ADDRESS MARK ENABLE
BIT 6	RETURN TO CYLINDER ZERO
BIT 7	DATA STROBE EARLY
BIT 8	DATA STROBE LATE

USEL1 THROUGH USEL8, Unit Select; four lines (1, 2, 4, 8) used by the DC-16-C to select the desired disk drive unit.

USELTAG, Unit Select Tag; strobes the information on the four unit select lines into the disk drive unit.

OPNCBL, Open Cable Detector; senses DC-16-C power loss or disconnect of the signal cable.

INDEX, Index; index pulse from the selected disk drive unit.

SECTOR, Sector; sector mark generated by the servo track of the selected disk drive unit.

Pin assignments of the DC-16-C interface cables are shown in Table 3-1.

3.6 OPERATION

Operation of the DC-16-C Disk System begins whenever the CPU raises the command out signal (COMO) and places a 16 bit parallel command word onto the CIM/GIM data bus. To accept the command the controller must be addressed properly and be online. With a few exceptions the drives must also be powered up and at operational speed. Once accepted by the controller, a command acknowledge COMACK is sent back to the CPU. In the controller the four most significant bits are stored and decoded to generate one of 16 commands the DC-16-C can respond to (see Table 3-2) the remaining 12 bits of the command convey address information or special condition flags that may be required to execute the command. These are loaded into appropriate registers or circuits as a result of the function code being logically combined with a translated version of COMO.

During initial operations, a sequence of commands must be issued to prepare the disk packs as an addressable storage medium. These are:

- UNIT SELECT
- RESTORE COMMAND
- FORMAT TRACK
- SEEK
- WRITE

The functions of these are described below. The functions of the remaining commands follow.

Table 3-1. Interface Cable Pin Assignments.

Processor Cable		DIM Cables for CalComp/Trident Drives				DIM Cables for Ampex, CDC, Memorex Drives			
Pin	Signal	Signal Cable		Data Cable		Signal Cable		Data Cable	
		Pin	Signal	Pin *	Signal	Pin	Signal	Pin *	Signal
J4-A	COMO	J01-77	SECTOR-0	JOX-H	+5 TERM	J01-1	USEL 1	JOX-A	R/W DATA
J4-B	COMACK	J01-19	EOC	JOX-J	+5 TERM	J01-2	USEL 2	JOX-H	WRCLK0-3
J4-C	MAJSTAT	J01-45	ADDMKDET-0	JOX-N	ATN-0	J01-3	USEL 4	JOX-M	SRVOCLK0-3
J4-D	MINSTAT	J01-04	OFFSET-0	JOX-CC	SELCTD-0	J01-8	USEL 8	JOX-U	READD0-3
J4-E	CYLSTAT	J01-13	INDEX	JOX-X	SEQ-0	J01-10	INDEX	JOX-W	READCK0-3
J4-F	RECSTAT	J01-17	READY-0	JOX-DD	SELECT-0	J01-11	FAULT	JOX-AA	SEEK END
J4-H	DMAREQ	J01-16	RONLY-0	JOX-V	R/WDATA-P	J01-15	ONCYLDR	JOX-BB	UNIT SEL0-3
J4-J	DMAACK	J01-14	DVCHK-0	JOX-U	R/WDATA-M	J01-16	OPNCBL		
J4-V	DMASTRB	J01-22	ONLINE-0	JOX-B	R/WCLOCK-P	J01-17	UNIT RDY		
J4-W	EOXFR	J01-75	SEEK END-0	JOX-A	R/WCLOCK-M	J01-22	USEL TAG		
J4-X	INTR	J01-44	SPARE-0			J01-23	BUS BIT 0		
J4-Y	INTACK	J01-05	BUS0-0			J01-24	BUS BIT 1		
J4-Z	SYSRES	J01-07	BUS1-0			J01-28	BUS BIT 2		
J4-AA	DOUT	J01-12	BUS2-0			J01-29	BUS BIT 3		
J4-A	B00	J01-26	BUS3-0			J01-30	BUS BIT 4		
J4-U	DB01	J01-27	BUS4-0			J01-34	BUS BIT 5		
J4-AN	DB02	J01-31	BUS5-0			J01-35	BUS BIT 6		
J4-AP	DB03	J01-32	BUS6-0			J01-36	BUS BIT 7		
J4-AR	DB04	J01-33	BUS7-0			J01-40	BUS BIT 8		
J4-AS	DB05	J01-37	BUS8-0			J01-42	ADDRESS MARK FOUND		
J4-AT	DB06	J01-38	BUS9-0			J01-46	TAG 1		
J4-AU	DB07	J01-39	TERMIN-0			J01-48	TAG 2		
J4-AV	DB08	J01-55	CONTROLTAG-0			J01-52	TAG 3		
J4-AW	DB09	J01-49	SETCYLTAG-0			J01-74	SECTOR MARK		
J4-AX	DB10	J01-51	SETHDTAG-0			J01-75	SEEKERRO		
J4-BJ	DB11	J01-43	+5 TERM						
J4-BK	DB12	J01-40	+5 TERM						
J4-BL	DB13								
J4-BH	DB14								
J4-BN	DB15								

* NOTE: X can be J02, J03, J04 or J05.

Table 3-2. DC-16-C Command Structure.

MSB											LSB								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
0	0	0	0	C_{CB}	\emptyset_+	\emptyset_-	S_E	S_L	TKS			UNIT			UNIT SELECT				
0	0	0	1													SPECIAL			
0	0	1	0	I_{C_E}	I_{S_E}											RESTORE			
0	0	1	1						NUMBER OF TRACKS TO SEARCH*										BUFFER WRITE
0	1	0	0	I_{C_E}	I_{S_E}	CYLINDER NUMBER										SEEK			
0	1	0	1													BUFFER READ			
0	1	1	0						CYLINDER NUMBER										LINKED SEEK
0	1	1	1						HEAD NUMBER					SECTOR NUMBER					READ SPECIAL
1	0	0	0						HEAD NUMBER					SECTOR NUMBER					READ
1	0	0	1	I_{C_C}	I_{R_C}	HEAD NUMBER					SECTOR NUMBER					READ HEADERS			
1	0	1	0						HEAD NUMBER					SECTOR NUMBER					WRITE CHECK
1	0	1	1						HEAD NUMBER					SECTOR NUMBER					SEARCH AND READ
1	1	0	0						HEAD NUMBER					SECTOR NUMBER					WRITE
1	1	0	1	I_{C_C}	I_{R_C}	HEAD NUMBER					SECTOR NUMBER					READ WITHOUT HEADER CHECK			
1	1	1	0						HEAD NUMBER										FORMAT TRACK
1	1	1	1						HEAD NUMBER					SECTOR NUMBER					WRITE SINGLE HEADER

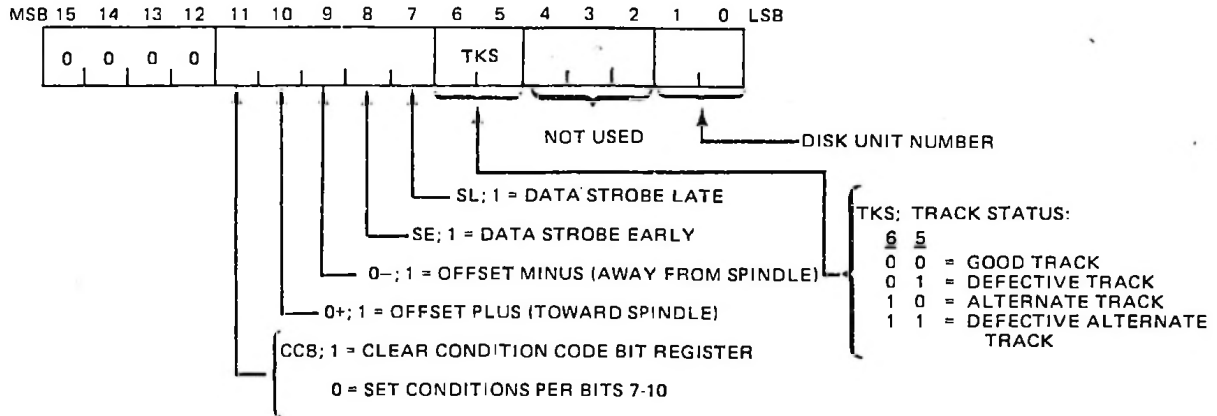
*RELEVANT ONLY TO SEARCH AND READ.

NOTES

CCB. 1 = CLEAR CONDITION BIT REGISTER
 \emptyset_+ , 1 = OFFSET TOWARD SPINDLE
 \emptyset_- , 1 = OFFSET AWAY FROM SPINDLE
 S_E , 1 = DATA STROBE EARLY
 S_L , 1 = DATA STROBE LATE
 I_{C_E} , 1 = INHIBIT CONTROLLER END INTERRUPT
 I_{S_E} , 1 = INHIBIT SEEK END INTERRUPT

I_{R_C} , 1 = INHIBIT CRC ERROR TERMINATION
 TKS = TRACK STATUS BITS:
 6 5
 0 0 GOOD TRACK
 0 1 DEFECTIVE TRACK
 1 0 ALTERNATE TRACK
 1 1 DEFECTIVE ALTERNATE TRACK

3.6.1 UNIT SELECT AND SET CONDITIONS



The select drive command causes the controller to select the drive specified by bits 01-00 of the command word and establish the drive control conditions by bits 07-11, that were implemented during subsequent seek or data operations in the selected drive.

Bit 11 (CCB) = 0 change conditions according to bits 07-10.
 = 1 clear condition register.

Bits 07 through 10 control servo offset positioning of the head actuator and data strobe in the drive data separator. These functions would normally only be used in recovering data under error conditions.

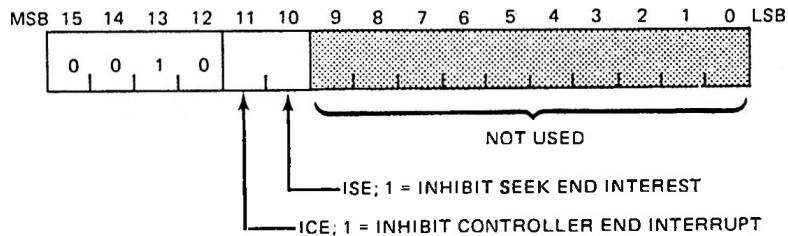
- Bit 10, Servo Offset Plus - When this bit is set, the head actuator in the drive is offset from the nominal on-cylinder position towards the spindle.
- Bit 09, Servo Offset Minus - When this bit is set, the head actuator in the drive is offset from the nominal on-cylinder position away from the spindle.
- Bit 08, Data Strobe Early - When this bit is set, the data separator in the drive will strobe the data at a time earlier than optimum. Normal strobe timing will be returned when the bit is false.
- Bit 07, Data Strobe Late - When this bit is set, the data separator in the drive will strobe the data at a time later than optimum. Normal strobe timing will be returned when the bit is false.

Head actuator offset will not be initiated until a data command is executed which will raise control select to the disk drive. The disk drive will go busy for approximately 2.75 milliseconds when an offset is executed. The DC-16-C goes neither busy nor generates an interrupt for this command. Bits 6 and 5 of the command word are written into the headers to define the track status as follows:

6	5	
0	0	Good track
0	1	Defective track
1	0	Alternate track
1	1	Defective alternate track

This command will be accepted by the controller if the drive is busy moving heads. Status from the selected drive will be available approximately 1.2 microseconds after the command.

3.6.2 RESTORE COMMAND



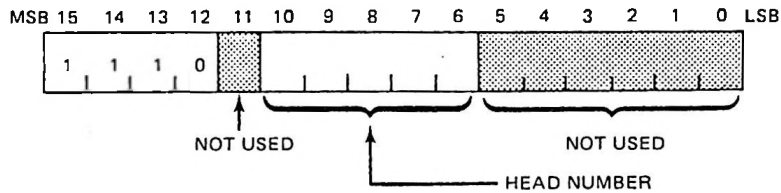
The restore command causes the head actuator assembly of the selected drive to be positioned on cylinder 0 and resets the seek error status. It also clears the cylinder, head and sector registers in the controller. The controller goes busy for 6 microseconds following receipt of the restore command. The selected drive may stay busy, however, for up to 500 milliseconds.

Bits 10 and 11 of the command word may be used to prevent interrupts associated with this command. Bit 11, if set, will prevent the occurrence of the interrupt which normally occurs when the controller assumes a not busy status after executing a command. If this bit is set, the only interrupt that may be generated by the restore command will occur at the end of the head actuator movement when the seek end status is raised by the drive. Bit 10, if set, will prevent the occurrence of an interrupt due to the completion of head movement in the drive.

In summary then, bits 10 and 11 of the command word have the following significance:

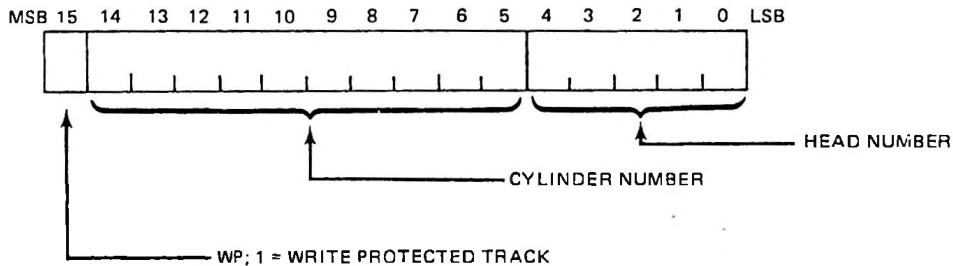
- Bit 10 (ISE) = 1: Inhibit seek end interrupt.
- Bit 11 (ICE) = 1: Inhibit controller end interrupt.

3.6.3 FORMAT TRACK COMMAND



The format track command is initiated when the CPU raises COMO and places the Command upon the data bus. As with all data transfer operations, the desired disk drive must have been selected and set up by a previous UNIT SELECT command. The word counter in the CIM must be set to the number of format data words to be supplied by the CPU.

The purpose of the format command is to cause the controller to write the preheader gap, sync byte and header area (reference Figure 3-2) in sectors of the track defined by bits 06 through 10 of the command word.



Bit 15, if set, indicates that the sector is write protected and the data area may not be written by a write command.

If the track is being labeled a defective track, bits 00 through 14 of the data words acquired from the processor must contain the head and cylinder address of the alternate track into which the data from the defective track has been relocated. The program must then issue a seek command to the alternate track in the normal course of data recovery.

For good or alternate tracks these bits must contain the same head address as the format command word and the same cylinder address as the last seek or linked seek command.

The number of words transmitted during the format command is left to the choice of the programmer. When writing of the headers starts, the first word received from the processor will be written into the header of the first sector after index, the second word into the second sector after index, etc. When the controller's internal memory is emptied, the last word received from the processor will be written into all succeeding sectors.

If the write protect bit 15 is to be the same in all sectors, then it is necessary to send only one word from the processor. If more than one word is sent, then bits 00 through 14 of all words must be identical.

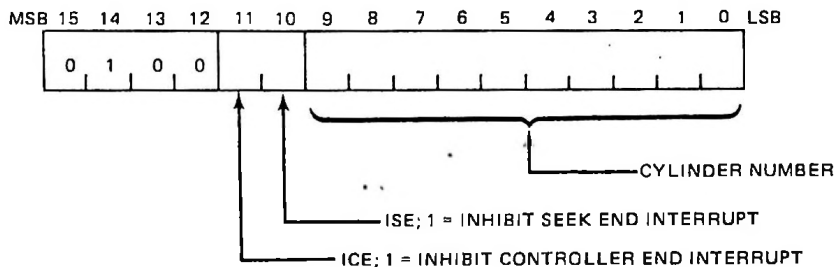
Note that for a staggered (interlaced) track format the sector progression is not sequential. For even sector formats, sector 0 is the first sector after index only on head 0.

The format track command will write only the header area; the data area will not be affected. As the header data is written, a CRC check character is calculated by the controller and written immediately after the header data.

The controller will write the header in all sectors, then assume a not busy status and generate a controller end interrupt. Execute time is 16.7 to 33.4 milliseconds.

3.6.4 SEEK COMMAND

The seek command is one of the basic seek operations which also include linked seek and restore commands. In all operations these commands cause the DC-16-C to position the head carriage assembly of the selected drive at a specified cylinder address in preparation for a subsequent data transfer operation.

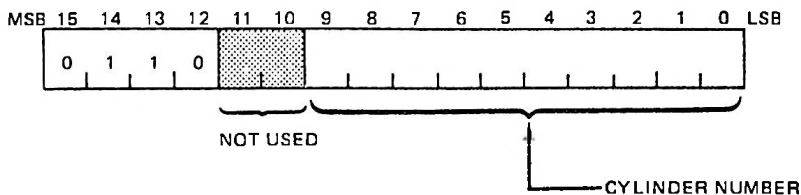


The seek command directs the head actuator assembly of the selected drive to the cylinder specified by bits 00 through 09 of the command word. The controller will be busy only for the time required (≈ 6 usec) to transfer control information to the drive to initiate the seek. The drive may be busy for up to 55 milliseconds.

The controller may generate an interrupt when it goes not busy and when the head actuator assembly of the selected drive has finished its movement.

Interrupts may be controlled by bits 10 and 11 of the command word. These bits have the same function in the seek command as described for the restore command.

3.6.5 LINKED SEEK COMMAND

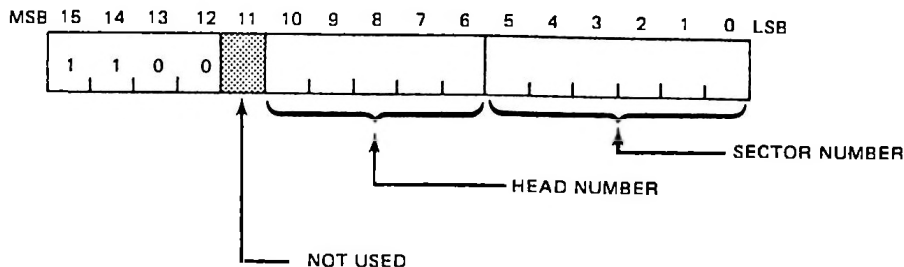


This command loads the contents of bits 00 through 09 into the cylinder address register in the controller and arms the controller to chain a seek to the next command received before executing the command. If the command following the linked seek command is not a data command, i.e., bits 12 through 15 do not contain hexadecimal codes "7" through "F", no seek is performed and the seek chain enable control is reset.

A seek generated due to a linked seek command does not produce a seek end interrupt to the processor.

The controller does not go busy on receipt of this command and no controller end interrupt will be generated.

3.6.6 WRITE COMMAND



The write command causes the DC-16-C to write one or more entire sectors on the selected disk drive starting at the head and sector number specified by bits 0 through 10 of the command word.

The amount of data to be written is specified by loading the word counter on the Computer Interface Module. The DC-16-C will automatically increment the cylinder, head and sector counters to continue the write operation until the word counter decrements to zero. The operation will be terminated, however, and the end of pack status bit will be set if a write operation is attempted beyond the last head and sector of the last disk cylinder.

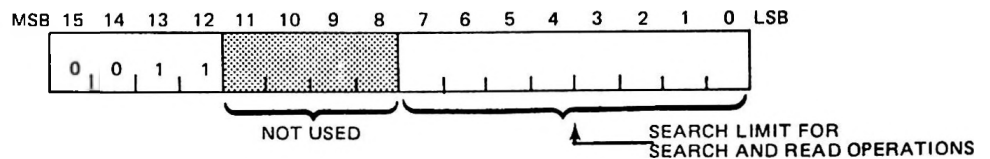
As data is written onto disk, the DC-16-C generates a CRC word and writes it onto disk after the data area of each sector. This CRC word will be read during subsequent read operations and compared with the CRC word regenerated from the read data.

The DC-16-C receives parallel write data from the CPU via the bidirectional data bus (DB00 through DB15). This data is loaded into the 256-word buffer and transferred serially to the selected disk drive.

After the first record is written to disk, the DC-16-C automatically increments the sector, head and cylinder counters and initiates seeks as required to continue the write operation until the 256-word buffer goes empty or the word counter decrements to zero.

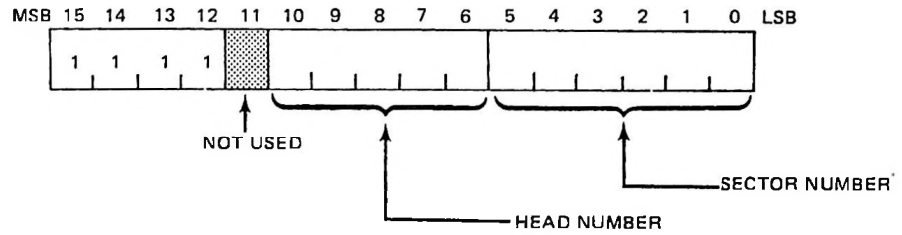
At the end of each record, the DC-16-C reverts to the read mode to verify the header area of the next sector before continuing with the write operation.

3.6.7 BUFFER WRITE COMMAND



This command allows transmission of data from the processor into the 256 word memory within the controller without performing any operation on the disk. The buffer write command, coupled with a buffer read command, may be used to verify the integrity of DMA data transmission between the controller and the processor.

3.6.8 WRITE SINGLE HEADER COMMAND

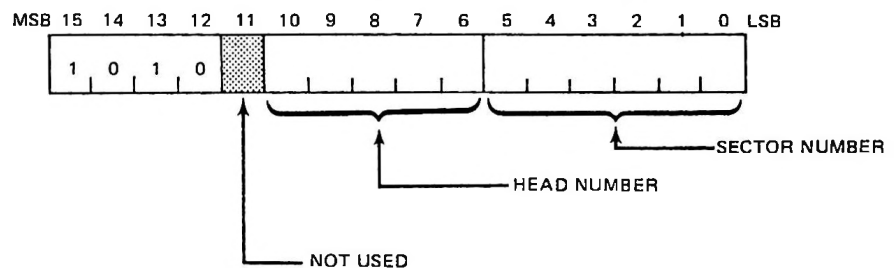


This command is identical to the format track command described in paragraph 3.6.3 except that the header of only a specific sector is written. The sector in which the header is to be rewritten is defined by bits 00 through 05 of the command word.

The controller will count sector marks from index to locate the addressed sector. The header will then be written and the controller will assume a not busy status and generate a controller end interrupt.

For this command, one word must be transferred from the processor as described in paragraph 3.6.3.

3.6.9 WRITE CHECK COMMAND



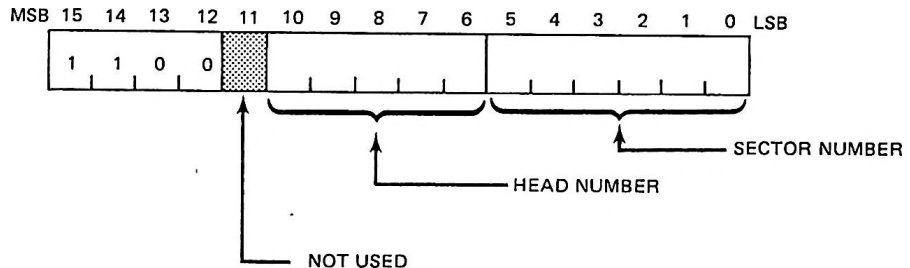
This command causes the controller to read data from the disk starting at the initial head and sector defined by bits 00 through 10 of the command word. Data is transferred from the processor to the controller and compared bit by bit with the data read from the disk. Any disagreement sets minor status bit 07. The controller verifies the sector header as described in paragraph 3.3.1 before reading data from the disk.

The word count established before the command determines the number of words that are compared. If the word count results in a partial sector transfer from the processor only those words transferred will be compared with disk data, but the controller will continue to read the entire sector in order to perform the CRC check to verify the integrity of the disk data that has been read.

As long as the word count is not zero, the disk address will be updated and seeks performed as required. If the data transmission extends beyond the last head and last sector of the last cylinder, the end of pack status will be generated and the operation terminated.

On completion of the operation the controller will assume a not busy status and a controller end interrupt will be generated.

3.6.10 READ COMMAND



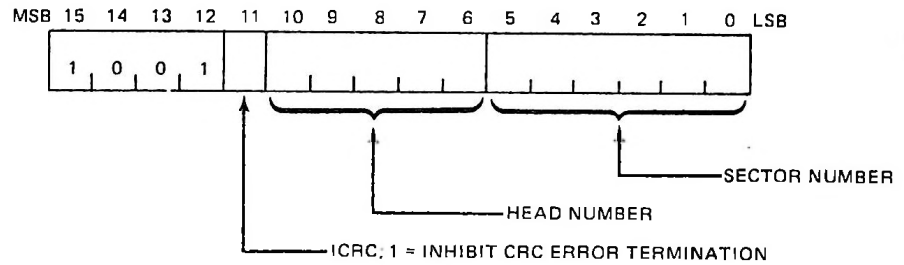
The read command causes the DC-16-C to read one or more complete records from the selected disk drive, starting at the head and sector specified by bits 0 through 10 of the command word.

The length of the read operation is determined by the word counter on the Computer Interface Module. The word counter is normally loaded with the number of words to be transferred prior to execution of the read command. As data is read from disk, the DC-16-C automatically decrements the word counter and increments the cylinder, head and sector counters on the Memory/Address Module.

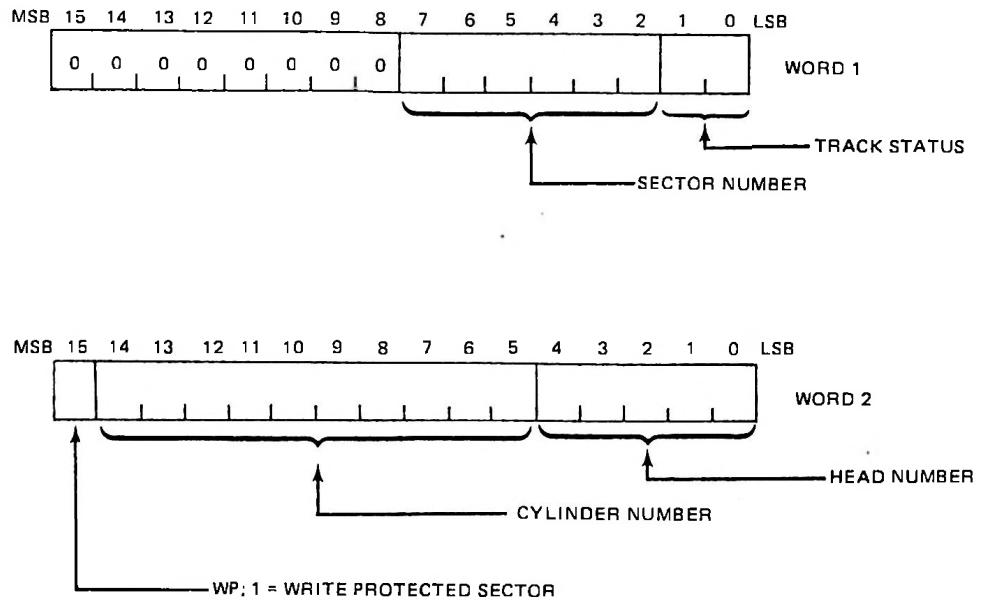
The DC-16-C will automatically seek to new cylinder positions if the data read operation extends beyond cylinder boundaries. If the request for data extends beyond the last head and sector of the last cylinder, however, the end of pack status flag will be raised and the operation will be terminated.

As data is read from disk, the DC-16-C generates a cyclic redundancy check word and compares it with the one read at the end of the data area of each sector. The read operation will be terminated with the appropriate error status bits set if a CRC error is detected.

3.6.11 READ HEADERS COMMAND



This command causes the controller to read the header information from the disk starting at the initial head and sector defined by bits 00 through 10 and transmit it to the processor. The word count established before the command determines the number of headers read. The data transmitted to the processor will consist of two words per header having the format:



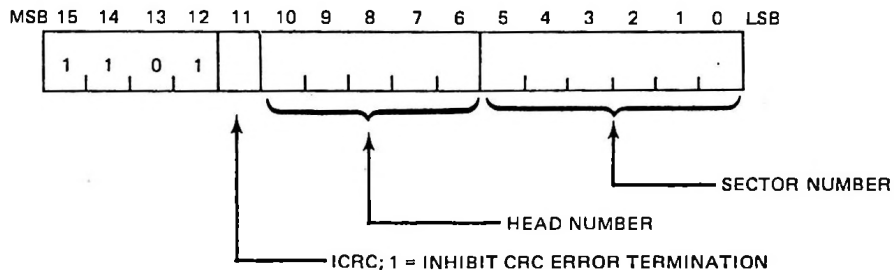
The information in bits 00 through 05 of the command word defines the sector address of the initial header to be read. The controller will count sector pulses starting at index and begin reading only when the count agrees with the number in bits 00 through 05 of the command word.

Once reading starts, headers are read sequentially from the disk. If the track format is staggered (interlaced), the sector numbers returned in the first word of each header pair will not be sequential but will reflect the actual track format.

During the read header command, cylinder, head and sector address verification and track status are disabled. Only a parity error, timeout, or end of pack status will terminate the command with an error status.

As long as the word count is not zero, the disk address will be updated and seeks performed as required. If the data transmission extends beyond the last head and last sector of the last cylinder, the end of pack status will be set and the operation terminated. At the completion of the operation, a controller end interrupt will be generated.

3.6.12 READ WITHOUT HEADER CHECK COMMAND

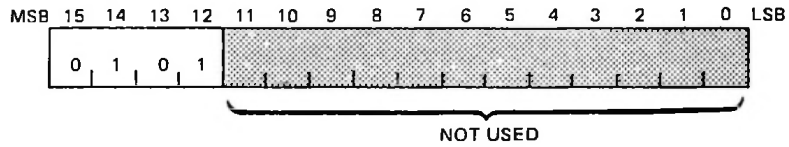


This command will cause the controller to read data from the disk starting at the head and sector defined by bits 00-10 of the command word. It functions exactly as the read command described in paragraph 3.3.1 except that there is no header verification before reading the data area of the sector.

The controller will count sector marks from index to locate the initially addressed sector. It will then space over the header area and read the data area of the sector. Following sectors will be read in the same way until the word count goes to zero or a CRC check error is detected in the data read from the disk. Bit 11 of the command word, if set, will inhibit termination of the command due to CRC check error in the data read from the disk.

This command provides a means of recovering data from tracks in which defects have occurred in the header area making it impossible to verify the header.

3.6.13 BUFFER READ COMMAND

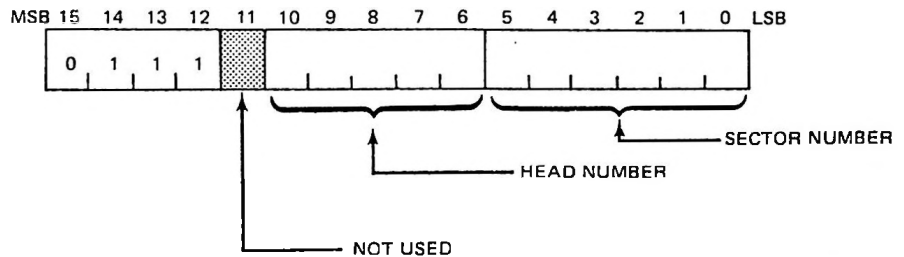


This command allows transmission of data from the 256 word memory within the controller to the processor without performing any function on the disk drive. When preceded by a buffer write command, this command will provide verification of the integrity of data transmission between the CPU and controller via the DMA channel.

The block transfer control functions (initial memory address and word count) must be established before execution of this command. If preceded by a buffer write command with no other intervening command, except buffer read, transmission of data by the buffer read command will be restricted to the number of words (≤ 256) transmitted by the buffer write. The command can transmit 256 words if not preceded by a buffer write command.

When data transmission has been completed, the controller will assume a not busy state and generate a controller end interrupt.

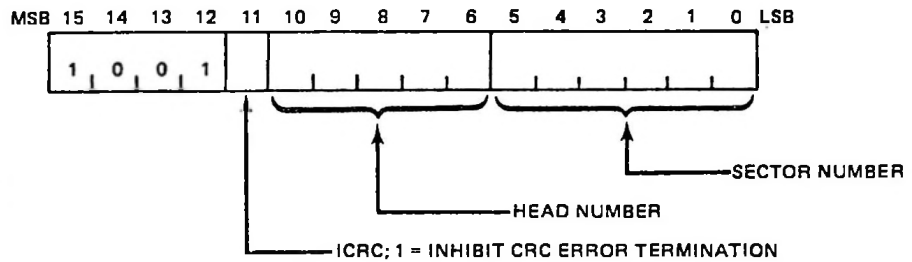
3.6.14 READ SPECIAL COMMAND



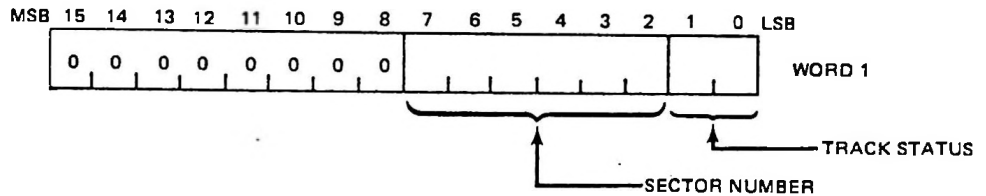
This command is implemented in the controller as a Read command and will perform as described in paragraph 3.6.10. The command is made available to the interface designer for implementation of special processing functions on data read from the disk.

Implementation of this special function is left to the interface designer. In lieu of any special implementation, the command will function exactly as a Read command.

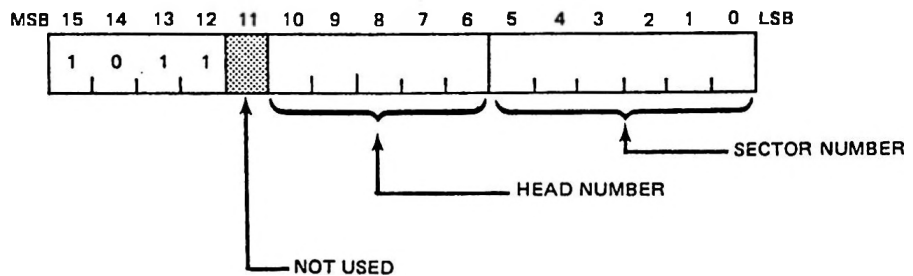
3.6.15 READ HEADERS COMMAND



This command causes the controller to read the header information from the disk starting at the initial head and sector defined by bits 00 through 10 and transmit it to the processor. The word count established before the command determines the number of headers read. The data transmitted to the processor will consist of two words per header having the format:



3.6.16 SEARCH AND READ COMMAND



This command causes the controller to read data from the disk beginning at the head and sector defined by bits 00 through 10 of the command word. As data is read it is compared bit by bit with a variable length data key (<256 words) prestored in the controller's internal memory. If a match is found anywhere within the data area of a sector, except on the last word, the remainder of the sector will be read and transmitted to the processor. A match occurring on the last word of a sector will be treated as a no match condition. If a match is not found before the end of the search, the controller will terminate without transmitting data to the processor and with minor status bit 07 set.

The controller verifies the sector header as described in paragraph 3.3.1 before reading data from the disk.

The buffer write command will be used before the search and read command to establish the variable length data key and to define the search limit. Bits 00-07 of the buffer write command will be stored in a counter in the controller and will define one less than the number of tracks (heads) the search and read command may operate on. Any number of words up to 255 may be transmitted by the preceding buffer write command to define the variable data key. The only permissible commands which may occur between a buffer write and a search and read are buffer read and linked seek.

As long as no match is found and the search limit has not been reached, the disk address will be updated and seeks performed as required. If the operation extends beyond the last head and sector of the last cylinder, the end of pack status will be set and the operation terminated. If a defective track status is detected, the defective track and no compare status bits will be set and the operation will be terminated.

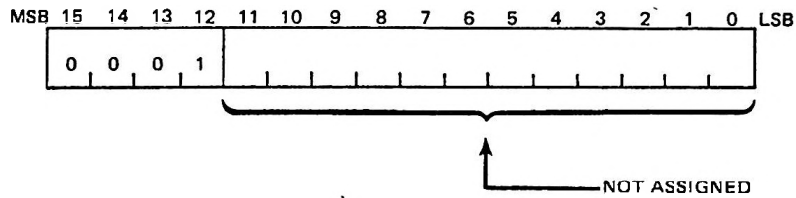
If a match is found, the remainder of the words in the sector containing the key will be transmitted to the processor memory starting at the location defined by the initial memory address established before the start of the command. The difference in the initial and final memory address will define how many words have been transferred. The disk address (cylinder, head, and sector) may be returned to the CPU via a status read function to define the location of the sector in which the match was found.

Once initiated, the command will continue to execute until any of the following conditions occur:

- A header error is detected.
- A match is found.
- The search limit is reached.
- The end of pack is reached.
- Parity error (CRC check) is found in the data read from the disk.

On termination of the command, the controller will assume a not busy status and generate a controller and interrupt.

3.6.17 SPECIAL COMMAND



This command code is reserved for special functions which do not deal directly with disk operation. Typically it might be used to initialize (reset) the controller, enable and disable controller interrupts, special DMA control, etc. The function of this command will be specified to fit the particular processor requirements. This command, except for an initialize function generated by it, will have no effect on the controller. The special command will be accepted by the controller at all times.

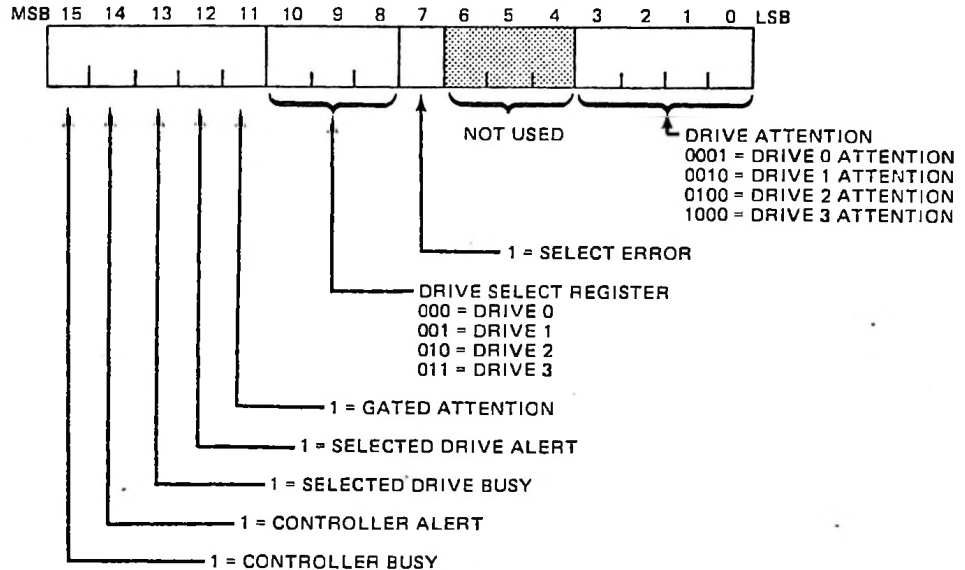
3.6.18 STATUS WORDS

Status and data transfers through the processor/controller interface are executed via the processor's I/O bus, DMA or high speed channel. The DC-16-C processor interface is individually tailored to each CPU. The controller supplies two basic status words which may be returned to the processor via status input or read functions. These words are the major and minor status.

The controller, where applicable, also supplies the following status words via status input or read functions.

- DMA MEMORY ADDRESS REGISTER
- DMA WORD COUNT (CIM FUNCTION)
- CYLINDER STATUS
- RECORD STATUS (GIM FUNCTION)

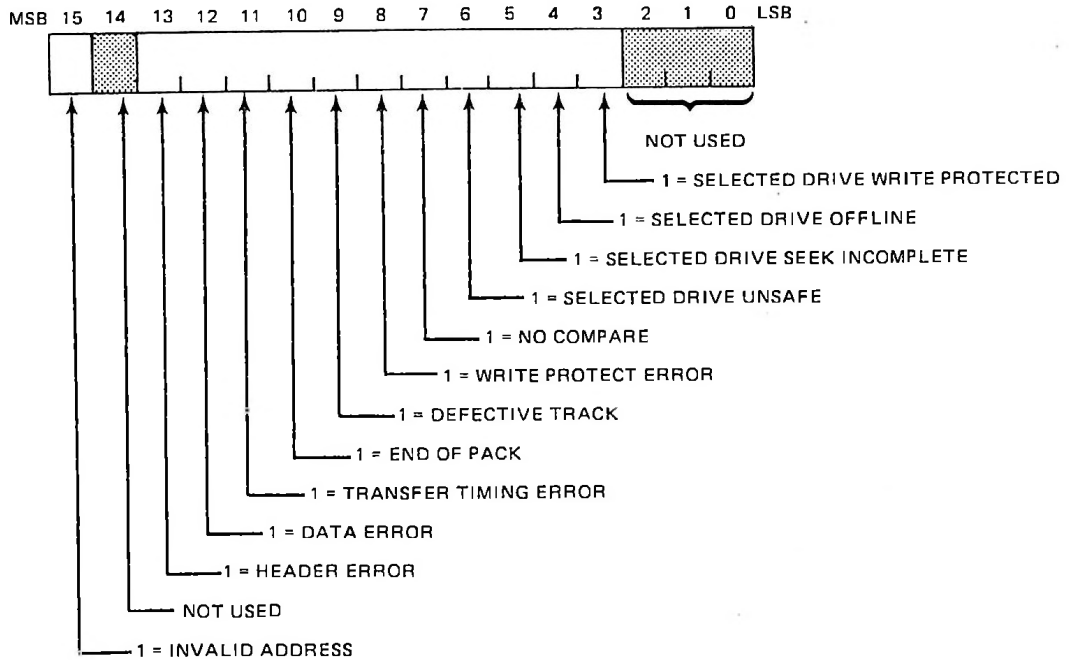
3.6.18.1 Major Status



- CONTROLLER BUSY (Bit 15) - Indicates that the controller is busy and will not accept any commands.
- CONTROLLER ALERT (Bit 14) - Abnormal condition occurred during a controller operation. Inclusive-OR of minor status bits 7-15.
- SELECTED DRIVE BUSY (Bit 13) - Set when the selected drive is busy seeking a cylinder. The only command that will be executed at this time is select drive.
- SELECTED DRIVE ALERT (Bit 12) - Inclusive-OR of major status bit 7 and minor status bits 4-6 to indicate that an abnormal condition exists in the selected disk drive.
- GATED ATTENTION (Bit 11) - Indicates that a drive has a seek end status. If interrupts are enabled, this bit indicates that the interrupt was a seek end interrupt. This status indicator is reset as processor inputs major status or by initialize instruction.
- DRIVE SELECTION REGISTER (Bits 8-10) - A three-bit code that indicates the currently selected drive.
- SELECT ERROR (Bit 7) - Set when an attempt is made to select a drive that is not connected to the controller or is offline.

- DRIVE ATTENTION (Bits 0-3) - Four bits, each of which specifies that associated drive has a seek end condition resulting from a seek complete, initial power on, restore, or seek incomplete.

3.6.18.2 Minor Status

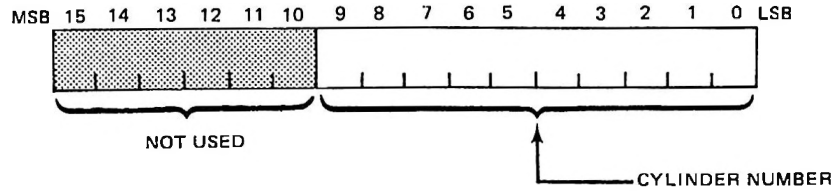


- INVALID ADDRESS (Bit 15) - Indicates that the issued command specified a nonexistent cylinder, head or sector. This bit is reset by the initialize instruction or at the beginning of the next command.
- HEADER ERROR (Bit 13) - Bit is set to terminate read or write operations if any of the following conditions occur: 1) record was not found; 2) cylinder or head read from the track did not agree with those specified; 3) the generated CRC did not agree with the CRC read; or 4) a clock error occurred while reading the header. (A clock error is a loss of one or more clocks from the disk drive.)

This bit indicates either a damaged disk surface or drive positioning error. It is reset by an initialize instruction or at the beginning of the next command.

- DATA ERROR (Bit 12) - Bit is set during a read operation if the generated CRC does not agree with the CRC read from the disk, or if a clock error occurs. The bit is reset by an initialize instruction or by the next command.
- TRANSFER TIMING ERROR (Bit 11) - Bit indicates that the processor did not provide a data word in time to maintain continuity during a write operation, or did not accept a data word in time to prevent overflow during a read operation. If this condition occurs during a write operation, the controller writes zeros for the remainder of the sector, writes the CRC byte, and then terminates the operation. If this condition occurs during a read operation, the controller terminates the operation immediately. This bit is reset by an initialize instruction or by the next command.
- END OF PACK (Bit 10) - Indicates that a data transfer beyond the last sector in the last cylinder was requested during a read or write operation.
- DEFECTIVE TRACK (Bit 9) - A header was read containing the defective track status. Any command except read headers will be terminated. Bit will be disabled during read header command.
- WRITE PROTECT ERROR (Bit 8) - A write command was attempted on a write protected sector or write operation was attempted on a write protected drive.
- NO COMPARE (Bit 7) - A search and read command terminated without finding a key match or a data mismatch occurred during a write check command.
- SELECTED DRIVE UNSAFE (Bit 6) - Indicates that the selected drive has an unsafe condition that requires operator intervention.
- SELECTED DRIVE SEEK INCOMPLETE (Bit 5) - Indicates that the selected drive has a seek incomplete status. This status bit can be reset by a restore command or by powering down the drive.
- SELECTED DRIVE OFFLINE (Bit 4) - Set when the selected drive is offline.
- SELECTED DRIVE WRITE PROTECTED (Bit 3) - Indicates that the selected drive has its write inhibit switch set in the inhibit position.

3.6.18.3 Cylinder Status

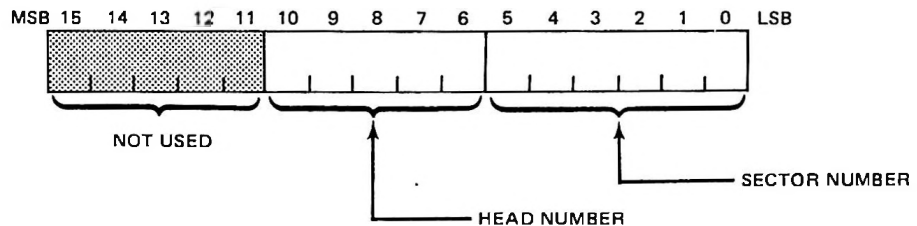


Cylinder status is reported to the CPU by a ten-bit binary code that reflects the current status of the cylinder counter on the DC-16-C Memory/Address Module.

The cylinder number is gated through the cylinder, head and sector multiplexer of the General Interface Module and sent to the CPU via bidirectional data bus DB00 through DB15 whenever the CPU raises CYLSTAT at the status select gating logic.

The cylinder counter will contain the cylinder number associated with the last seek operation on the selected disk drive unit directed by the CPU or the final increment generated by the DC-16-C in response to a data transfer operation that extended beyond cylinder boundaries.

3.6.18.4 Record Status



Record status is reported to the CPU by six-bit and five-bit binary codes that reflect the current status of the sector and head counters on the DC-16-C Memory/Address Module.

The sector and head numbers are gated through the cylinder, head and sector multiplexer of the General Interface Module and sent to the CPU via bidirectional data bus DB00 through DB15 whenever the CPU raises RECSTAT at the status select gating logic.

The sector and head counters will contain the sector and head numbers of the selected disk drive unit that were last accessed by a data transfer operation.

3.6.19 INTERRUPTS

Two interrupt signals are provided to the processor. The first interrupt becomes true when the DC-16-C transitions from the busy to the not busy status. This signifies completion of an operation. The other interrupt is generated as a function of the drive attention lines. This interrupt is set true when any of the attention lines transitions to the true status and the controller is not busy. The interrupts are reset by a request major status command or interrupt acknowledge.

3.6.20 LINKED SEEK OPERATION

For a linked seek operation, the DC-16-C does not go busy; it awaits the next command word. If a command code 6-F is received, the DC-16-C goes busy, executes the seek portion and then performs the specified command. A gated attention interrupt will not be generated when the attention line comes true after the seek portion. A termination interrupt will be generated when the controller returns to the not busy state. If any command other than 7-F is received after a linked seek, then that command is executed and the linked seek is cancelled.

3.6.21 FORMAT COMMAND EXECUTE TIME

Since only one track at a time can be formatted, and because writing on the disk is done from index to index, the worst case execute time is 33.4 milliseconds - 16.7 milliseconds access time plus 16.7 milliseconds writing time.

3.6.20 PARTIAL

If word count rollover occurs during a sector, the following takes place:

- Read - No more data transfers occur, but the DC-16-C will continue reading data from the disk until the end of the sector data. It will check the check characters and terminate normally.
- Write or Write Check - No more data transfers will occur, but data that is in the controller buffer memory will be written on the disk or write checked. The remainder of the sector will be filled with zeros (write checking will be terminated) check characters will be written (or checked, if write check) and the controller will terminate normally.

3.6.23 DATA ERROR CHECKING

The controller provides header verification and cyclic checks on disk data.

3.6.24 HEADER VERIFICATION

Before reading or writing data on the disk, the sector headers are verified for most commands. The exceptions are:

- Read headers
- Read without header check
- Format
- Write single header

The read header command reads and returns the header data to the processor and ignores any header verification error. The read without header check command skips over the sector header so no error is possible. The format and write single header commands write the headers and perform no verification.

As the header data is read from the disk, it is compared against stored or preset conditions. The first two bits of the header indicate the track status. The 01 or 11 combinations indicate the track is defective and will result in termination of the command with major status bit 14 and minor status bit 09 set.

The sector number read from the disk is initially compared with data received in bits 00 through 05 of the command word. Agreement must be found for the read or write to occur. Two disk revolutions are permitted for sector agreement to occur. If this condition is not met, the operation will terminate with major status bit 14 and minor status bit 13 set.

The head number is initially compared with data received in bits 06 through 10 of the command word; the cylinder number is initially compared with data stored from bits 00 through 09 of a previous seek or linked seek command. Any mismatch in these addresses will result in termination of the command with major status bit 14 and minor status bit 13 set.

The last header data bit is the sector write protect bit. If this bit is a one, a write command addressing the sector will be terminated with major status bit 14 and minor status bit 08 set.

As the header data is read from the disk, a CRC check character is calculated by the controller. This character is compared with the CRC character read from the disk at the end of the header. Any mismatch will cause termination of the command with major status bit 14 and minor status bits 13 and 14 set.

As each sector operation is successfully completed, the sector, head and cylinder address is updated for comparison with the next sector header.

3.6.25 CYCLIC CHECK CHARACTER

The controller will use the polynomial $x^{16} + x^{15} + x^2 + 1$ to generate a 16-bit CRC check character.

This CRC will be generated by the controller and written at the end of the header address and after the last data word of each sector. During a read operation (header or data), the CRC will be regenerated in the controller and compared against the CRC written on the disk pack. If the regenerated CRC does not compare with the written CRC, the command will be terminated with the appropriate bit set in the status word.

3.7 GENERAL PROGRAMMING

The DC-16-C will not accept a command when it is busy, if the selected drive is busy, or if a selected drive alert exists. The controller will, however, accept a special command. A drive select command will be accepted if the selected drive is busy.

The DC-16-C does not go busy after select drive, linked seek or special commands are accepted.

The DC-16-C does go busy for 6-20 microseconds after a positioning command (seek or recalibrate) is received. The selected drive may stay busy for up to 55 milliseconds for a seek command, and for up to 500 milliseconds for a restore command. As soon as the DC-16-C goes not busy, a different drive may be selected. This permits offline or overlapped seek capability. The gated attention status bit is set when any drive's attention line transitions to the true state.

3.7.1 PROGRAMMING EXAMPLE

Following is a suggested sequence of operations. This is an example only; it is not always necessary to execute all of the operations listed. To use the overlapped seek capability of the DC-16-C, the associated seek and drive selection sequences should be completed before initiating this sequence.

- 1) Initiate controller (Reset).
- 2) Select drive.
- 3) Check for drive busy or alert conditions in major status. If set, take remedial action (e.g., tell the operator to ready the drive).
- 4) Set up the memory address and word count registers.
- 5) Execute linked seek to the desired cylinder.
- 6) Execute the write, write check, read or format command using the desired head, sector and track ID bits.
- 7) Wait for interrupt. During this time, it is permissible to examine all readable registers such as the major and minor status, current address and word count registers. The DC-16-C will not acknowledge any command except reset while it is busy; if one is executed, it will cause a timeout error interrupt to occur.

The interrupt processing routine (or the wait routine, if the program is not using interrupts) should take the following steps:

- 1) Read the major and minor status registers.
- 2) Check for controller busy; if set, ignore the interrupt.
- 3) Check for nonzero word count; if set, retry transfer.
- 4) Check for drive alert; if set, tell the operator to ready the drive if offline or unsafe, or restore the drive if seek incomplete.
- 5) Check for controller alert; if set, retry transfer if data error or transfer timing error. If header or track ID error, restore the drive.
- 6) If no errors occur, the operation is complete.

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

This section provides a detailed description of the circuit elements which form the functional blocks within the DC-16-C controller. The text is presented on a logic diagram level and is supported by detailed block diagrams, schematics, and timing charts. Complete logic diagrams and wire lists for the General Interface, Command Timing, and Memory Address Modules are located at the back of this section. Those for the Drive Interface Module used in this system are contained in Appendix A. However, functional operation of these modules is the same and the operating theory is included in this section.

4.2 GENERAL CIRCUIT FUNCTIONS

The following paragraphs provide a general analysis of the main circuit functions within the controller.

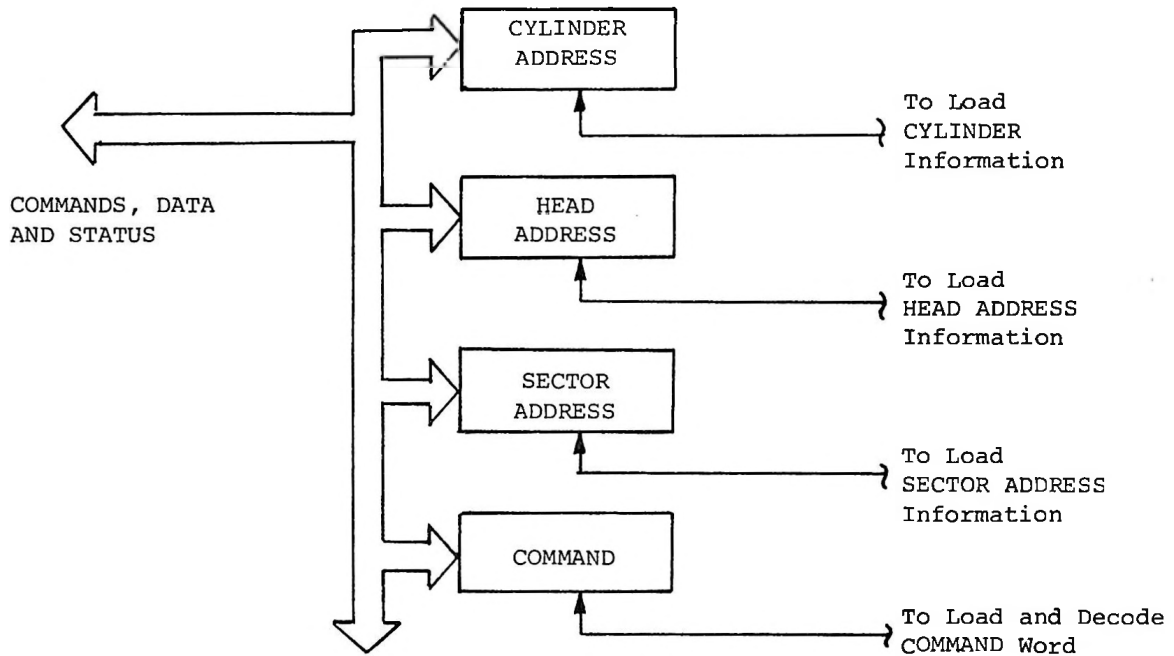
4.2.1 COMMANDS

As described in Section 3, DC-16-C controller operation is initiated by the CPU loading a command onto the CIM/GIM data bus and issuing a COMO signal. There are 16 possible commands that can be recognized by the controller. These can be grouped into four different categories: Read, Seek, Write and Unique. If accepted, the DC-16-C returns a command acknowledge (COMACK) to the CPU and decodes the command to begin operation. The four most significant bits of the command word are decoded to determine which one of the 16 commands the controller is going to execute. The remaining 12 bits define specific information such as cylinder, head, and sector inhibits.

4.2.2 CONTROLLER REGISTERS

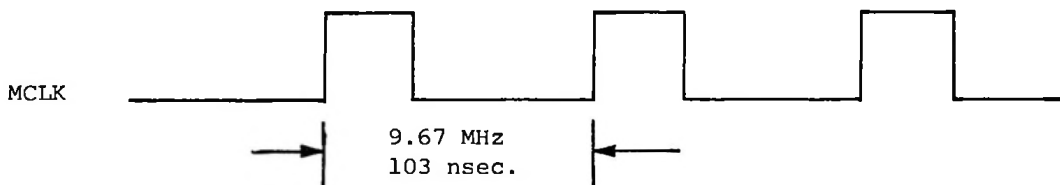
In the DC-16-C there are various registers to hold such information as cylinder address, head address, sector or record address, command word, etc. These provide the ability to have one data bus, and with the proper control logic, to load the various registers at specific times.

After the registers are parallel loaded, they can serve as counters at appropriate times. Another register is used during the unit select command to hold the various condition bits to be used by the disk drive. This makes it simple to provide control logic at the time the information is on the bus. Status being returned to the CPU is gated onto the bus through a multiplexer, but is not really the output of a register. It is made up of various scattered flip-flops throughout the DC-16-C logic. Each flip-flop's output is used to form a 16 bit word that is gated back as major or minor status. It seems logical then, when the CPU requests Cylinder Status, that the output of the Cylinder Address register be gated back to the data bus. The design concept here is to load the registers at specific times, then gate their outputs back to the CPU as status or to activate the registers when updating is needed.



4.2.3 CLOCK TIMING

Probably the most important signal in the controller is the master clock (MCLK) circuit in the Disk Interface Module. All data transfer is synchronized by this clock which has a free running square-wave frequency of 9.67 MHz. Its repetition rate is approximately 103 nanoseconds.



This means that both the controller and drive have a bit cell time of 1.03 nanoseconds. Data is written to and read from the disk in serial form. Theoretically, if three bits of data were to be written, the data line would be activated for a count of three, then deactivated. The same would hold true for a read. However, because the disk drive does not run at the same precise speed at all times, timing errors would be introduced if the master clock were generated in the controller. Thus, most disk drive units have separate phase locked-oscillators synched

to the disk drive speed which provide the master clock to the controller during read and write operations (an exception is the CalComp Trident). During a Write operation, the write oscillator, which is synchronized with the disk drive motor, provides SVCLOCK to the controller as the master clock. During a read operation the read oscillator, which is synched to the data, provides RDCLOCK. In either case, if the disk speeds up, the entire controller timing speeds up, which means the entire controller runs faster. This concept allows better data control, less logic within the controller, and perfectly synchronized data at all times. Another 9.67 MHz oscillator is located internally in the controller's Disk Interface Module (see Figure 4-1). This is used whenever the controller is not busy, or when something happens to the drive supplied signal. Thus, in the event that something goes wrong with the drive supplied signal, the controller can continue running to let the CPU know that something is wrong. (Reference sheet 2 of DIM schematics in Appendix A.) Timing within the controller is done not only by master clock, but also by some clocks whose intervals are longer than master clock. These are supplied by a free running, multistate

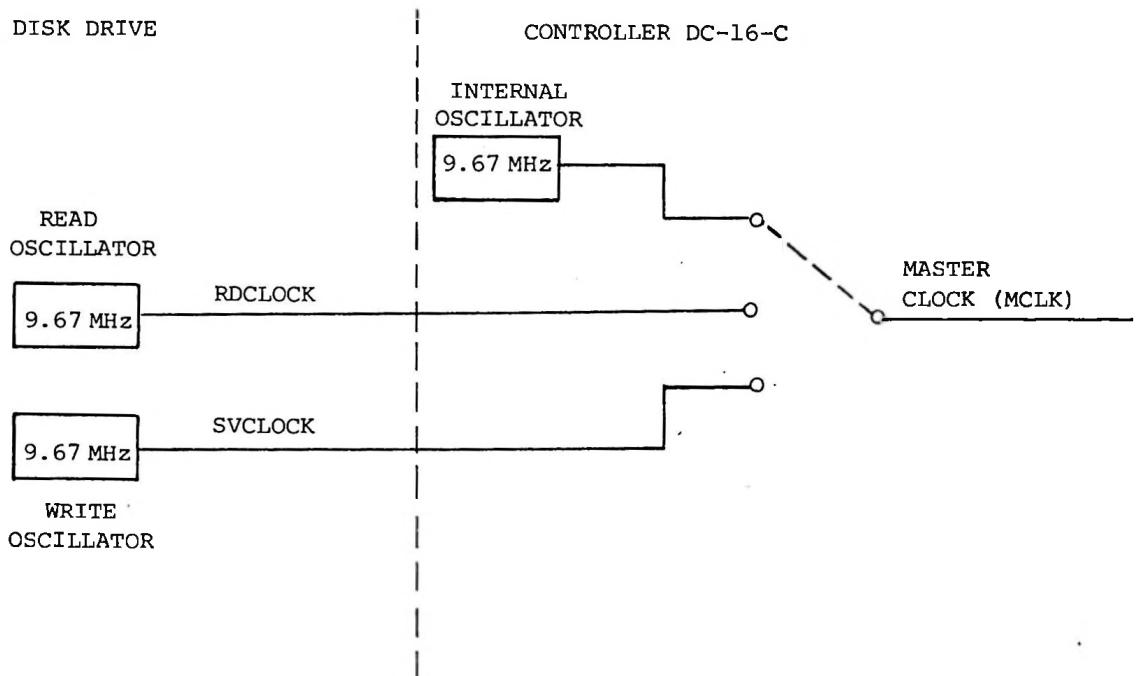
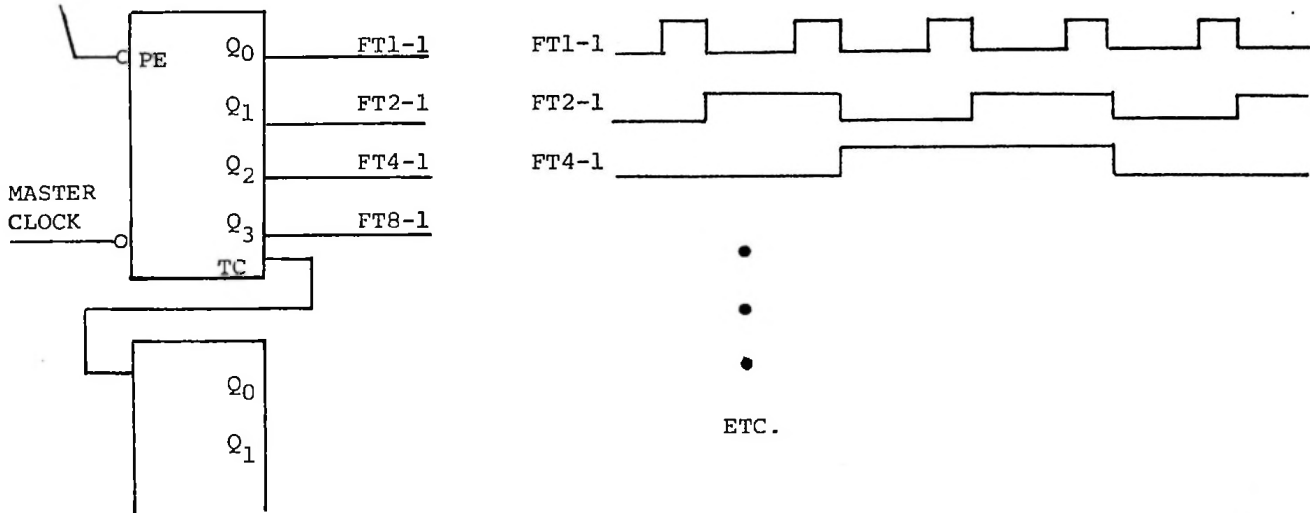
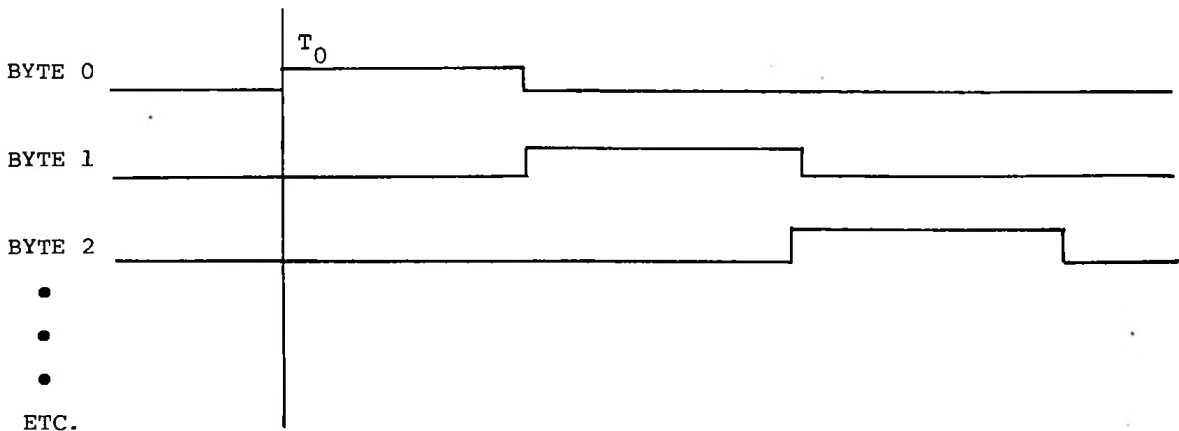


Figure 4-1. Master Clock Circuit, Simplified Logic Diagram.

bit and byte counter on the CTM which is incremented by the master clock and periodically preset to a count of zero. This counter will be used to gate certain functions at certain byte and bit times, within the controller. The bit times available look like the following:

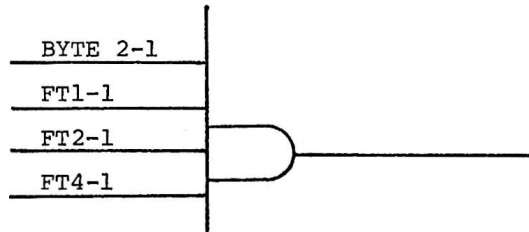


The byte times available from the bit and byte counter/decoder are:



Within each byte time are 8 bit times that can be made from the proper decode of FT1, FT2, FT4, FT8, etc.

Example:

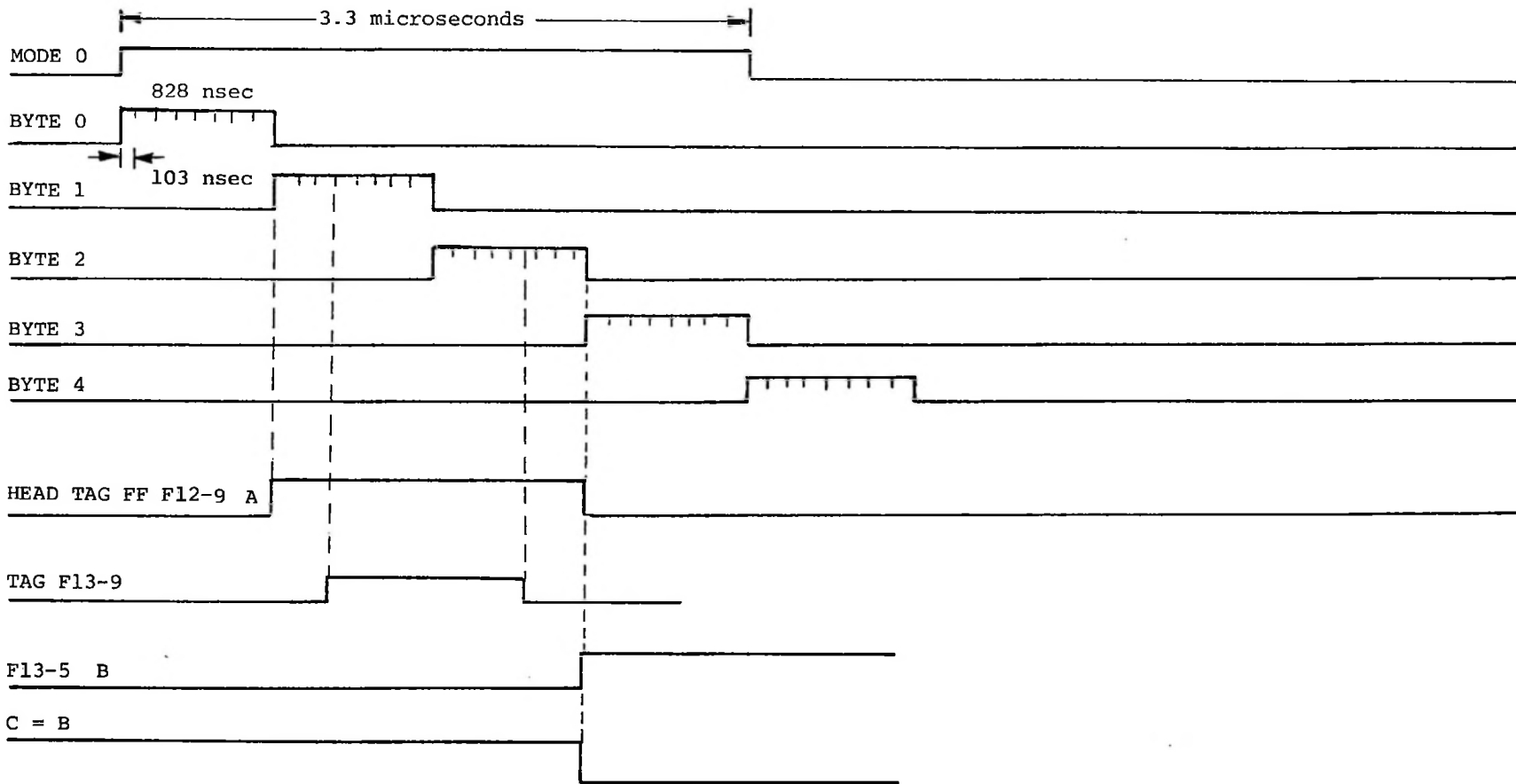


The above "ANDING" condition would only happen at byte two, bit time seven, or the last bit time of the third byte. The purpose here is to illustrate that a complete controller timing scheme can be generated to run the entire controller from a counter and a synchronized master clock.

4.2.4 DRIVE BUS SEQUENCE

The DC-16-C drive bus sequence is sequential timing performed by the controller to tell the drive either to seek or to change heads. This is called MODE CONTROL ZERO or MCO. The drive bus lines carry information destined for the drive. The type of information is identified by the tag lines which accompany the information. MCO is entered upon receipt of a command. If the command is a seek, the drive is directed to set the head register, and then set the cylinder address register. If the command was other than a seek, only the set head address register in the drive is activated. The bus lines must come active before the tag is issued. Therefore MCO time is devoted to changing cylinder address or head address in the drive. Once MCO is entered, the controller steps through sequential byte times to accomplish the task. After the task is completed, the controller exits MCO and enters some other mode to continue operation. The following timing diagrams illustrate the two possible conditions of being in MCO.

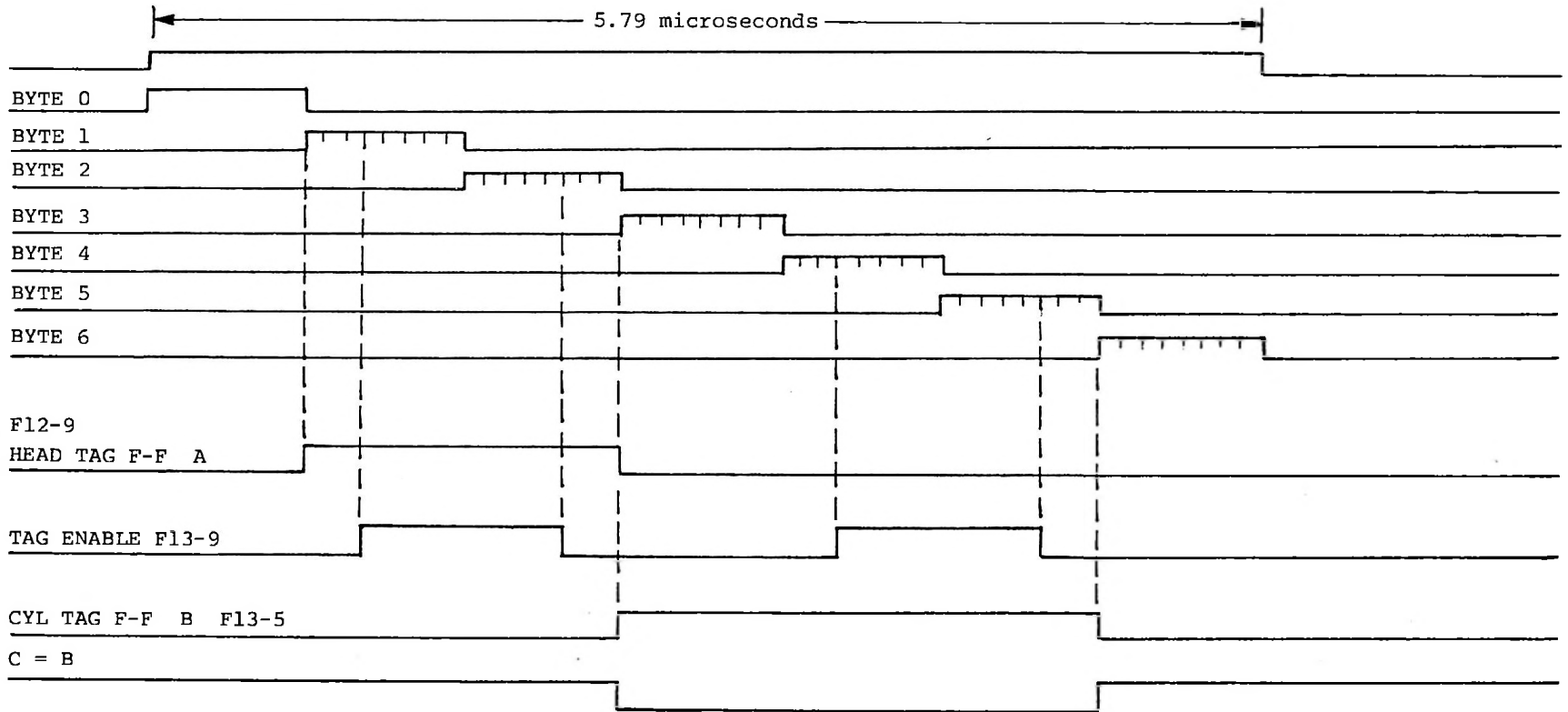
MODE 0 AND TAG TIMING WITHOUT SEEK



4-6

(A)

MODE 0 AND TAG TIMING WITH COUPLED SEEK

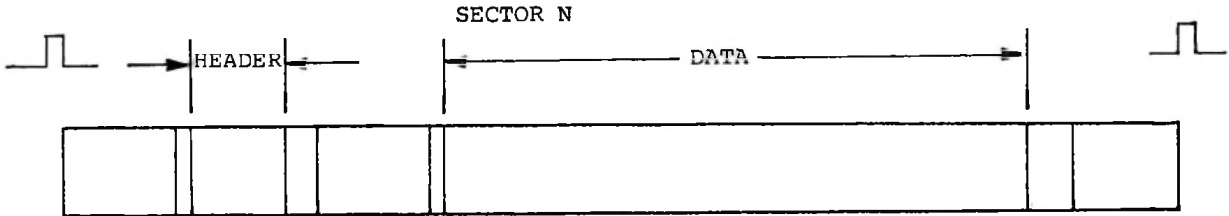


4-7

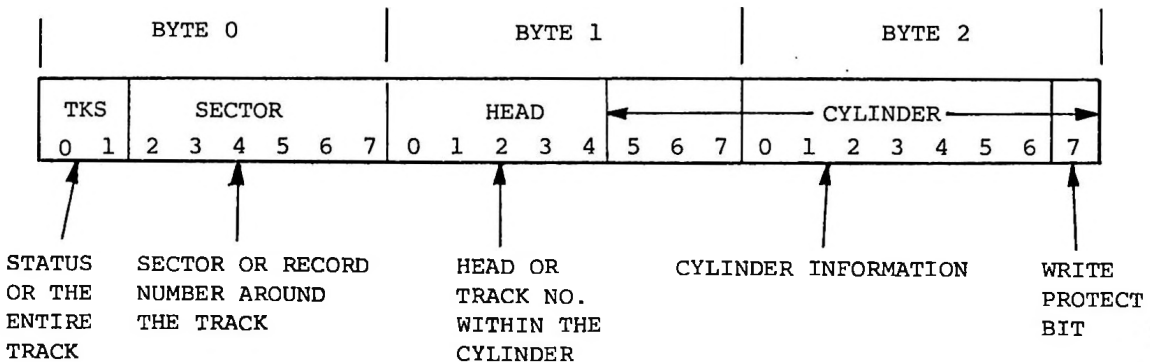
(B)

4.2.5 MODE CONTROL

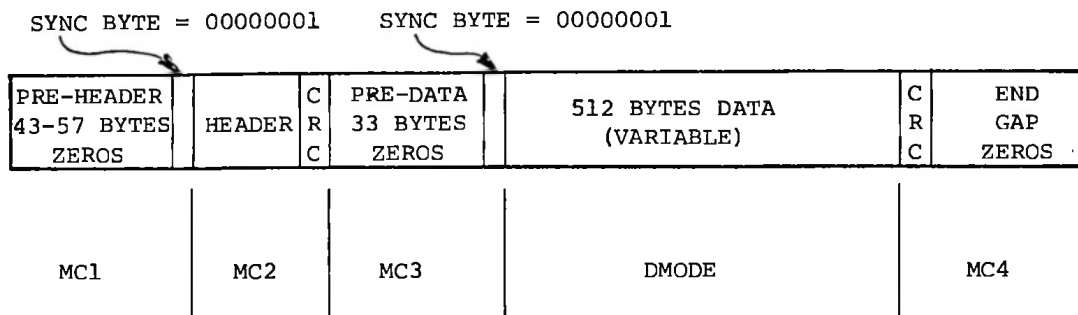
All conventional disk systems have some type of format that is written on the pack before the disk can be used for data storage. This format is the key to finding data on the pack after it has been written. In the following figure, note that the data area is preceded by an identifier area called the header. The header contains three bytes of information that are used to verify position information such as cylinder, head, sector,



before any operation is performed on the data area. Also in the same three byte area is track status for labeling the condition of the track, such as: good track, defective track, alternate good track or alternate defective track. One other bit of information is the write protect bit which is used to label the data area following the header. If that bit is activated in the header, the data area cannot be written into. The header area looks like the following:



The total format then looks like the diagram below. The same format is used for every sector with only the header information changing accordingly. The data area can be changed, but it is shown here with 256 words/sector.



The areas other than the header and data area are needed for controller and disk interfacing.

4.2.5.1 Mode Control 1. The preheader gap, which may consist of 43, 47, or 57 bytes of zeros and one sync byte, is used for letting the drive oscillators sync to the data stream in a read operation. This area is called Mode Control 1 and is the result of nothing more than the MC1 flip-flop being set and reset at appropriate times in the controller. When set, the controller is in MC1 for total of byte times selected by switch F-08 in the command timing module.

4.2.5.2 Mode Control 2. In MC2, (not drawn to scale) the controller is there for three byte times plus two CRC byte times. CRC is the Cyclic Redundancy Check Character generated anytime the controller is reading or writing the header or data. At the beginning of MC2 time, when the header information is being written on the disk, the same information is applied to a CRC generator which starts a CRC calculation. When the header is completed at byte three time, the CRC calculation is stopped and a Check Character is written into the two byte slot left in MC2. Later, when the header is read during the MC2 time of a read, it is applied to the CRC generator and a new CRC character is calculated. As the controller reads the CRC area of the disk pack, the CRC check character is compared with the CRC just calculated. If the two don't compare an error signal is generated.

4.2.5.3 Mode Control 3. Mode Control 3 is the pre-data gap and is called MC3. It is similar to MC1 and in all but one case is 31 bytes long (TT80 drive requires 21). MC3 is used for switching and for synchronizing between controller and disk drive.

4.2.5.4 Data Mode. Data Mode is the mode of the controller where CPU data to be written is actually written on the disk pack. The same is true for reading data from the disk bound for the CPU. DMODE can be selected from switches to determine its length but must be calculated based on number of sectors per track.

4.2.5.5 Mode Control 4. Mode Control 4 is the time after DMODE in which the data CRC is read and compared or is written. MC4 also contains the end gap or spacing between records. Obviously, MC4 must be set up according to number of sectors per track, length of data mode, before a byte time can be established. As an example, a 512 byte data area at 32 sectors per track on an 80 megabyte disk drive, yields approximately 40 bytes of end gap time. This figure will change depending on drive type or the number of sectors selected.

4.2.5.6 Mode Control Summary. Mode controls are nothing more than definitions of time within a sector. Each mode control is entered by associated flip-flops in the CTM which are set and reset according to specific byte counts. Certain actions happen within each mode control time providing excellent sync points for troubleshooting. (Reference sheet 2 of CTM logic diagrams.)

The mode control flip-flops work in such a way that the resetting of one also sets another in sequence. There should never be more than one mode control set at a time (excluding MCO). On a 32 sector disk drive for example, there would be 32 MC1's, 32 MC2's, etc. The data format that was just discussed previously is the same for every sector. If you wanted to look at sector 8's MC2, you would have to sync on index pulse or a known starting point on the disk, and then count the eighth sector down and look at its MC2. When the DC-16-C is not busy, it is not in any mode. When the DC-16-C receives a command and goes busy, it must always go through MCO to set up the disk drive with the appropriate information. From that point on it will go through the mode controls, if the command was a data type command. If the command was a non-data command, such as a seek, the controller will simply go through MCO and terminate. These are examples of how the mode controls fit into the general picture of the DC-16-C.

4.3 MEMORY SYSTEM

The memory system in the DC-16-C is located in the Memory Address Module and consists of an input buffer shift register, a 256 word by 16 bit static RAM, and an output buffer shift register. There is also a pair of counters that will increment the RAM address at appropriate times. Figure 4-2 illustrates how the various components tie together.

4.3.1 WRITING TO DISK

To properly understand a write operation, it is important to notice the data flow path of Figure 4-2. When data is being written to the disk drive from the CPU, data in parallel form is loaded into the input buffer shift register. From there it is loaded into the RAM. Data then leaves the RAM and is loaded into the output buffer shift register, which in this case is used as a shift register. Data then leaves the output buffer shift register in serial form bound for the disk. In this data path, the input buffer shift register is used as an input buffer, the RAM is the holding device, and the output buffer shift register is used as a shift register. In this manner the parallel write data is serialized and sent to the disk.

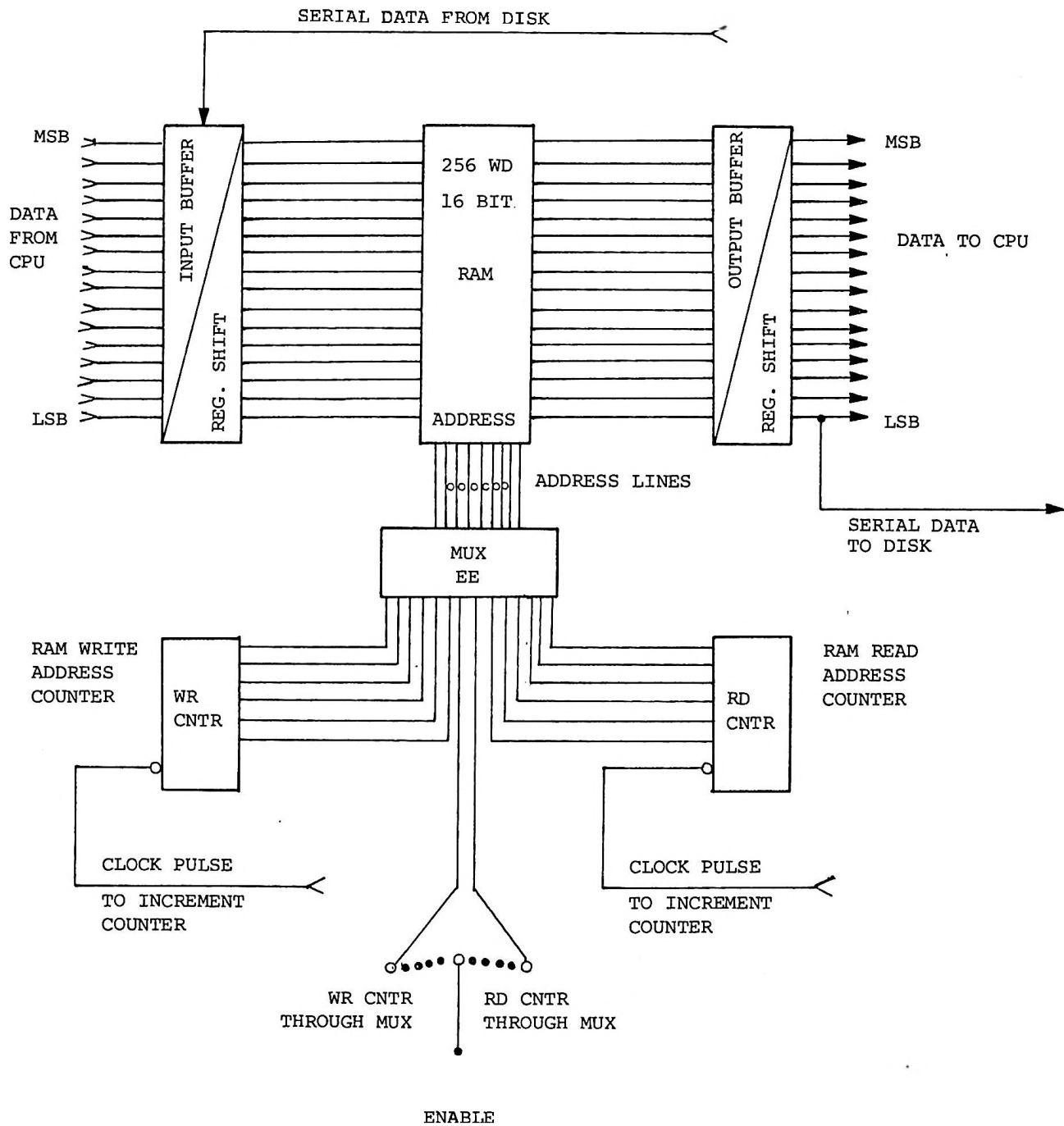


Figure 4-2. RAM Simplified Block Diagram.

The RAM read counter is the incrementing counter to control the address of the RAM data that is being loaded into the output buffer shift register. After the 16th bit is shifted out, a new word gets loaded from the RAM. At the same time, the RAM read counter gets incremented to reflect the new or next address to be loaded. This says that the RAM address multiplexer only needs to be switched to the Read counter lines once every 16 bits (to get another word). However, while the output buffer shift register is serially shifting data out, the multiplexer switch can be such that the MUX is reflecting the write counter lines. The CPU now transfers data to keep the RAM full of words. As long as the MUX switch flips over to the read counter address to load the new word every 16 bit times, the MUX switch can occupy most of its time on the RAM write counter. It is logical then, that the data transferring logic from the CPU interface will increment the RAM Write Counter.

4.3.2 READING FROM DISK

When reading from the disk, the memory system configuration works slightly different. Data from the disk is serially shifted into the input buffer shift register (which is now a shift register instead of a buffer) and after 16 bit times must be loaded into a location of the RAM. (This involves the RAM write counter.) The MUX switch must be flipped to the RAM write counter at least once every 16 bit times or data could get lost. Thus, while data is being shifted into the input buffer shift register serially, the MUX switch can occupy most of its time to reflect the RAM read counter lines. This means that the CPU can be unloading the RAM, and incrementing the read counter, as long as the MUX switch flips over to the RAM write counter every 16 bit times. Data is then taken out of the RAM to the output buffer shift register and is parallel loaded to the CPU interface.

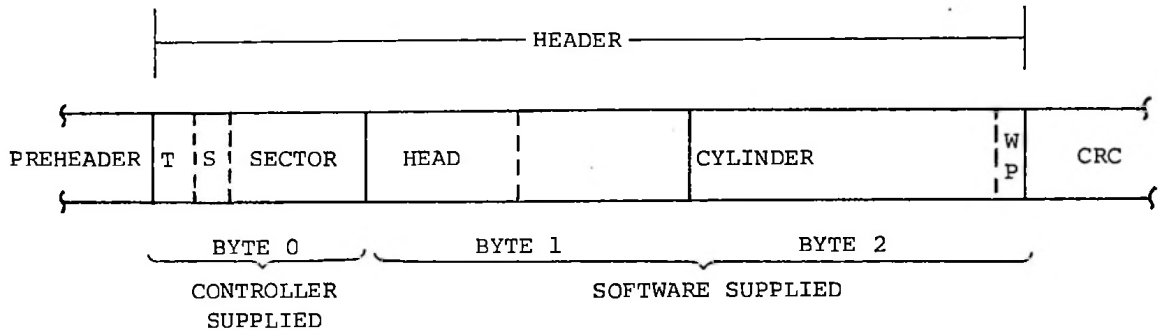
The concept here is to have one RAM that can be controlled by two sets of address lines or counters. Depending on the operation, two functions can be happening almost simultaneously - the input buffer shift register serially being loaded while the output buffer shift register, as a buffer, is being loaded with data bound for the CPU.

The net effect of the memory system is to act as a buffer between disk and CPU while the disk is loading the RAM. During a read from disk operation for example, the CPU does not have to try to unload the RAM immediately. The CPU can finish what it is doing with another device and then work with the disk.

During a write data to disk, the CPU transfers up to 256 words to the RAM (more than that would cause writing over addresses again). After that, it is free to disconnect and service other devices as long as RAM does not go empty. The controller will continue to unload the RAM as needed to keep the serial data to the disk in a constant flow.

4.4 FORMAT DATA

During the format track command, the header is written onto all sectors of the track or head specified. Assume that we are talking about a 32 sector DC-16-C. If the header is observed for just one sector, you will note that the header is made up of three bytes of information. Byte zero



of the header contains the track status bits and sector number. This information is supplied at the time of writing by the controller registers or hardware outputs from within the controller. When it is time to write byte one and two of the header, a word is transferred from RAM and is written. If you have a 32 sector disk drive, you could load the RAM with 32 words of head and cylinder and write protect bit information. The first header would use the first word from RAM. The second header would use the second word from RAM and so on. If you only loaded two words into the RAM, the first word from RAM would be put into the first header. The second word from RAM would be put into the second header. The third header would contain the second word from RAM as would the remaining headers. There is a minimum of one word per head or track needed to use this command. When you use this command, the controller will make a request for data. As in all commands dealing with data, the memory address and word count must be initialized via software commands. Refer to the appropriate CPU theory of operation for further information.

4.5 ERROR CHECKING

The DC-16-C uses a Cyclic Redundancy Check (CRC) method of checking data integrity. As discussed previously paragraph 4.2.5.2 while the header is being written on the pack, a CRC calculation is being generated by the CRC generator in the CTM (see Figure 4-3). After the header is written, the calculation is written into the two byte CRC area of the header for future use. When reading the header at a later time, a new calculation is formed while reading the header. After the header is read, the old CRC is read from the pack and compared with the new CRC calculation. If they do not compare, a CRC error is generated. The same action is repeated for the data area of the format.

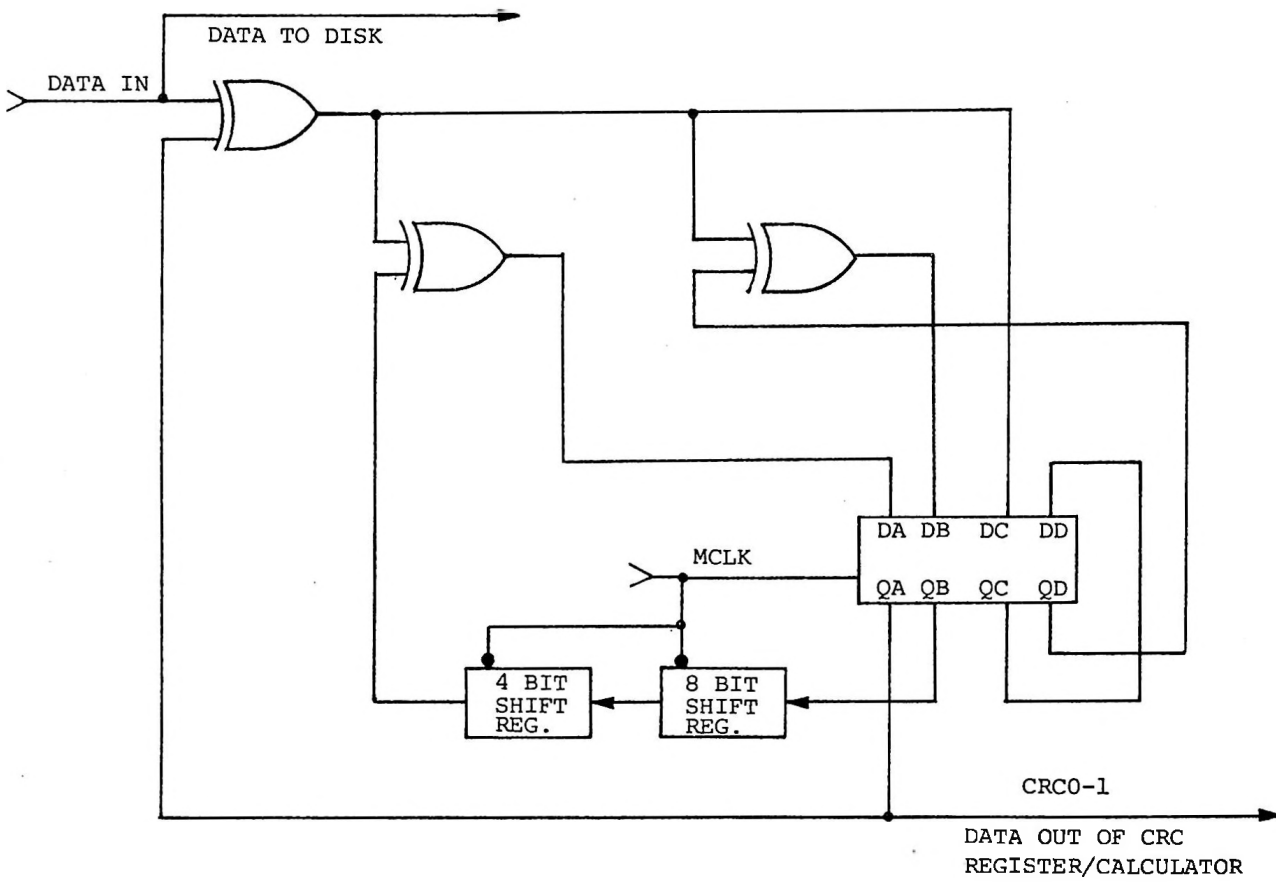


Figure 4-3. CRC Calculator, Simplified Logic Diagram.

4.6 SEARCH AND READ

The purpose of Search and Read is to be able to load the RAM with a group of characters known as the key, and compare those characters with data coming from the disk. If the data from the disk matches the key, the rest of the sector is transferred to the CPU. This key can be any length up to 255 words. If a match is found on the last word of a record, it is treated as a non-match and continues until the search limit is reached. The simplified diagram in Figure 4-4 illustrates how the hardware can accomplish this task.

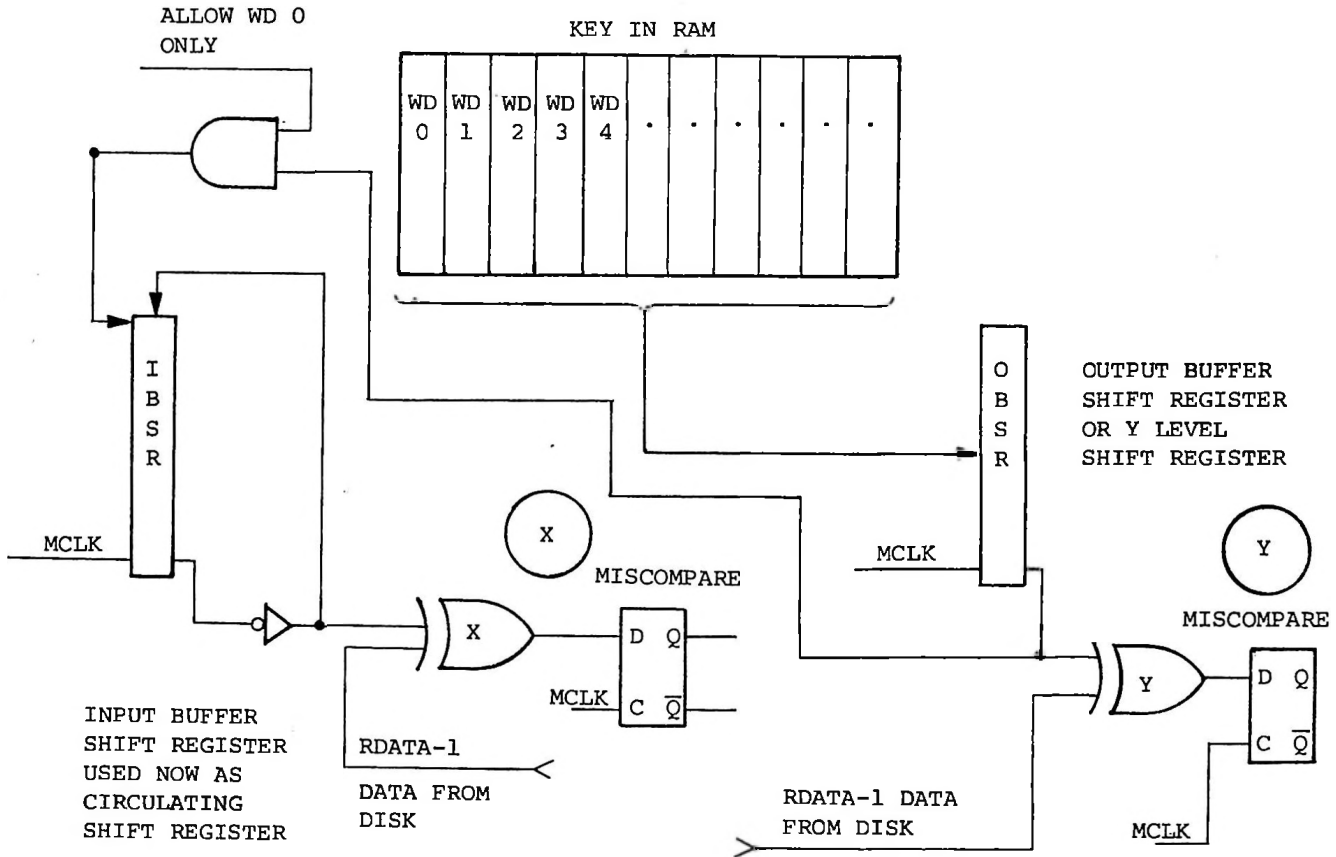


Figure 4-4. Key Compare Circuit, Simplified Logic Diagram.

There are two levels of exclusive "ORing", level X and level Y. Level Y is always checked first, level X is checked second. The first word from RAM is loaded into the output buffer shift register. It is then shifted out and exclusive ORed at Y with data from the disk. It is also at that time loaded into the input buffer shift register (circulating) where it is kept for the remainder of the operation. If the first word from RAM, (word 0) compared at Y, then word 1 is loaded into the output buffer shift register. Word 1 is then shifted and compared. If word 1 compares word 2 is loaded. Now, if word 2 does not compare a decision has to be made as to the next word to be loaded from RAM. Is it word 0 or word 1? Assume word 2 does not compare and that level X is checked, and found to compare. The action would be then to load word 1 next because word 0 compared OK at X. If both level Y and level X did not compare, word 0 would have been loaded from RAM again and operation would have started over again. As long as there is no miscomparing, all words are loaded from RAM sequentially to the output buffer shift register. Level X is always checking for word 0. If a miscompare happens at Y, a check at X is made to see if it was word 0, if it was, word 1 is loaded in the Y shift register. If it was not 0, then word 0 is loaded in the Y level shift register and process starts over.

There is a programming consideration which must be mentioned here. There is a possible combination of characters in the key that results in the controller never finding a match. Thus the first two words of the key should never be the same (see Figure 4-5).

	0	1	2	3	4	5	6	7	8	9	10
CHARACTER IN KEY	T	T	E	L	E	F	I	L	E		
CHARACTER IN Y S.R.	T	T	E	T							
CHARACTER READ FROM DISK	T	T	T	E	L	E	F	I	L	E	
LEVEL Y COMPARE	YES	YES	NO	NO							
LEVEL X COMPARE			YES	NO							
LOAD WORD NUMBER INTO Y S.R.	1	2	1	0							

} NEVER FINDS KEY.

SUMMARY

- If Y compares, load the next word.
- If Y miscompares, check X and if it compares, load word 1.
- If Y and X miscompare, load word zero.

Figure 4-5. Example of a Search and Read Operation.

4.7 WRITE CHECKING

The concept of write checking is to be able to issue a write check command and have the hardware check the integrity of the previously written data. Data is first written on the disk as a normal write data operation. A write check command is then issued which makes the DC-16-C act like it is performing two functions at the same time. As far as the CPU or CIM is concerned, it appears to be writing data to the DC-16-C. As far as the DC-16-C is concerned, it appears to be reading data from the disk drive. The two data sources are exclusive ORed for a mismatch (see Figure 4-6). If a mismatch occurs, the operation is terminated.

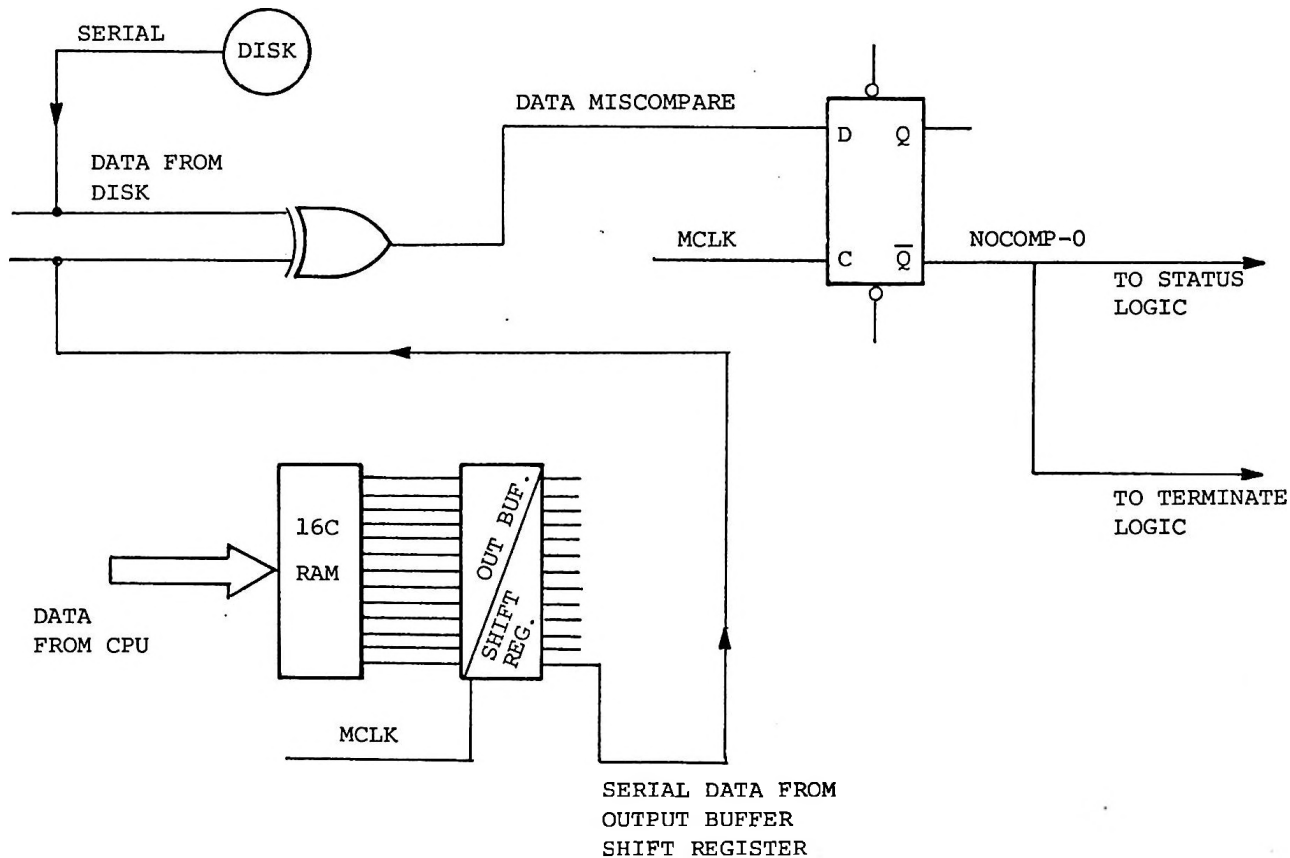


Figure 4-6. Write Check - Simplified Logic Diagram.

4.8 SECTORING

Sectoring is the process of dividing a track into equal portions. It is usually done by the drive and can be set to a predetermined count. At the start of each new sector the drive will issue a sector pulse to the controller. A standard count of 32 sectors per track is used by Telefile. However, any amount, with limitations, can be programmed. The controller has its own sector counter but it is only incremented by receiving a sector pulse from the drive (see Figure 4-7). The number of sectors programmed in the controller must equal the number of sector pulses generated by the disk drive.

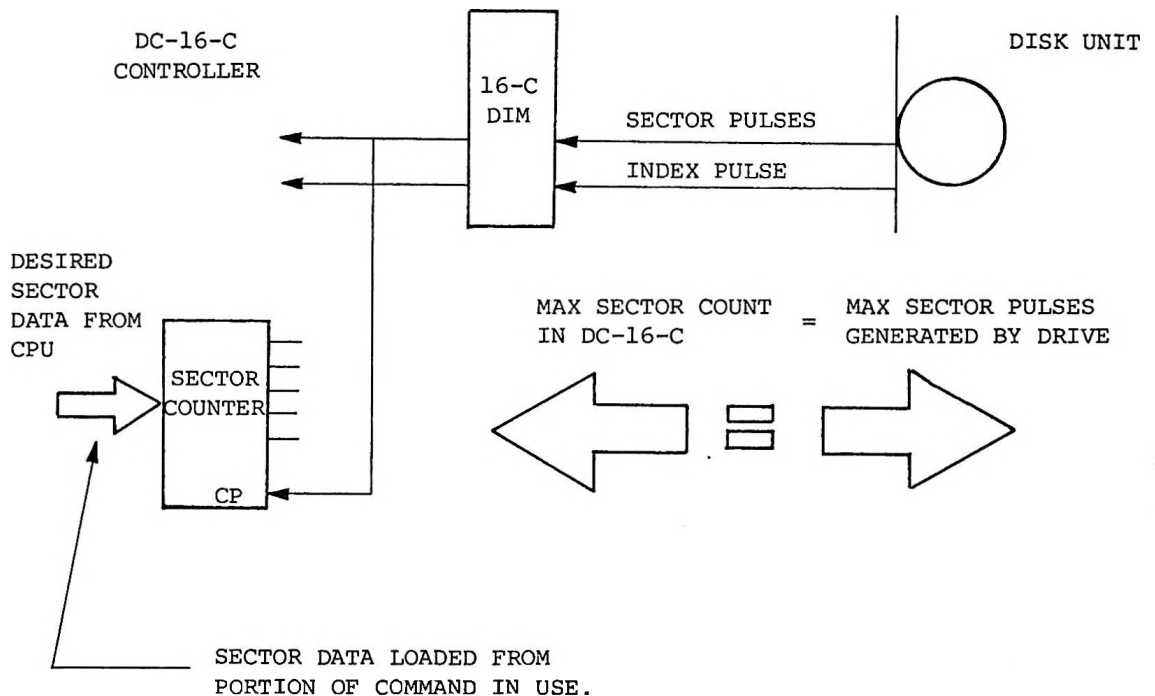


Figure 4-7. Sectoring - Simplified Logic Diagram.

There are two sector settings that must be set. One is the maximum sector count as programmed in the DC-16-C. (Refer to Section 2 "Installation".)

The other setting must be set in the disk drive unit itself. The appropriate jumper plug must be inserted.

Now the following question may be considered. If you want to change the number of sectors/track and bytes per sector, how does that affect the overall operation? Referring to the "Mode Control Concept" diagrams in paragraph 4.2.4, note that MC1, MC2, MC3, and the first two bytes of MC4 are constant numbers that cannot be changed by sectoring or data area size. Thus, if you change the data area size and the number of sectors, the only area that feels the effective change is MC4. The rest of the modes will remain the same size regardless of the number of bytes per data area or sectors per track. Our concern here is what is the smallest MC4 can be? Fact: MC4 must be 4 bytes minimum.

Using the following formula, as long as MC4 is at least 4 bytes, any configuration can be achieved.

$$MC4 = \left(\frac{Z - XY}{Y} \right) - W$$

W = CONSTANT 89

X = NUMBER OF BYTES/SECTOR

Y = NUMBER OF SECTORS/TRACK

Z = NUMBER OF BYTES AVAILABLE/TRACK AS SPECIFIED BY MANUFACTURER'S DATA SHEET.

4.9 OPERATIONS WITHOUT HEADER VERIFICATION

When data is read from the disk, the normal operation is to verify the header before any operation is performed on the data area of the sector. This technique gives the flexibility to start reading at any sector time and search for the proper sector. However if there were bad headers, reading of the data area would never be accomplished. Writing headers is another example of not verifying headers, obviously. The commands that do not use header verification are:

- a. Read Headers
- b. Read Without Header Check
- c. Format Track
- d. Write Single Header

These commands start from index and count sector pulses until the sector is reached (regardless of header) and the operation is performed.

4.10 FUNCTIONAL BLOCK DIAGRAM ANALYSIS

4.10.1 COMMAND LOADING

Referring to Figure 4-8, the bi-directional data bus (DB00-DB15) carries all command, data and status information to and from the CIM logic inside the CPU. If command information is on the bus, the command data is passed through the data bus transceiver logic. From there it is presented to various sections of logic for future use, i.e., search termination logic, command control and timing, command store and decode, cylinder counter, head counter, sector counter input buffer shift register, etc. Only the logic concerned with the information in the command actually gets loaded. For example, a unit select command, bits 0 and 1 will get parallel loaded into the drive select logic to help select the appropriate drive number. The track status bits, 5 and 6 of the command, will get parallel loaded into the track status register. The condition bits (7, 8, 9, 10, 11) get parallel loaded into a register for use when connection is made with the drive.

The command bits (12-15) are loaded into the command store and decode register. In the case of the unit select command, all four zeros are decoded to give the select command. The controller action during this command is to take sections, or groups of bits, and route them to the appropriate storage registers and load them all at the same time.

4.10.2 DATA FLOW PATH

After the command has been loaded, the controller will execute the command. If the command was a data command such as a read, data has to get to the CPU through the CIM. Referring to the block diagram of Figure 4-8, the path would be from one of the READD0-3 lines, through the differential receivers to become READAT. From there it passes through the Data/Clock sync logic to become RDATA. At this point, and all the way up to this point, it is serial data. RDATA is then de-serialized at the input buffer/shift register. After sixteen bit times it is parallel loaded into the 256 word RAM. From there the data is parallel loaded to output buffer/shift register, then to the output drivers. The output drivers feed the data bus transceivers, which in turn, transfers it to the CIM. Note the signal names change from RDATA to DI00-DI15, then to D000-D015. Data then becomes DAOUT00-DAOUT15. The output of the output drivers becomes DSTAT00-DSTAT15. After data passes through the data bus transceivers it becomes DB00-DB15. This is the path that data would take back from the disk to the CIM.

If the operation was a write data to the disk, the DB00-DB15 would reverse direction and the data would become DATAI00-DATAI15. From there, since it is data now, it is parallel loaded into the input buffer shift register and becomes DI00-DI15 into the RAM. Out of the RAM, the data changes name to D000-D015 to the output buffer shift register. At this point, the data is serialized, for use on the disk, and becomes WRD00. From here it passes through the write data gate to become WRDATA and winds up out to the disk.

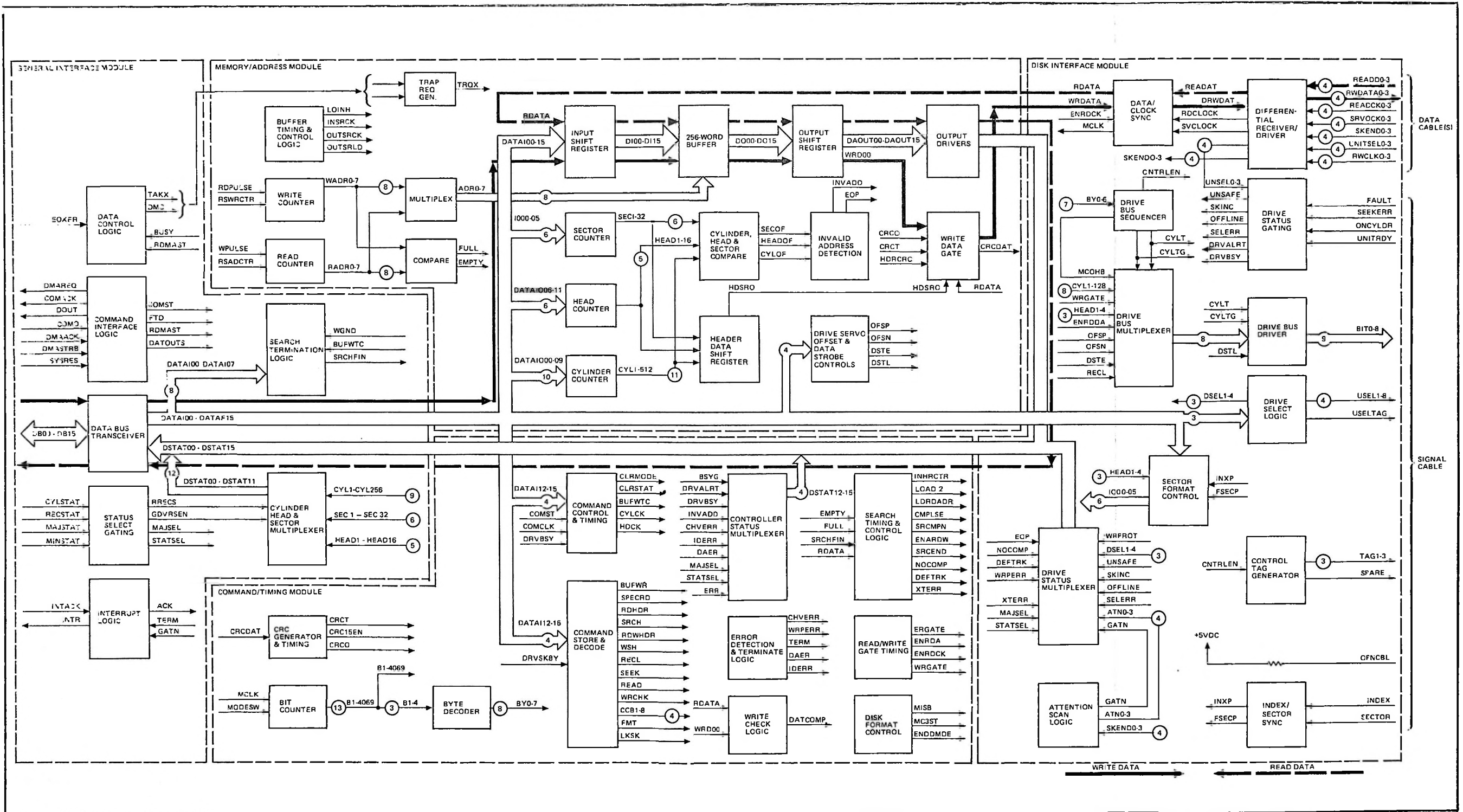


Figure 4-8. DC-16-C Detailed Block Diagram.

When status information is required by the CPU, the DSTAT00-DSTAT15 is no longer data but is now status. The status multiplexers (status from the controller and from the drive) put their information on the bus.

4.11 DETAILED CIRCUIT THEORY

The following discussion pertains to schematic diagrams for the DC-16-C disk controller. Throughout this discussion, reference will be made to the names of each schematic:

201801	Command Timing Board (CTM).
201802	Memory Address Module Board (MAM).
201823	General Interface Module (GIM).
201803	Disk Interface Module (DIM).

For purposes of discussion we will assume that the disk controller is connected to a CPU, and an 1803 DIM on a disk drive. The controller is set up for 32 sectors/track, 256 words per sector, and 823₁₀ cylinders. The disk drive is set up to reflect 32 sectors per track, and there is a completely erased disk pack on the drive. The sequence of commands could be the following: (but do not have to be used all the time in this sequence)

- 1) UNIT SELECT
- 2) RECAL
- 3) SEEK
- 4) FORMAT TRACK
- 5) WRITE DATA
- 6) READ DATA

The only requirements in the above sequence are: that the unit select command be used first to connect with the drive, the format track command used next because the pack is completely blank in our example here, and then a write data command because there is nothing in the data area.

4.11.1 UNIT SELECT COMMAND

The unit select command is issued on the DB00-DB15 bus and presented to the CTM board where it is decoded and latched. This command does not cause the controller to go busy. It does cause registers to be loaded with data within the command. On CTM logic sheets the commands represented by DATAI 13, 14, 12 and 15 are applied in parallel to a 93S01 decoder and to a D flip-flop I.C. Since the command bits of a unit select are all zeros (reference Table 3-2) the inverted SELECT-0 output to a three input NAND is high. With the controller not busy (BUSY-0 = high) the arrival of COMST-1A (a derivative of COMO) drives the SELCK-0 output. This is used in the DIM board to load the drive select bits DATAI00, 01 and 02. The following latch produce the DSEL 1, 2 and 4 outputs which go to all drives via the signal cable. Only the appropriate will respond to that address.

The track status bits are also loaded at COMO time on MAM sheet 4. The term SPECLK-0 is really derived from COMO from the interface. The condition bits, bits 7-11, are loaded on the MAM also by SELCK-0. The end result here is that the command was placed on the bus and loaded into the appropriate registers at COMO time. The DC-16-C did not go busy, but did acknowledge receipt of the command on the GIM sheet 2 with COMACK-0. The signal COMACK-0 is issued 125 nanoseconds after the receipt of COMO.

4.11.2 RECAL COMMAND

During a Recal Command (RESTORE) DATAI-13 of the four command bits shown in CTM logic sheet 7 is high. This drives both the SPECCOM-0 and SELECT-0 outputs from the bit decoder high. As long as the drive is not busy (DRUBSY-1 - low) and the controller busy flip-flop has not been set, the NOTTBSY-0A input to the Not Busy one shot is high. When COMST (another derivative of COMO) clocks the one shot, the NTBSY-1 output strobes the command store flip-flop to latch in DATAI13-1. The output of this latch is applied to a command decode chips which drives the RECL-0 (Recalibrate) line active. When the Not Busy one shot times out it causes the Linked Seek flip-flop to go set because LSK-0 is high (Linked Seek not programmed). On the next master clock the INTLK F-F is set creating an active INTLK-1 and enabling the Busy flip-flop. The next master clock sets this flip-flop causes the controller to go busy on DIM logic sheet 4. RECL-0 prevents the MCO flip-flop from going set. This indicates that the controller does not have to go through a MCO sequence for a recalibrate command. Under this condition, the MUX chips are in the idle state which permits control information such as WRGATE-1, ENRDA-1 OFSP-1, etc. to be presented to the drive bus via drive amplifiers. (During MCO the MUX chips change inputs for either head or cylinder information depending on the controlling input.) Whenever the controller is not in MCO, the high MCO-0 output permits the master clock to strobe the 74164 shift register. This results in a high CONTAG-1 output. As a consequence, the TAG 3-0 output to the drive goes active. As the drive goes busy (DRUBSY-1) the Terminate flip-flop shown on CTM logic sheet 1 is set. With the controller terminated, CLRMODE-0 goes active to reset the Busy, Linked Seek and INTLK flip-flops, after five byte times. In summary the drive did a recal from the command, went busy and after five byte times did a terminate to reset the Busy flip-flop and complete the operation.

4.11.3 SEEK COMMAND

During a Seek command, only the DATAI-14 command bit shown on CTM logic sheet 1 is high. With the occurrence of a master clock the Not Busy single shot is set which latches DATAI-14 into the Command Store flip-flop. This is then decoded and SEEK-0 goes active. After the one shot times out, the LSK, INTLK and Busy flip-flops are sequentially set. During this time loading of the DATAI00-DATAI-07 cylinder bits in the command and into the cylinder address register takes place when the CAR chips are clocked by CYLCK-0. (See MAM logic sheet 3.) CYLCK-0 occurs upon decode of a Linked Seek or Seek by the Command Bit Decoder and the firing of the Not Busy single shot. With CAR loaded and the controller busy, the next step is to enter MCO so that the drive can do the seek. INTLK-1, which had helped

set the Busy flip-flop, is coupled with an inactive RECAL-0 to set the MCO F-F (1803 sheet 4). Refer to Figure B of paragraph 4.2.4. Note that MCO is 5.79 microseconds long or seven byte times. The MUX chips (DIM logic sheet 4) will first reflect head information (i.e., HEAD-1, HEAD-2, etc.) then the TAG2-0 is issued and the drive loads the drive bus information into the drive head address register. Note: The head information presented to the MUX chips (outputs from the controller head counter) was from a previous operation. As the byte counters continue, the MUX chips shift to reflect cylinder information. At the fourth byte time, the TAG-1 output is issued. When the cylinder tag is dropped the drive does the seek start automatically. The controller then begins the process of getting out of MCO and terminating.

At the seventh byte time and bit 7, the MCO flip-flop gets reset (DIM logic sheet 4). In other words, at the end of the seventh byte MCO exits. With the head register and cylinder register loaded in the drive, the next step is to terminate so the controller can go not busy. This is accomplished at the ninth byte into the seek operation, or two bytes after the exit of MCO, when the B8-1 and SEEK-1 inputs to a NAND enable the Terminate F-F to be set by the master clock (CTM logic sheet 4). Setting the Terminate F-F clears the Busy F-F. Note: Anytime the controller terminates, an interrupt is raised. Also, whenever the drive finishes seeking, or finds something wrong with the seek, an interrupt is raised. (See GIM logic sheet 3.) The interrupt (INTRO-0) is sent to the CPU via the CIM interface cable.

4.11.4 FORMAT TRACK COMMAND

The format command is applied to the CTM input as shown in CTM logic sheet 1. To execute the command the following events have to occur, some in sequence, some simultaneously:

- a) Decoding the command.
- b) Loading the head words (one per sector) from the CPU into the RAM.
- c) Going into MCO.
- d) Selecting a sector pulse starting from index.
- e) Start formatting at MCl.

4.11.4.1 Decoding the Command

The Format Track command bits are applied to the bit decoder and to the command latch in the usual manner (1801 sheet 1). In this case DATAI 15, 14, and 13 are all active and all the decoder outputs are high. If the drive is not busy, the Not Busy F-F is set and the command bits are latched and decoded to generate FMT-0. This ANDed to become FMTCOM-0 generates DATAOUT-1. Concurrently, the INTLK F-F is set setting the MCO F-F on the DIM board. On the following clock the Busy F-F is set. During this time, COMO had been issued from the CIM. After dual inversion, this becomes COMLD-0 (1823 sheet 2). On the MAM board COMLK-0 is used to parallel load the head information (DATAI-06 - DATAI-08) in the format track command into the controller's head address counter (1802 sheet 3). At this point, the command is decoded, the controller is busy and DATAOUT-1 is active.

4.11.4.2 Drive Bus Sequence

With MCO set to start the drive bus sequence DATAOUT-1 which is applied to the data terminal of the Data Out F-F (1802 sheet 2) also generates DOUT-0 on the GIM 1823 sheet 1. This indicates to the CPU data will be required. DATAOUT-1 also sets the TRQX-FF sheet 2 to generate TRQX-1. TRQX-1 goes to 1823 sheet 2 where it sets the Data Request F-F to generate DMAREQ-0 to the CPU. The Data Out F-F is clocked by DATAOUTS-0 which is a DMA signal from the CIM that says in effect "here's the data". The Data Out F-F indirectly sets the adjacent Write Pulse F-F which generates the WPULSE-0 signal. This is used to clock the RAM and increment the RAM write counter. It will also pull the "switch" over to allow the MUX chips shown on 1802 sheet 2 to gate through the address from the write counters to control the address lines of the RAM. The Write Pulse F-F then resets the Data Out F-F to allow for another transfer. The TRQX F-F gets reset by TAKX-0 which is an acknowledge of the DMA transfer. This action continues until the WD count set in the CIM is reached or until the RAM goes full. A nine input NAND samples the outputs of the MUX chips to detect when the RAM read counter is equal to the RAM write counter. When equal it generates FULL-0. This is applied to the NAND input to the TRQX F-F to inhibit further data requests until the RAM goes not full. In our test case here, the RAM won't go full because only 32 words, one for each sector, are going to be transferred. Now that data is in the RAM, MCO continues to permit loading the drive head address registers.

4.11.4.3 Formatting

As stated previously, INTLK-1 and no RECL-0 enable the setting of the MCO F-F. Since this is not a seek operation, the controller needs to stay in MCO for the head portion only. (See Figure A in paragraph 4.2.4.) Since only the drive head address registers are to be loaded, the controller stays in MCO for only four byte times. It is reset by the combination of BY3-0 and T7 (1803 sheet 4). The Drive Bus MUX chips go back to IDLE to reflect control information. Three clock pulses later TAG3 will be issued again by the CONTAG F-F.

During formatting and creating a pack the controller has no way of determining where the write heads are on the track. Thus, all formatting must start from the index pulse issued from the drive. Instead of using the index pulse, the controller blocks all sector pulses until the index is found. The Index F-F is in the set state and its INXFD-0 output blocks SECP-1 (1803 sheet 3). Once found, the flip-flop is reset, allowing the sector pulses coming from the drive to pass. The first sector passed will be sector zero which will put the controller into MCl via an eight input NAND to enable writing of the headers. At the same time MODESW-0 is generated which resets the bit and byte counters. To get into MCl, the MCl F-F (1801 sheet 2) must be set. This is done by SECP-1 via an eight input NAND, which also sets the EXEC-1 F-F. With the controller in MCl, data will start being written as soon as WRGATE is activated through the Drive Bus MUX chips to the drive. The WRGATE F-F gets set by having FMTCOM-1 active when MCl goes high, and B8-1 is present. This means that writing of zeros and counting commences during the ninth byte of MCl during a format command.

The write data path starts as WRDATA-1 on 1802 sheet 1. This, in turn goes to DIM 1803 sheet 1 to a flip-flop. When set by a master clock, the DRWDAT-1 is made available to all drives, depending on the drive selected, as RWDATA0-3. As indicated WRDATA-1 can be generated from multiple sources. The fact that the controller is in MC1, the drive write gate is on and WRDATA-1 is false (or nothing is happening) indicates that NRZ zeros are being written on the pack. With the bit and byte counters running, the first one bit of data to be written is the sync bit. On MAM 1802 sheet 1, NOR gate MLC3SB is pulsed by M1SB which is a byte decode of MC1. It occurs at the 45 byte bit time 7 (when switches are set for 43) to generate WRDATA-1. It also causes the mode switch line to go active putting the controller into MC2 and resetting the bit and byte counters, at the same time the sync byte is being written on the pack.

With the controller in MC2, the bit and byte counters start over again to start the task of writing header information out on the pack. As previously mentioned, byte zero of the header is controller supplied so its information has already been loaded in a register. On the 1802 sheet 1, the HDSR0-1 output of the header shift register becomes the source of WRDATA-1 shown on sheet 4. Notice that cylinder head and sector is loaded as well as track status. Cylinder information is from the cylinder address register from the previous operation. The head information is from the head address register loaded during the format command. The sector information is from the sector counter. (In this case cleared to zero because the controller started at index time.) All the above are located on MAM 1802 sheet 3. The header shift register, which is latched at MC2, starts a serial shifting out its data at the rate of the CK-0A clock. Normally, the shift register is allowed to keep shifting. However, in a format command only the first 8 bits (byte zero) containing track status and sector number are gated out. At the end of byte zero the HDRCRC-0 output from the four input NAND goes high to inhibit the WRDATA-1 output.

The remaining 16 bits left of the header are provided by the words from RAM which were loaded previously. These are represented by the WRD00-1 pulses from the RAM output buffer shift register. In conjunction with MC2BON-1, (MC2 Byte 0 Not) CRCT-0 and FRMMC2-1 it generates HDRCRC-0 pulses to provide a WRDATA-1 output to the drive and a CRCDAT-1 output to the CRC generator circuit (CTM 1801 sheet 4). When the next sector pulse comes along, a new word will be parallel loaded (word two) to the output buffer shift register for use in writing the header.

As data was being written, the CRCDAT-1 input initiated a CRC calculation. At the end of the three bytes of header, CRC calculation stops. The controller is then ready to write the calculated CRC as data into the two byte area in MC2. This is accomplished by the output of the CRC shift generator, CRC0-1, being applied to a three input NAND (MAM 1801 sheet 1) to provide the data (WRDATA-1) output. With the writing of the CRC bytes, MC2 is completed. On the next bit count, HDRCRS-0, a decode of the bit and byte counter, goes active to generate a mode switch. This resets the counters, and sets the MC3 F-F on the next master clock. Since the controller is writing headers the FMTCOM-1 and MC3-1A levels to the RSHDR-0 NAND permit the B2-1 dock (1801 sheet 4) to reset the Write Gate F-F. Thus the write gate to the drive is turned off at the beginning of byte 3 in mode MC3.

With WRGATE-1 inactive, no more data is written to the drive. Since the controller must get to the next sector, MC3 DMODE and MC4 are allowed to continue until the next sector pulse arrives causing the controller to go back into MCl. This is accomplished during MC4 time by the ENDSEC-0 pulse (1801 sheet 2) which sets the MCl F-F.

This operation is repeated until the end of track is reached. To continue further, a new format track command must be issued.

4.11.5 WRITE COMMAND

The write command is issued by the CPU/CIM and is presented to the GIM 1823 PCB. This is done assuming the drive is on the correct cylinder and the unit select command was issued. As the write command must write data from the CPU to the disk drive, the following tasks must be accomplished:

- a) Decoding the command.
- b) Transferring data to the DC-16-C RAM from CPU.
- c) Entering MCO for proper set up fo drive.
- d) Reading header to verify address.
- e) Writing the data in the data area if the address verifies.
- f) Ending the operation.

4.11.5.1 Decoding the Command

When the write command is issued from the CIM it is presented to the GIM transceivers as shown in PCB 1823 sheet 1. DB00-15 become DATAI00-DATAI15. The command bits, represented by DATAI12 - DATAI15, are presented to the CTM 1801 sheet, 1. Again if the drives are not busy, the Not Busy F-F is set by COMST-0 to set the LSK and Command Storage flip-flops and the sequentially set the INTLK and Busy flip-flops. As the write command is decoded, the WRT-0 line goes active. As in other commands, INTLK-1 is applied to set the MCO flip-flop on the DIM board (1803 sheet 4).

4.11.5.2 Drive Bus Sequence

Because this is a write operation, the drive bus sequence will be entered for 4 byte times to give the current head address to the drive. The head number from the write command is loaded into the head register in the same manner as the previously discussed format command.

During MCO, the 256 word RAM was filled in the same manner as the previously discussed format by the controller raising alternately DMAREQ and DMAACK until the FULL-1 line on 1802 sheet 2 goes active.

As the controller leaves MCO, it must first start reading the preheader gaps before actual writing can begin. This is done in the MCl mode. Previously, MCl was entered into in the first sector after the index pulse was detected, to ensure starting at sector zero. In this case, the controller can start reading at the first sector it sees from the drive. When this occurs, the SECP-1 output from the three input NAND shown on 1803 sheet 5 goes active. This, in turn, is applied to NAND gate logic on the CTM board (1801 sheet 2) where it causes the MODESW-1 line to go active to reset the bit and byte counters. On the next master clock, it permits MCl to go set.

As the MCl F-F is toggled, MCl-1 strobes a 10-15 microsecond one shot on the CMT board (1801 sheet 1). After the one shot times out, the MCl DEL-0 output sets the ENDRS F-F. The ENDRA-1 output is used to cause the controller to switch from the internal clock to the read clock from the drive, RDCLK. RDCLK, synchronized to the data stream then serves as the master clock (see DIM 1803 sheet 1). As shown the master clock circuit has three sources from which to generate MCLK.

- a) Internal oscillator when DC-16-C is not busy.
- b) Servo clock (synchronized to drive motor speed).
- c) Read clock (synchronized to data stream).

Figure 4-9 illustrates the clock switching sequence during a read.

The time from A to B in the diagram is the time needed for the drive to sync to the zeros data stream previously written in the format track command.

At this time the drive is reading, the clocks are switched over, and now it is time to go into MC2. On 1801 sheet 2, MC2 is set from MCl a master clock and MODESW-1. Any time a mode is changed (MCl through MC4), MODESW-1 will be active. In this case a change is made from MCl to MC2, the RDSB-0 input to mode switch NOR. RDSB-0 is the first "one" bit seen coming from the disk (i.e., the sync byte bit). ENEDC-1 is valid because of previous occurrence, and is active high because the time is MCl.

4.11.5.3 Header Address Verification

In MC2, two things must happen. One, the controller must exclusive "OR" the header shift register with the data coming from the disk. The header shift register on MAM 1802 sheet 4 had been parallel loaded during MCl with the outputs of the DC-16-C cylinder, head, and sector registers. This represents where the controller would "like to be" concerning address. This information is latched at MC2 time into the header shift register (1802 sheet 4). The header shift register is then MCLK shifted out as HDSRO-1 and exclusive "ORed" with the data actually read from the disk. This happens on 1801 CTM sheet 3. If all three bytes of the header compare, the controller is where it should be and the only thing left to check is the CRC.

If the header bytes did not compare, the HDRCOMP-1 goes high. It is then applied to the CTM error circuit (1801 sheet 4). If during the first byte of the header a defective track status bit is detected, there is no need to compare further, and the CHVERR F-F is reset. This results in setting the Terminate F-F to terminate the operation. If only the sector bits of the first byte miscompare the ADRERR-1 F-F is set, but no error is recorded. Although the term indicates address error, all it is saying in effect is "not this header". During MC3 time, ADRERR-1 would be NANDed with MC3-1 (1801 sheet 2) to cause the EXRES-0 line to go active. EXRES-0 is used to set the Execute F-F. The EXEC-1 output of this resets all the Mode Control flip-flops to start all over again at the next sector pulse. If the header is not found in two revolutions an error does occur, i.e., the REVTO-1 line

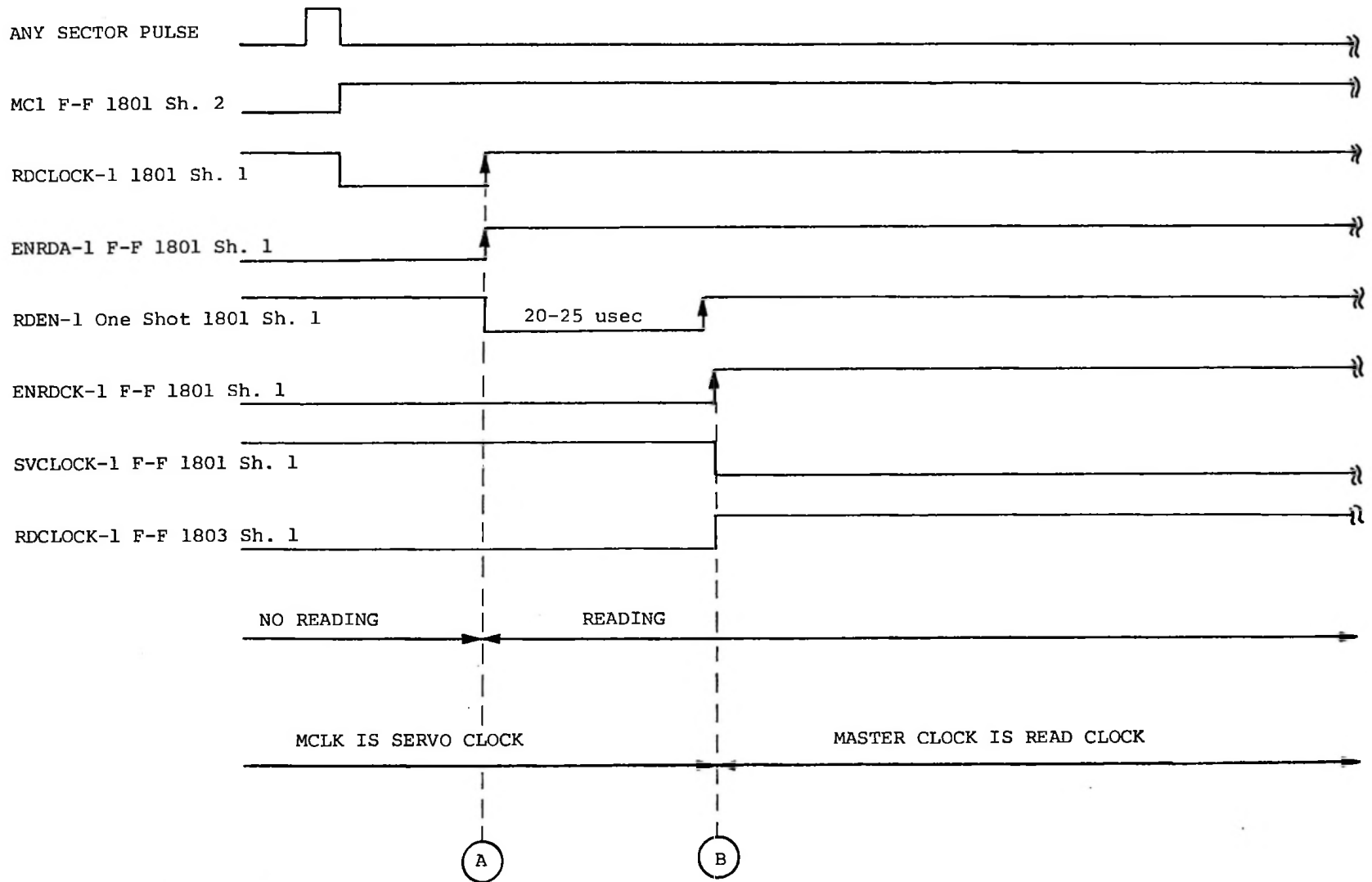


Figure 4-9. Clock Switching for a Read, Timing Diagram.

on 1801 sheet 3 goes active and is applied to the error circuit on sheet 4. The fact that the header mismatches in the sector section of the first byte prohibits the end of sector (ENDSEC-0) from occurring. As a result, the controller times out.

If the header mismatches in the second and third byte of the header, it indicates that the drive is on the wrong cylinder or head. That constitutes a "never find". As a result the CHUERR F-F would be set causing the controller to terminate. Recall that the CRC calculation was begun at the start of MC2 when CRRDAT-1 (data from the disk) (1802 sheet 1) was applied to the CRC generator (1801 sheet 4). After the 3 bytes of CRC data are shifted in, the CRC accumulators are serially shifted out and exclusive ORed at CRC time (i.e., the fourth and fifth bytes of the header). An error detected will cause the CRCERR F-F to be set and indirectly cause the controller to terminate. At the end of the fifth byte and the seventh bit the bit and byte counter outputs to the HDRERS NAND (1801 sheet 2) generates a mode switch and a high KCRCT-1 pulse to advance the controllers from MC2 to MC3. During MC3, the reading is stopped and writing is started. This is initiated by KCRCT-1 which resets the ENRDA (End Read) F-F. As ENRDA-1 goes low, the read gate is turned off. During the third byte of MC3, the high WRT-1 MC3-1, and IDCHK-1 levels to the NAND input of the WRGATE F-F enable it to set by B2-1. WRGATE-1 then goes to the drive but the data line (serial data to the drive) is held inactive because only zeros are written in MC3. It is now time to write the MC3 sync bit, load the first word of data from the RAM into the output buffer shift register and proceed to the data mode (DMODE).

The sync byte occurs as a result of the MC3SB-0 input to the WRDATA-1 gate on 1802 sheet 1 MC3SB-0 is a decode of the byte and bit counters that comes through clocked flip-flops (shown on 1801 sheet 5) at the last bit time of the last byte of MC3. Also generated at this time is WBIT-1. During a write operation the sync bit is always written. It is also used as the vehicle for getting the controller into data mode. Its application to the MODE SW NOR on 1801 sheet 2 resets the bit and byte counters and advances the controller into DMODE.

4.11.5.4 Writing the Data

To actually start writing data the output buffer shift registers must first be parallel loaded from RAM. This occurs when the WBIT-1 output enables a four input NAND on 1802 sheet 2 to generate OUTSRLD-1. OUTSRLD-0, in turn, enables the RAM output to be loaded into the output buffer shift registers. WBIT-1 also occurs every 16 bit times to load the next word from RAM. The same signal is responsible for generating RDPLSEN-1. This combined with a master clock at the NAND gate input to the RADR0 and RADr4 read address counters increments the count. The outputs of the address counters pass through adjacent multiplexers to produce the eight address lines used to control the RAM. Ram is composed of 16 82S16 chips shown on 1802 sheet 1. The output buffer/shift register (now used as a shift register) keeps shifting out serial data through the WRDATA NOR to the disk until the end of DMODE is reached. Keep in mind that while data is being written another CRC is being calculated. At the end of DMODE, the controller has written

a full sector, which in this example was 256 words. The end of DMODE occurs when a switch directed decode of the byte and bit counter generates ENDMODE-1 (1801 sheet 2), END MODE-0 does two things:

- a) Produces another mode switch which resets the byte and bit counter and advances the controller from DMODE to MC4.
- b) Sets the CRCT F-F which establishes CRC time. Since CRC time is defined as the first two bytes in MC4, the output that was calculated during DMODE will go to the WRDATA NOR gate (1802 sheet 1) to produce the WRDATA-1 needed to go to the drive.

The next step is to shut off the write gate to the drive as it is no longer needed. This happens on 1801 sheet 4 when the combination of WRT-1, MC4-1 and CRCT-0 reset the WRGATE F-F. This occurs at the second byte time of MC4.

After the data has been written, the CRC calculated and written during MC4 byte zero and one time, the only operation left is to determine if the last data has been written. If the RAM went empty, EMPTY-1 will cause the Terminate F-F to cause a terminate after the CRC has been written. Setting the terminate F-F causes the controller to go not busy and end the operation. If RAM did not go empty, the controller will wait for the next sector pulse and go into MC1.

Going into MC1 causes the whole operation to start over again under the following conditions:

- a) The RAM still is not empty.
- b) The sector counter was updated (on the sector pulse) so that the header will compare with what is being read.
- c) The CRC is okay in the next sectors header.

If the RAM goes empty half way through the next sector, the controller will pad the data area with zeros and not terminate until CRC time is finished in MC4.

This completes the write operation.

4.11.6 READ COMMAND

A read command initiates the same type of controller operation as the first half of a write command except of course that a different command is decoded. MC0, MC1 and MC2 action is the same because in both cases address verification and CRC check must take place prior to data transfer. The difference in operation occurs in MC3 DMODE and MC4.

A read operation involves the following tasks:

- a) Decoding the command.
- b) Entering MC0 for drive set up.

- c) Reading header to verify address.
- d) Reading the data area and transferring data to the DC-16-C RAM.
- e) Transferring data to the CPU.
- f) Ending the operation.

4.11.6.1 Decoding the Command

The four most significant bits of the read command are applied to CMT command bit decode circuit (1801 sheet 1). Since only bit 15 is high the NOTBSY one shot will go set if the drive not busy (DRUBSY-0A) is high. As a result the command F-F is strobed to latch the command to the command decoder. After the one-shot times out the LSK F-F is set to enable the INTLK F-F. The INTLK and Busy F-F are then set sequentially by internal master clock pulses.

4.11.6.2 Drive Bus Sequence

As INTLK-1 goes active it sets the MC0 F-F on the DIM board (1803 sheet 4) which starts the MC0 drive bus sequence to initialize the drive. The drive bus sequence and CRC check operation MC0-MC2 described under the Write Command are repeated.

4.11.6.3 Reading the Data Area

The real change takes place when the controller enters MC3. Assuming that the header compared with the data read from the disk and that CRC was okay, the controller enters MC3. Recall that during a write operation, the read gate (ENRDA-1) was shut off and the write gate (WRDATE-1) was turned on. Since this is a read operation, the controller will continue to read but a re-synchronizing effort has to be made. Refer to the ENRDA-1 F-F shown on 1801 sheet 1. At the end of MC2 time this had been reset by KCRCT-1 to stop the drive from reading. At the beginning of MC3 time the M3OS one shot is triggered again. As it times out, it sets the ENRDA F-F. ENRDA-1 causes the controller to switch from its internal clock to the RCLOCK from the drive. This is done to ensure that the data area will be properly handled. At this point, the drive is reading zeros. To begin reading data the controller has to enter data mode. This is accomplished by the RDSB-0 NAND shown on 1801 sheet 2. The ENRDCK-1 input to the NAND is the result of the controller using the read clock from the drive. When the sync bit, the only data bit in MC3 is read, the RDATA-1 line goes high. RDSB-0 then goes active to produce the mode switch that advances the controller to DMODE. The drive starts reading the data area. On MAM 1802 sheet 1, input serial data from the drive is presented to the 74564 chip on 1802 sheet 1 and loaded into the shift registers.

4.11.6.4 Data Transfer to the CPU

Every 16 bit times the WPULSE-0 is generated to cause the input data to be parallel loaded into RAM and at the same time to increment RAM address

counters WADRO and WADR4. This action continues as the RAM tries to fill. As EMPTY-0 goes inactive its application to the SEROEN NAND on 1802 sheet 2 sets the TRQX F-F. The TRQX-1 line sets the FDMAREQ F-F to send a DMAREQ to the CPU. (If the request is not answered with a 256 word time, a transfer timing error is produced.)

As long as the RAM is emptied before it ever goes full, the read operation continues until a word count of zero is reached in the CIM board.

The data path from RAM is through the output buffer through output drivers to the transceivers on the GIM board. From the transceivers the data terms become DB00-DB15 and are bound to the CPU memory via the GIM. DMODE is completed by a predetermined byte count set in the switches on CMT 1801 sheet 2. When the byte and bit count reaches this setting the term ENDMODE-0 goes active to produce a mode switch. The controller enters MC4 and compares the CRC just accumulated with what it is then reading. This comparison takes place at the exclusive or on the CRC accumulator circuit (CMT 1801 sheet 4).

4.12 STATUS

Status returned to the CPU when requested consists of the following:

- CYLSTAT-0
 - RECSTAT-0
 - MAJSTAT-0
 - MINSTAT-0
- a) CYLSTAT-0 - When requested returns the output of the cylinder address register. Data flow is from the cylinder counters on 1802 sheet 3 to the 74S257 multiplexer chips shown on 1823 sheet 1 and out the CIM board via the transceivers and line drivers.
- b) RECSTAT-0 - When record status is requested head and sector address data is returned from the head and sector address counters on 1802 sheet 3. Data flow to the CIM is through the MUX chips on the GIM board.
- c) MAJSTAT-0/MINSTAT-0 - Major and minor status is returned from the 74S258 chips shown on DIM 1803 sheet 3. The DSTAT00-DSTAT15 lines are wired "ORed" to the input lines of the transceivers shown on 1823 sheet 1.

BASIC DC-16-C CONTROLLER

ENGINEERING DOCUMENTS

CONTROLLER LOGIC DIAGRAMS AND ASSEMBLY DRAWINGS

- * ● General Interface Module Logic Diagram (201823 L1).
- ** ● Memory/Address Module Logic Diagram (201802 L3).
- ** ● Command/Timing Module Logic Diagram (201801 L3).
- Maintenance Module (optional) Logic Diagram (201800 L1).
- * ● General Interface Module Assembly Drawing (201823 A1).
- ** ● Memory/Address Module Assembly Drawing (201802 A3).
- ** ● Command/Timing Module Assembly Drawing (201801 A3).
- Maintenance Module (optional) Assembly Drawing (201800 A1).

BACKPLANE AND LOGIC MODULE WIRE LISTS

- DC-16-C Backplane Term List and Pin Sort (201806 WL1).
- * ● General Interface Module Term List and Pin Sort (201823 WL1).

DC-16-C INTERNAL CABLE PIN ASSIGNMENTS AND WIRING

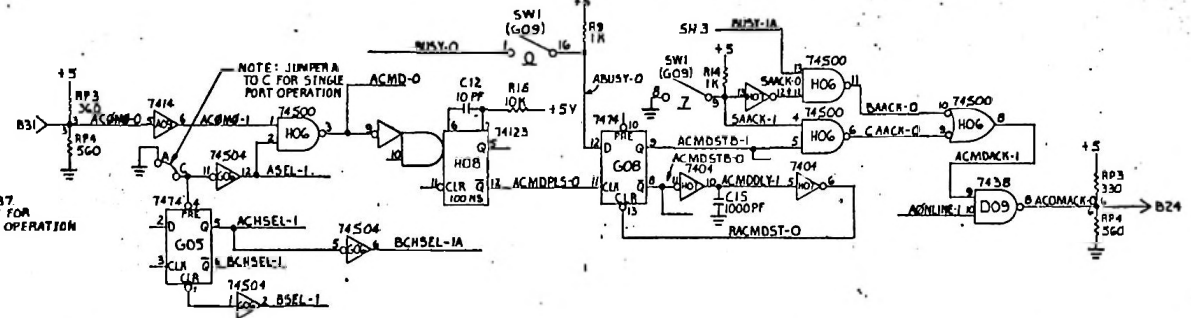
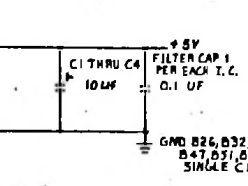
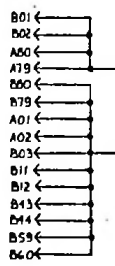
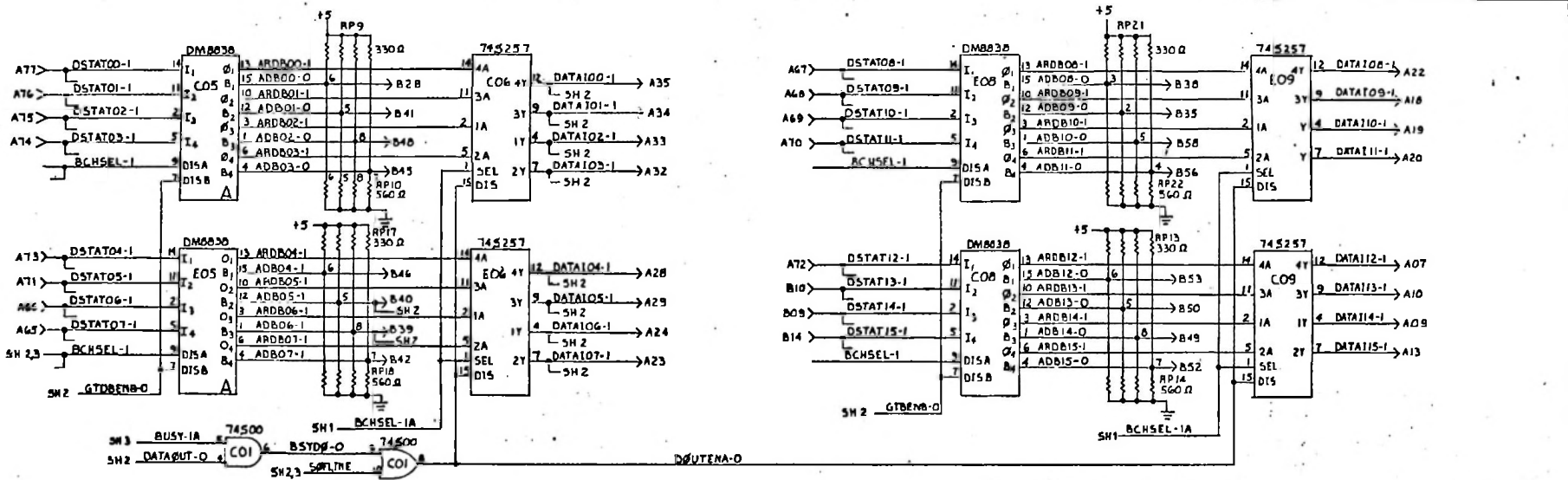
- Internal Drive Interface Data Cable Harness (201809 WL2).
- Internal Drive Interface Signal Cable Harness (201809 WL1).
- Internal CPU Interface Cable Harness (201827 WL1).

POWER SUPPLY SCHEMATIC DIAGRAM AND ASSEMBLY DRAWINGS

- DC-16-C Power Supply Schematic Diagram
- DC-16-C Power Supply Assembly Drawing

- * This module not used with PDP-11 processors.
- ** P.C. board.

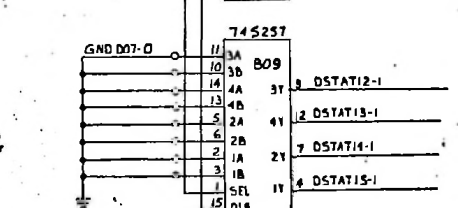
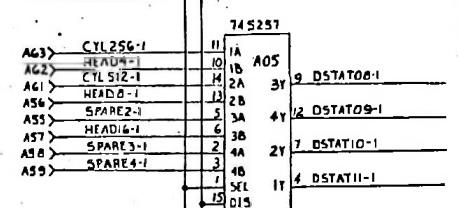
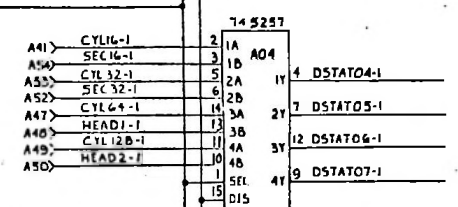
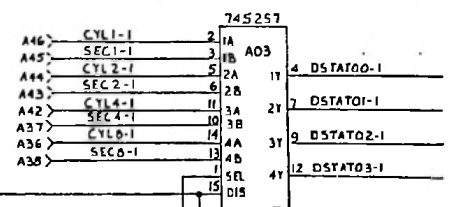
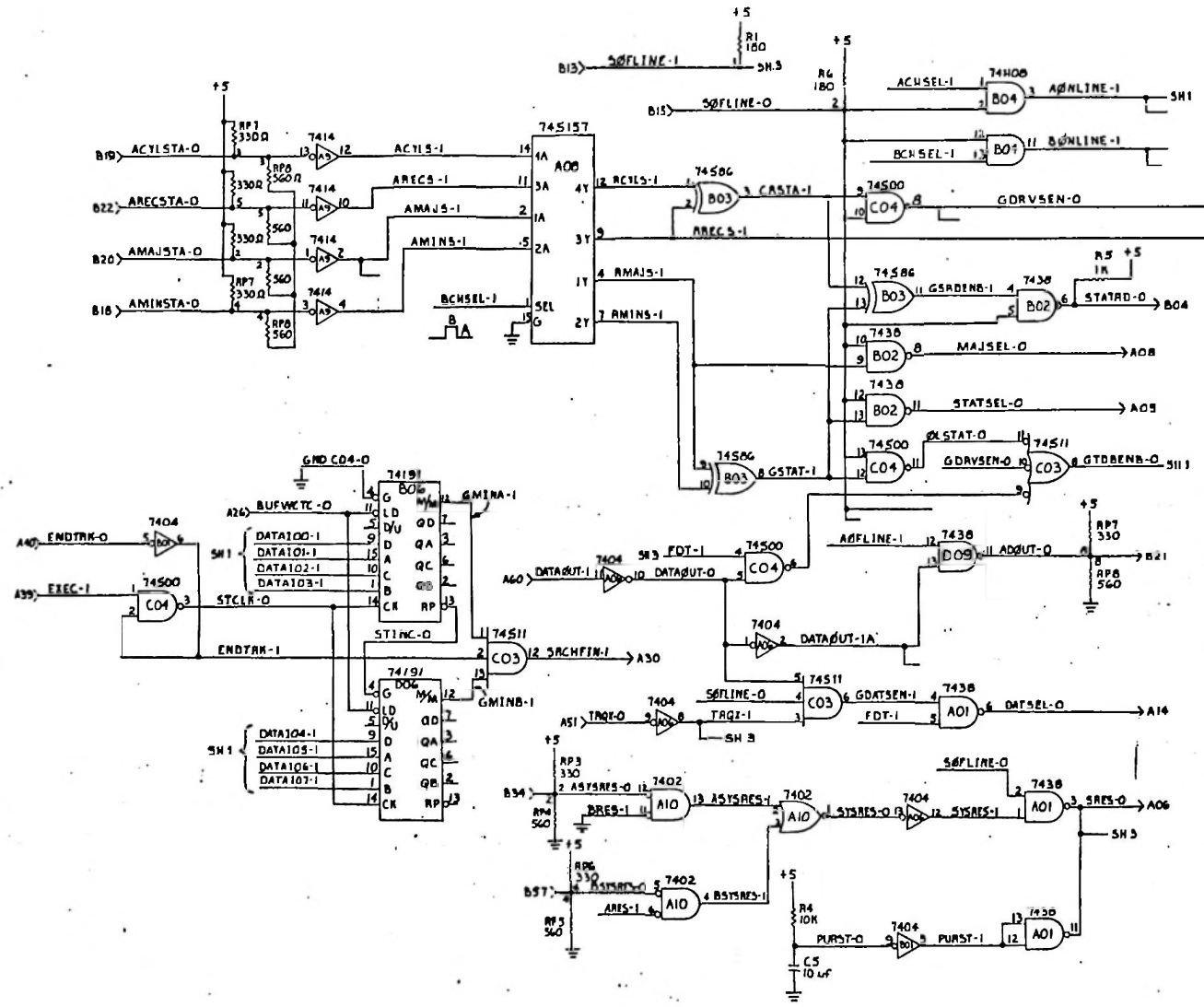
REVISIONS			
ZONE	DATE	DESCRIPTION	APPROVED
A	11-1-77	REVISED PER ENGINEERING CORRECTIONS	LS/LJS

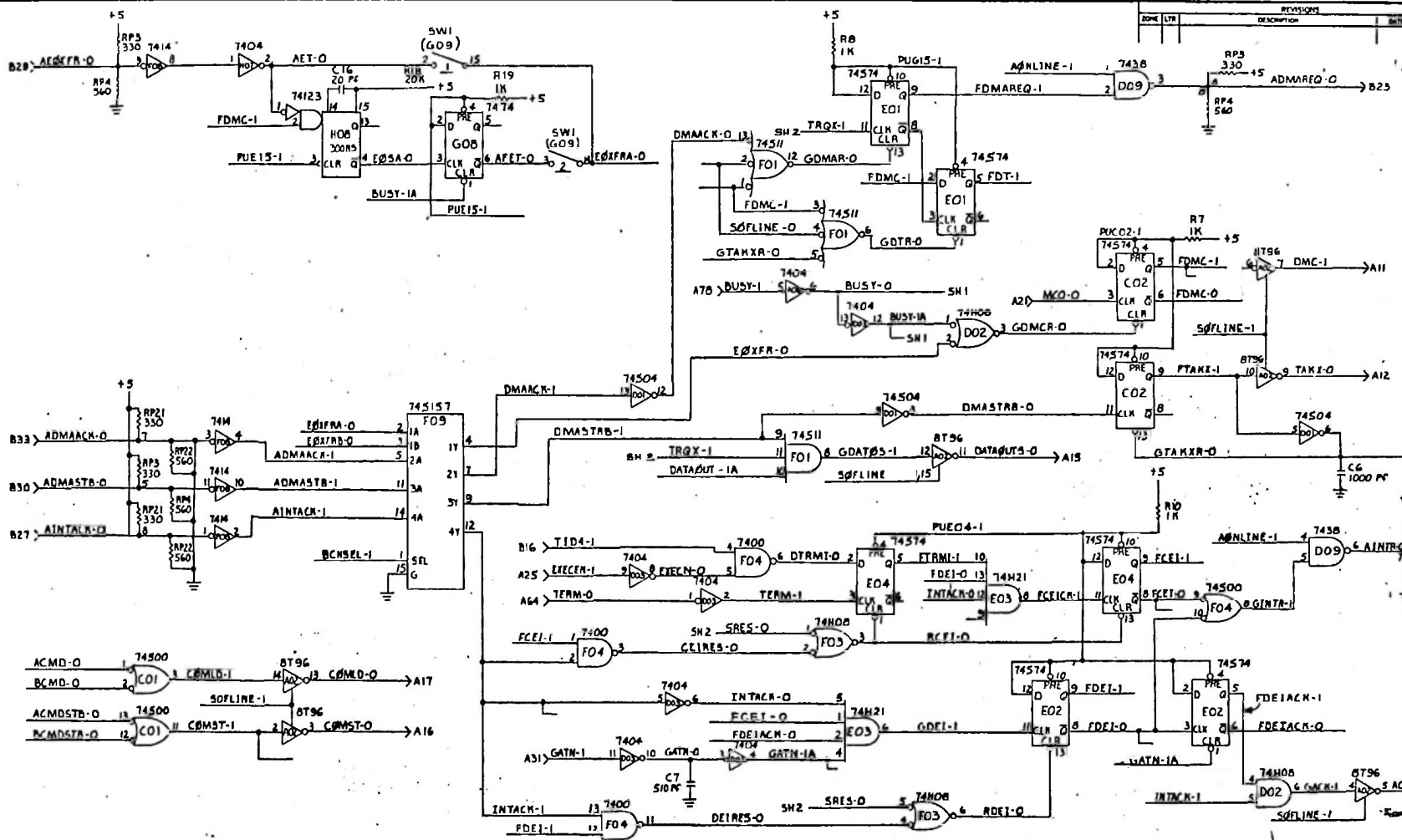


4. REF MATERIAL LIST 202098 ML2
 3. REF ASSEMBLY 202098 A2
 2. CAPACITOR VALUES ARE IN MICROFARADS
 1. RESISTOR VALUES ARE IN OHMS ±5%, 1/4 WATT
- NOTE UNLESS OTHERWISE SPECIFIED

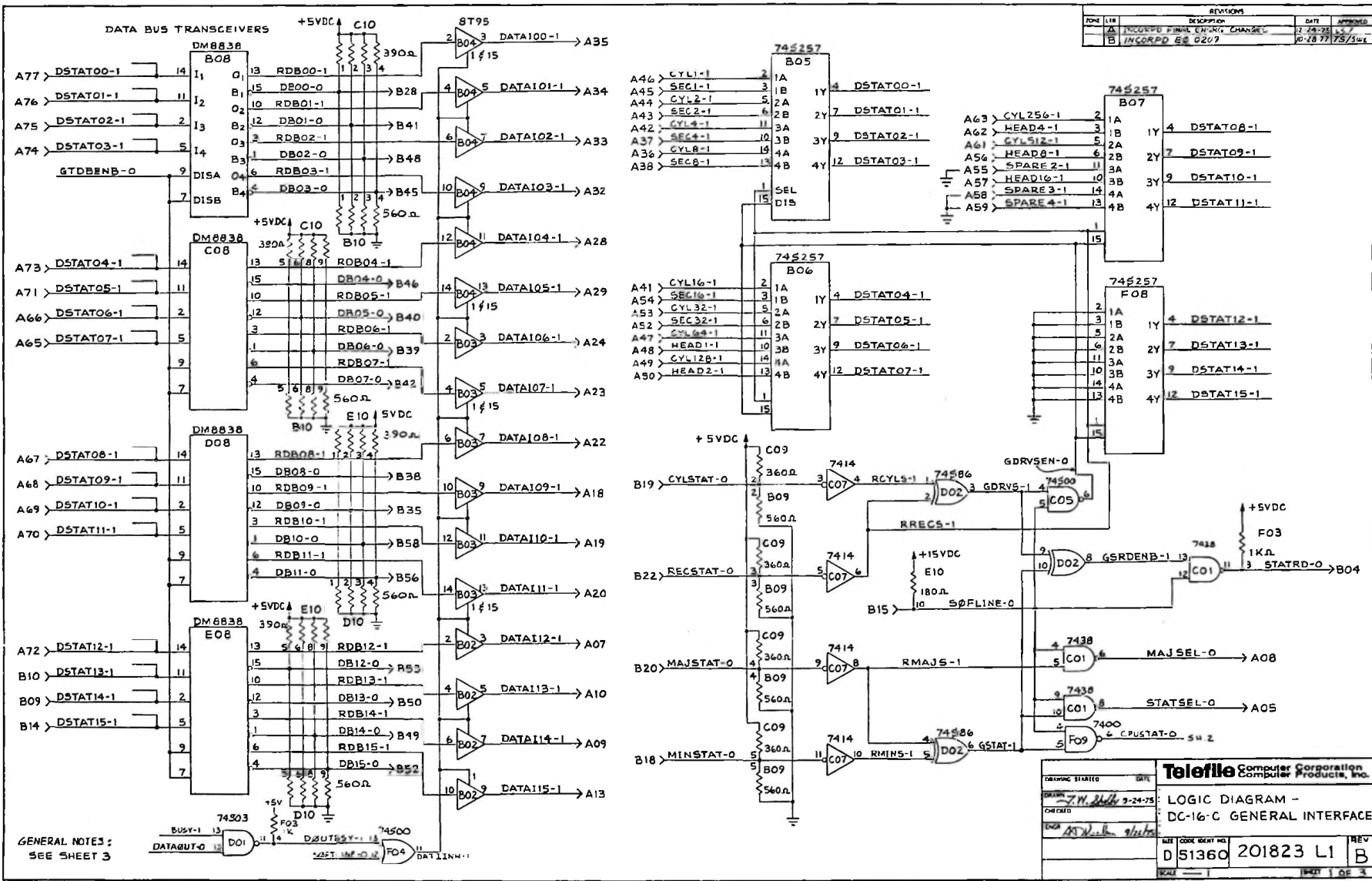
MATERIAL	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DATE	Tele. Computer Products, Inc.
	TOLERANCES ON DIMENSIONS: X.X = ±0.010 X.XX = ±0.005 X.XXX = ±0.001		
FORMER	CHECKED: [Signature]	DATE: 8-22-77	LOGIC DIAGRAM DC-16-C, (SINGLE HOST) GENERAL I/O BD.
PART NO.	ENGR: [Signature]	DATE: 8-22-77	REV: A
QUANTITY	QUANTITY	DATE: 8-22-77	202098 L2
SCALE	SCALE	DATE: 8-22-77	SHEET 1 OF 5

ZONE LTR		REVISIONS	DATE	APPROVED



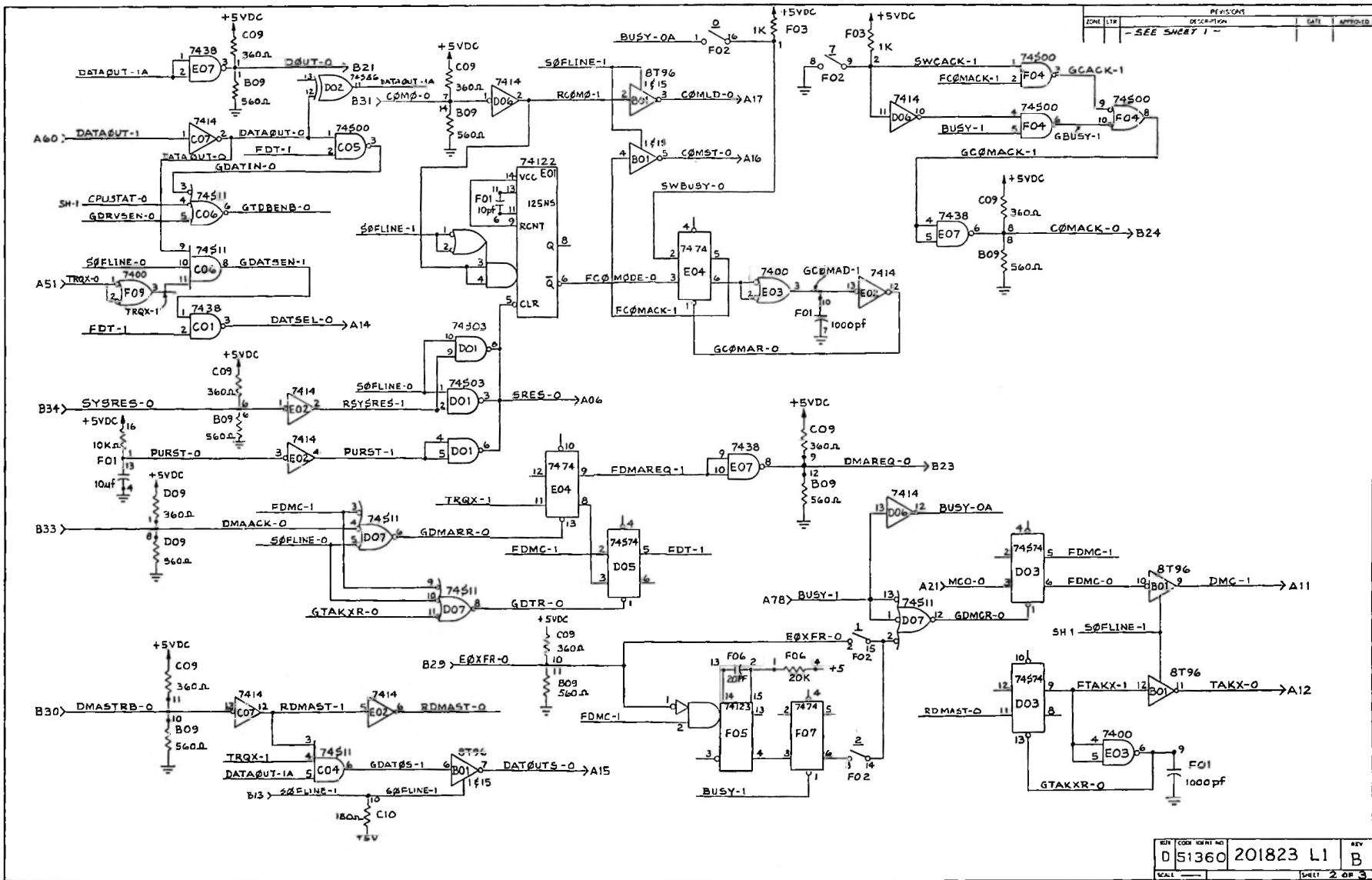


DATE	LTN	REVISION	DESCRIPTION	DATE	APPROVED



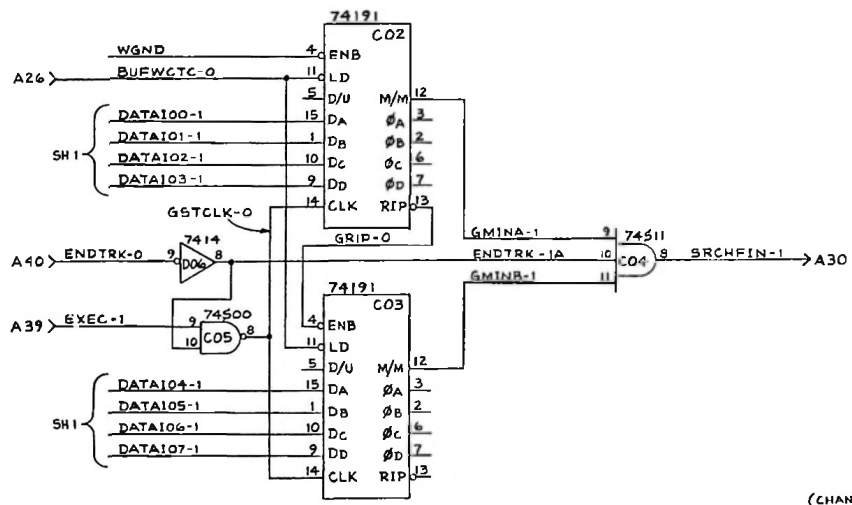
REVISIONS				
FORM	LIB	DESCRIPTION	DATE	APPROVED
A		INCORP'D FINAL CHANGES	12-29-75	L.S.
B		INCORP'D EQ 0207	10-28-77	TS/SW

DRAWING STARTED		DATE		Telefile Computer Corporation Computer Products, Inc.	
CHECKED		DATE			
LOGIC DIAGRAM - DC-16-C GENERAL INTERFACE				SIZE	CODE SHEET NO.
GENERAL NOTES: SEE SHEET 3				D51360 SCALE: 1	201823 L1 REV B SHEET 1 OF 3

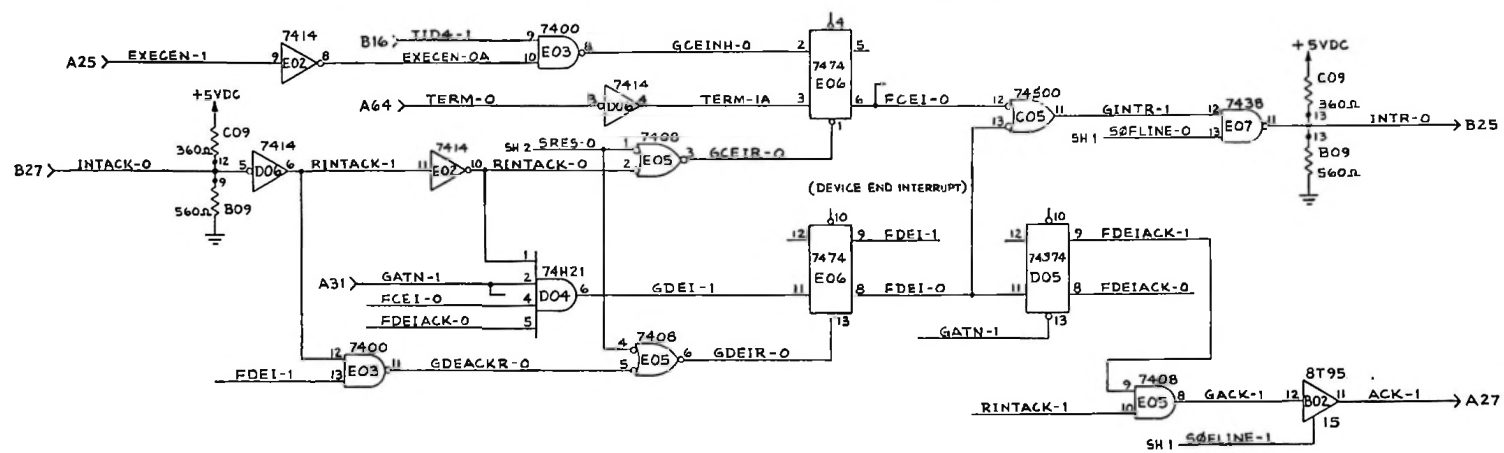


REVISIONS				
ZONE	REVISION	DESCRIPTION	DATE	APPROVED
A	1	SEE SMT-1		

SEARCH TERMINATION



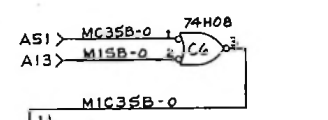
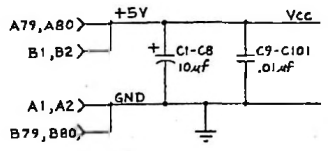
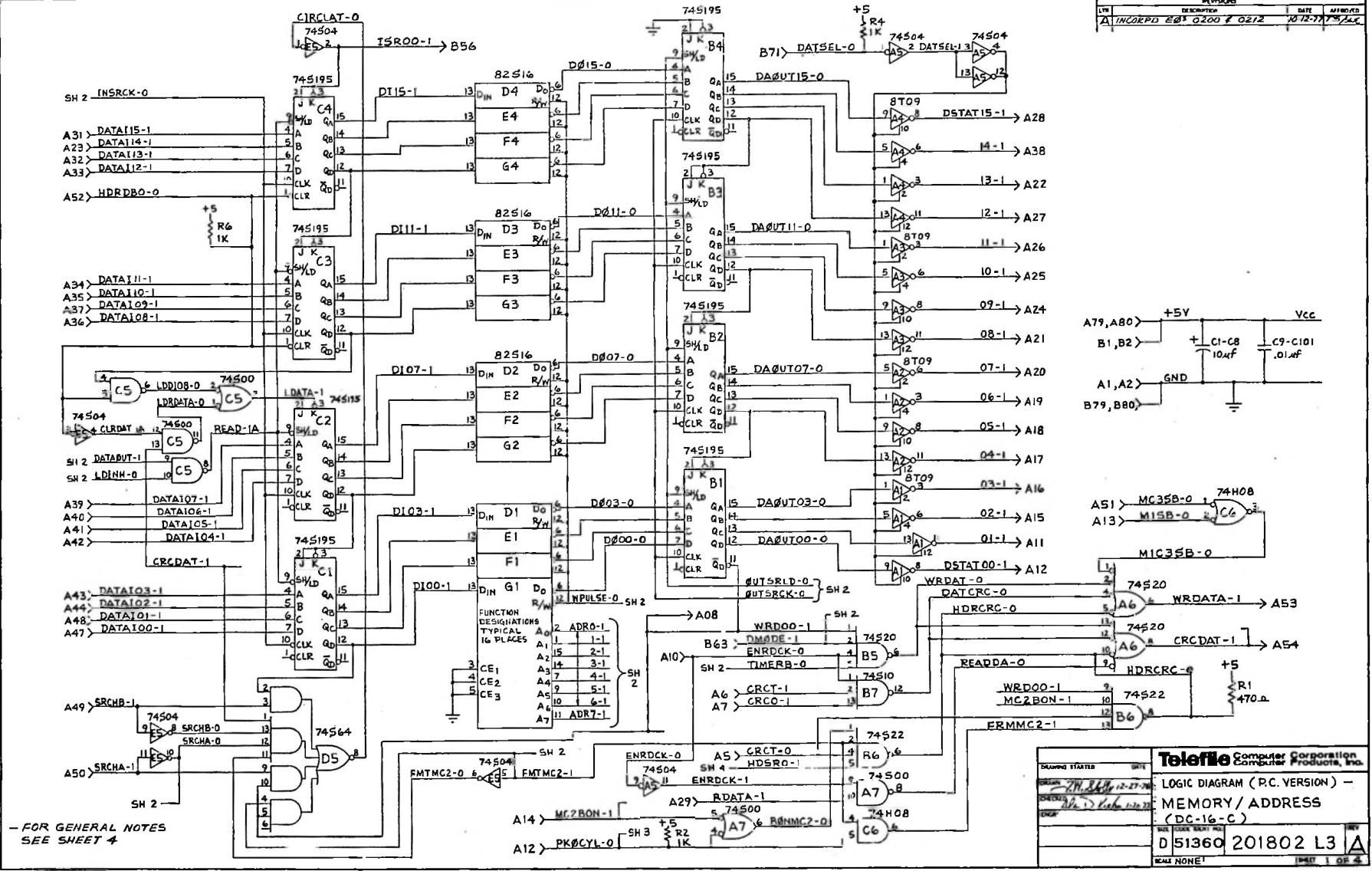
(CHANNEL END INTERRUPT)



- 4. CAPACITOR VALUES ARE IN MICROFARADS
 - 3. RESISTOR VALUES ARE IN OHMS \pm 5%
 - 2. REF ASSEMBLY DWG NO. 201823 A1
 - 1. REF MATERIAL LIST NO. 201823 ML1
- NOTE : UNLESS OTHERWISE SPECIFIED

SIZE	CODE SHEET NO.	REV.
D	51360	201823 L1
SCALE		SHEET 3 OF 3

REV	DESCRIPTION	DATE	APPROVED
A1	INCORP'D E81 Q200 & Q212	10/12/77	WJL/CCL



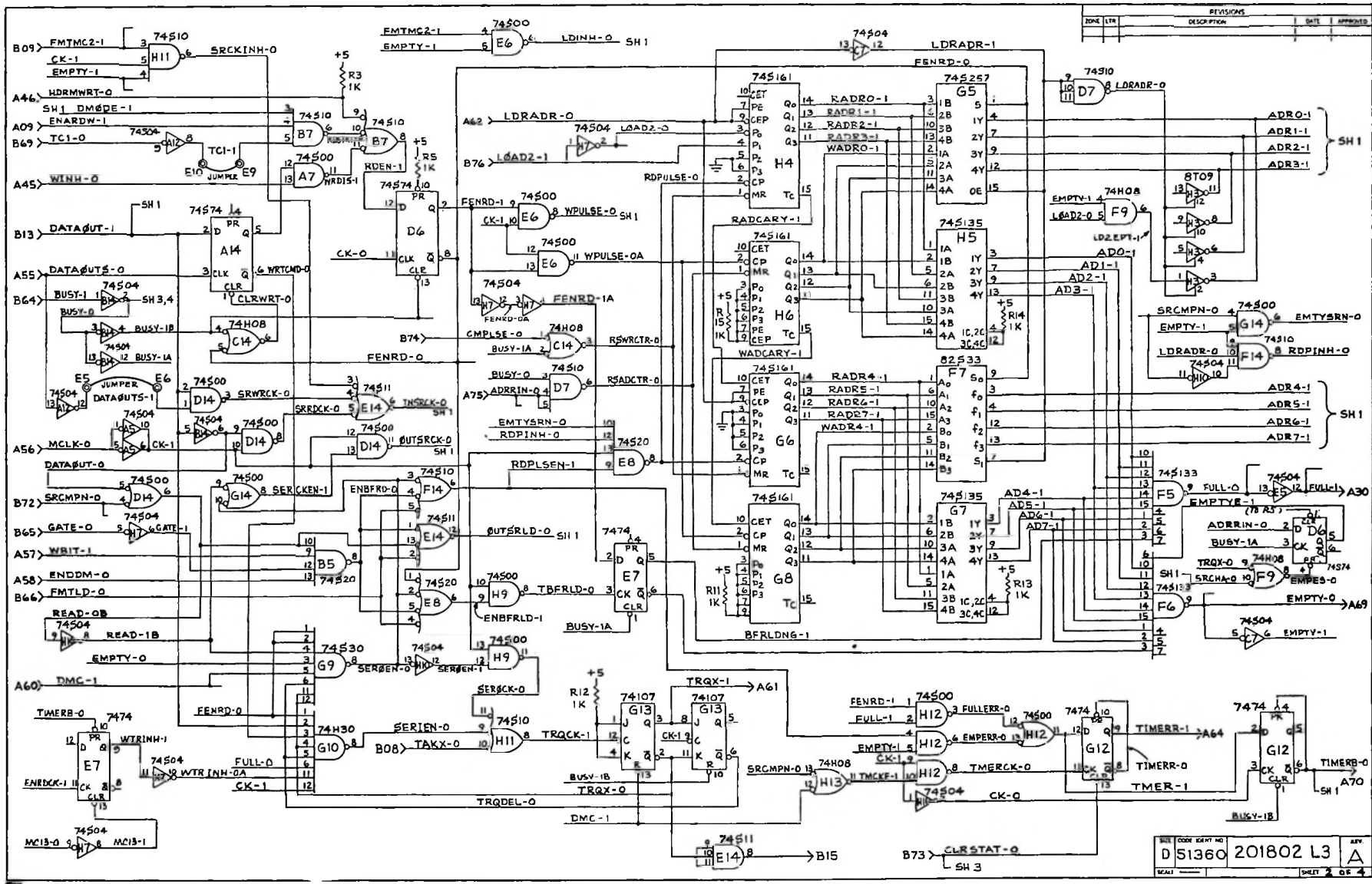
- FOR GENERAL NOTES
SEE SHEET 4

DESIGN	DATE	REV	DESCRIPTION
211	12-27-76	1	LOGIC DIAGRAM (P.C. VERSION) - MEMORY/ADDRESS (DC-16-C)
212	12-27-76	2	

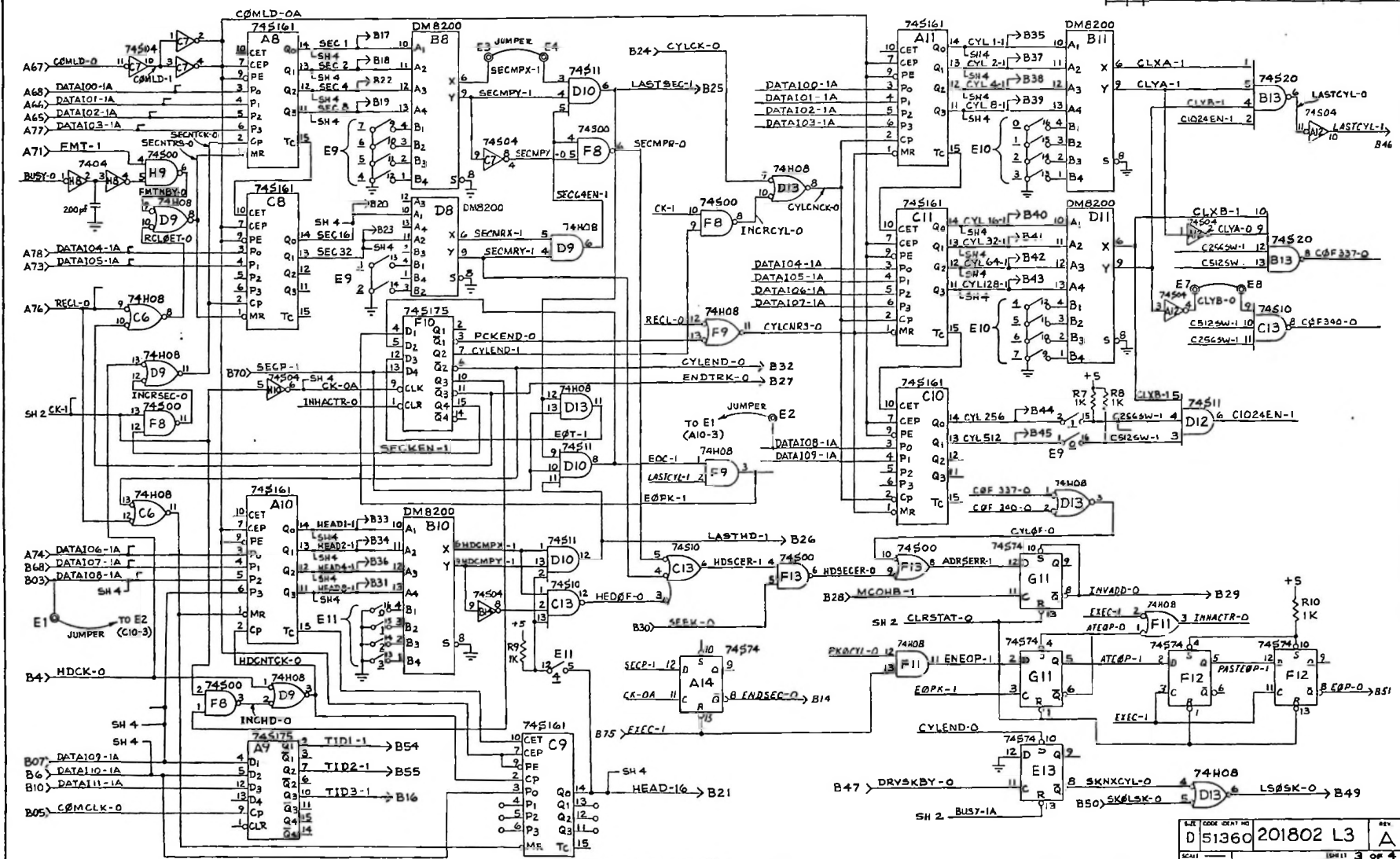
Telefile Computer Corporation
 10000 W. 12th St., Denver, CO 80202
 (303) 751-1000

Part No. **D51360** 201802 L3

REV 1 OF 4

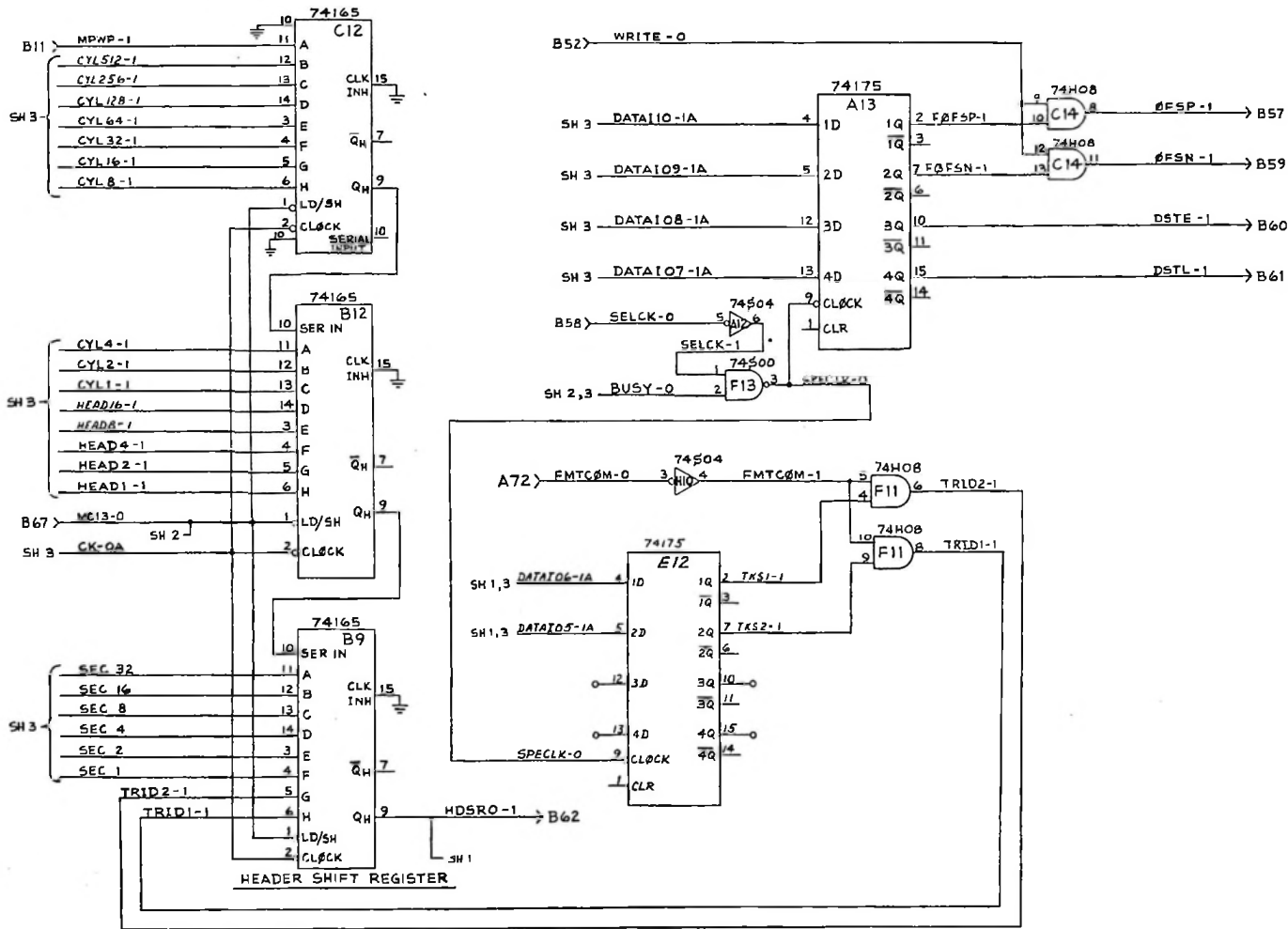


DATE	DESCRIPTION	DATE	APPROVED



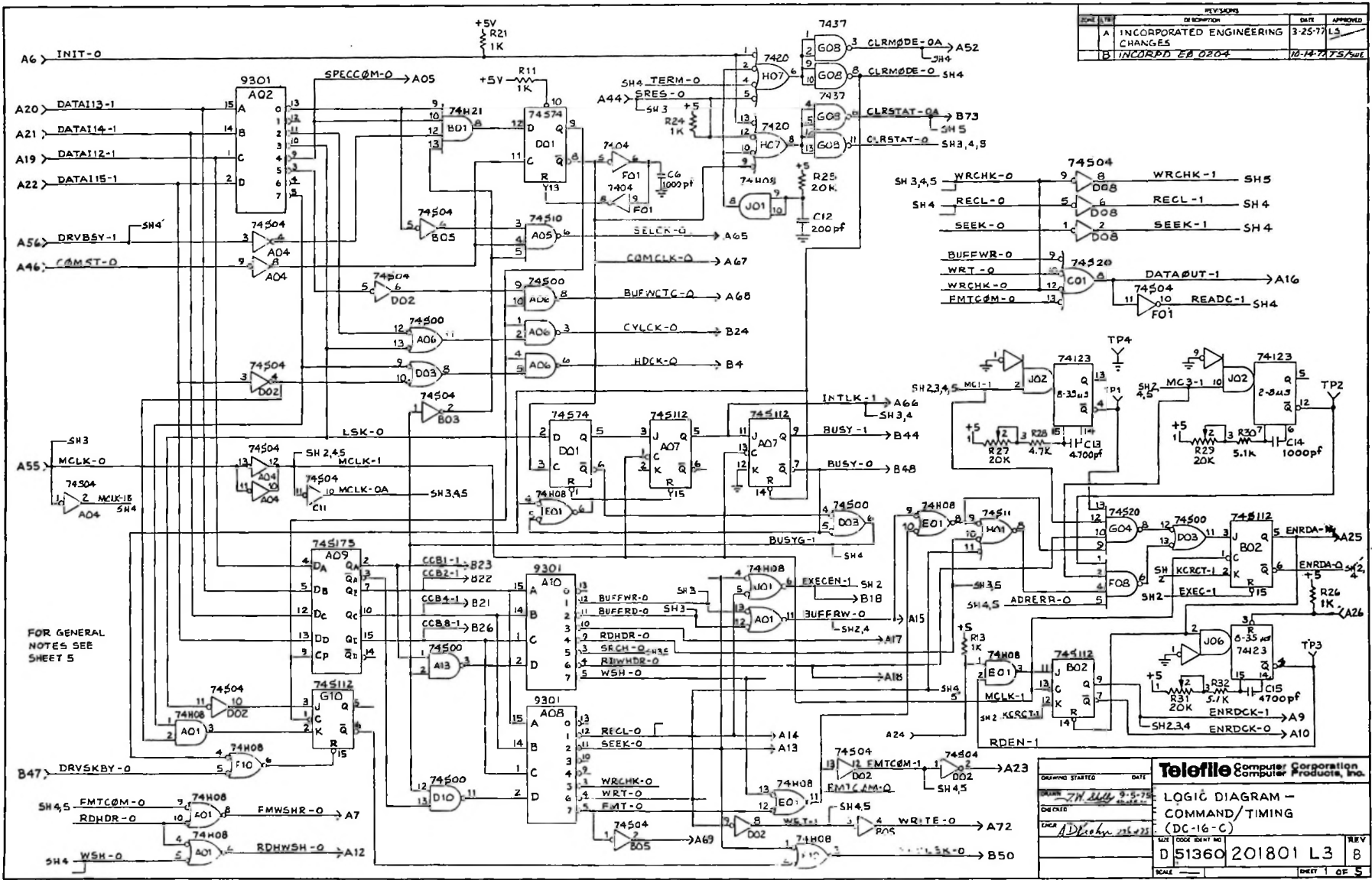
REV	CODE	IDENT NO	REV
D	51360	201802 L3	Δ
SCALE			

REVISIONS			
ZONE (LTR)	DESCRIPTION	DATE	APPROVED



4. CAPACITOR VALUES ARE IN MICROFARADS
 3. RESISTOR VALUES ARE IN OHMS ± 5%
 2. REF ASSEMBLY DWG NO. 201802 A3
 1. REF MATERIAL LIST NO. 201802 ML3
- NOTE: UNLESS OTHERWISE SPECIFIED

SCALE	D 51360	201802 L3	REV



REV	DATE	DESCRIPTION	APPROVED
A	3-25-77	INCORPORATED ENGINEERING CHANGES	L3
B	10-14-75	ED 0204	L3

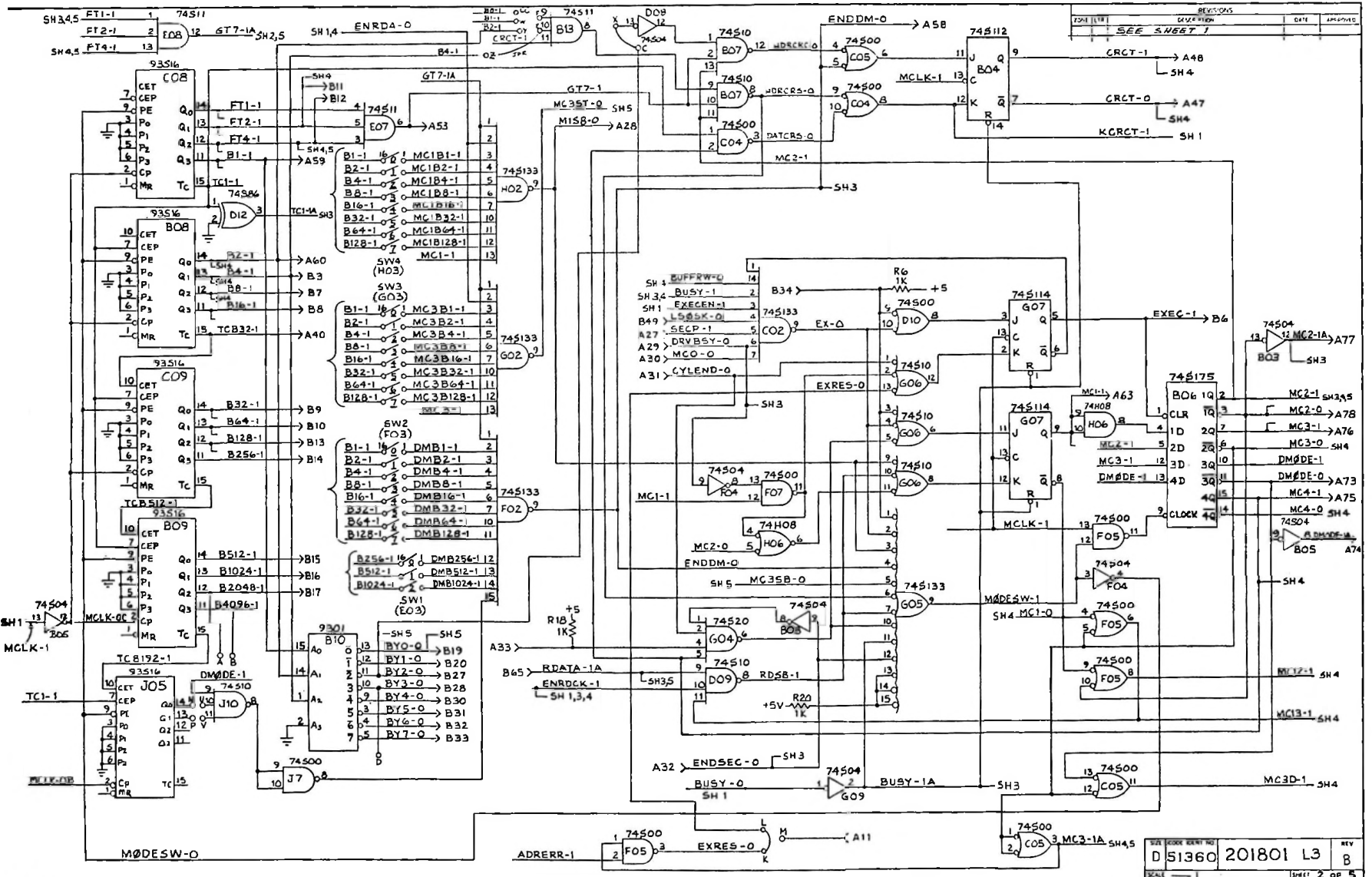
FOR GENERAL NOTES SEE SHEET 5

DRAWING STARTED		DATE	
DRAWN		DATE	
CHECKED		DATE	
DESIGNED		DATE	
SCALE		SHEET 1 OF 5	

Telefile Computer Corporation
Computer Products, Inc.

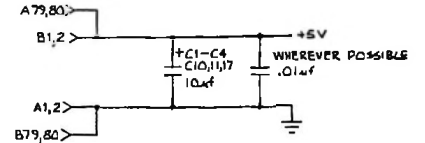
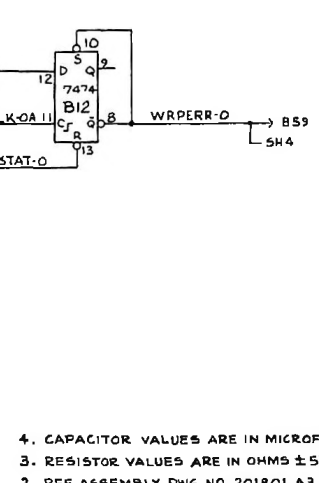
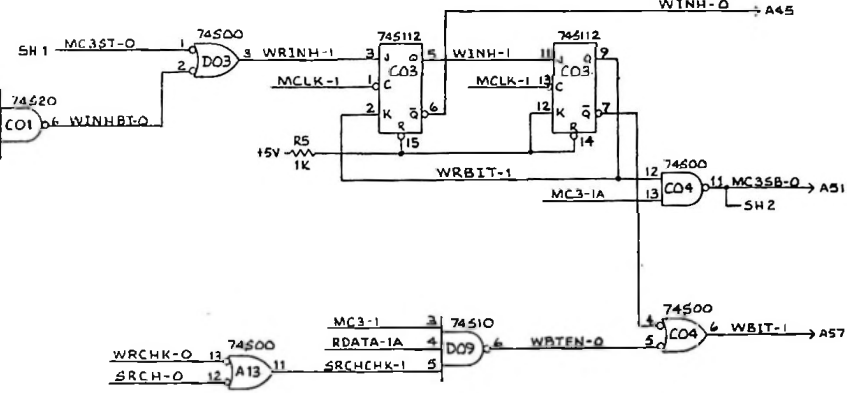
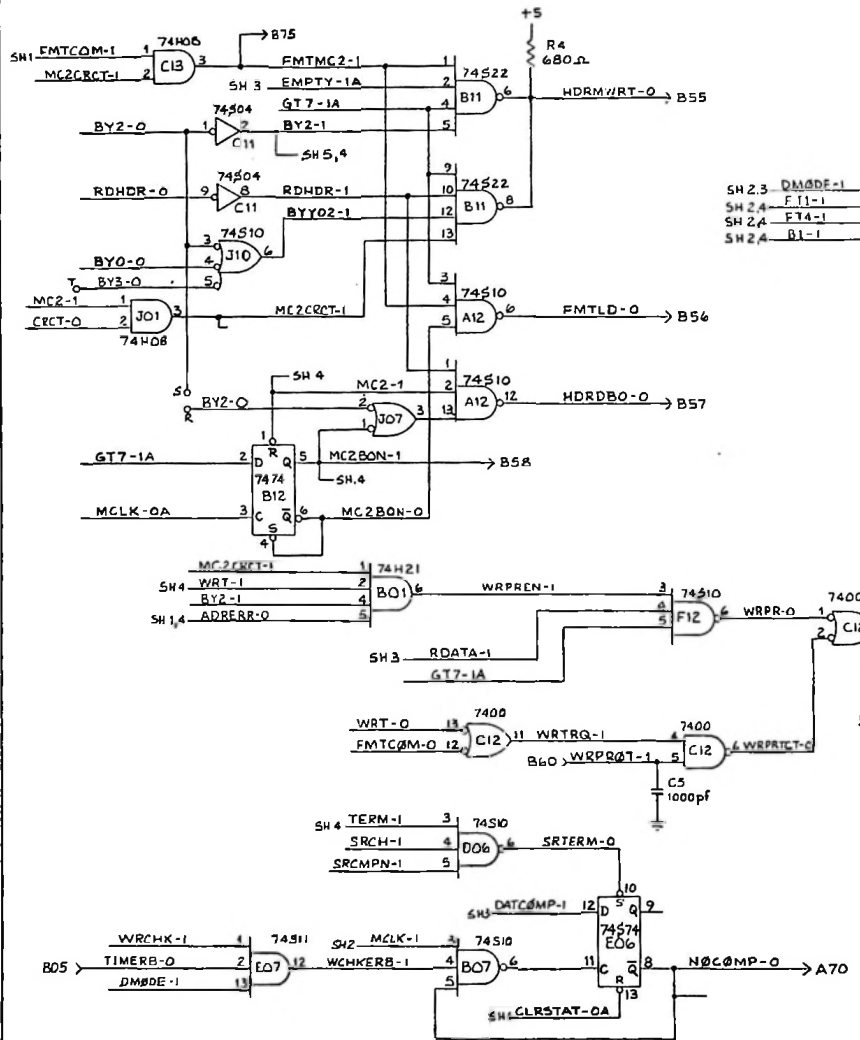
LOGIC DIAGRAM -
COMMAND/TIMING
(DC-16-C)

SUB CODE SHEET NO. D51360 201801 L3 8



REV	DATE	APPROVED
1	20180113	

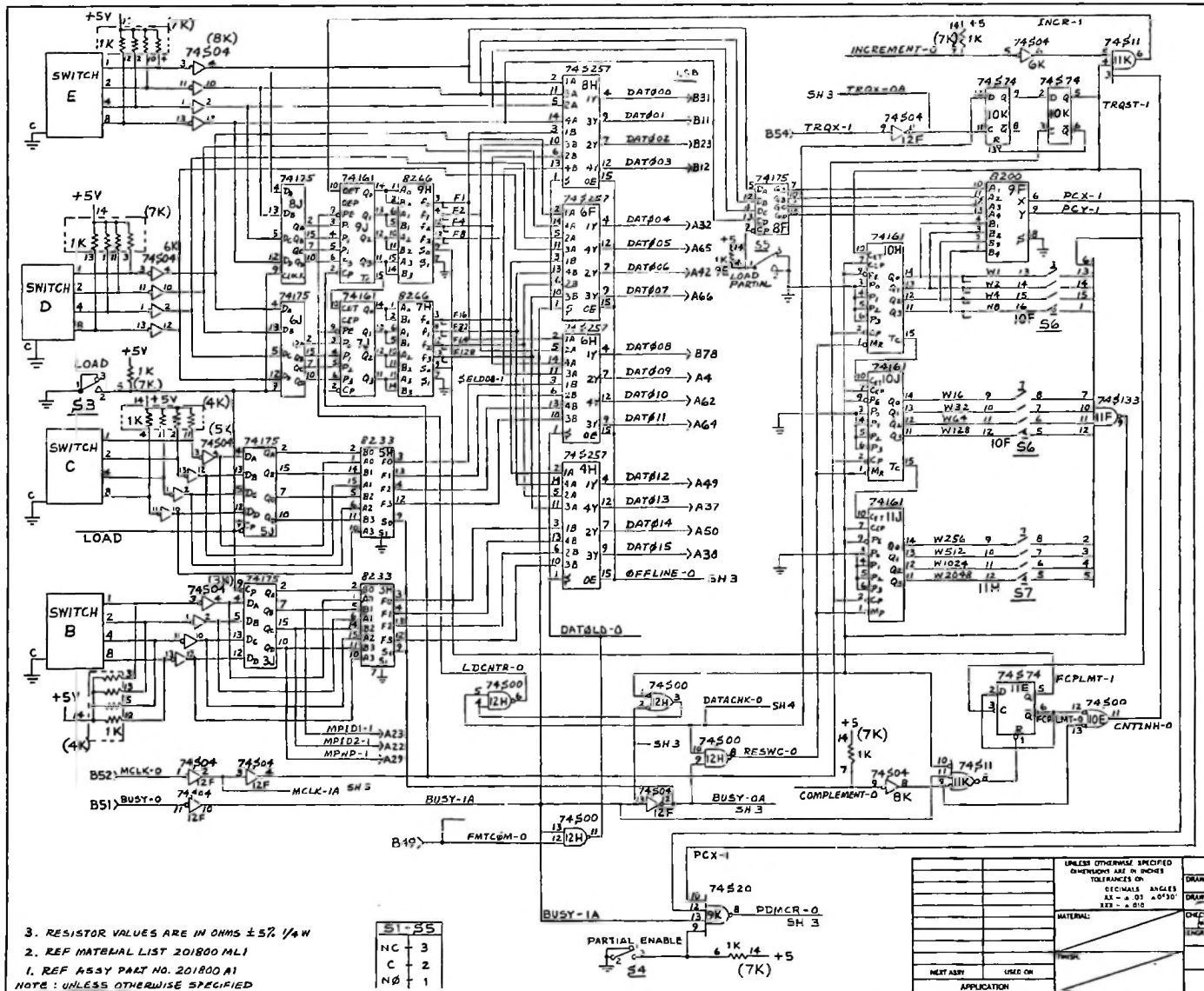
ZONE	LIST	DESCRIPTION	DATE	APPROVED
		SC. SHEET 1		



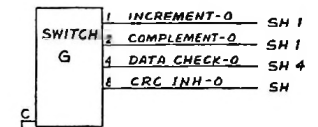
4. CAPACITOR VALUES ARE IN MICROFARADS
 3. RESISTOR VALUES ARE IN OHMS ± 5%
 2. REF ASSEMBLY DWG NO. 201801 A3
 1. REF MATERIAL LIST NO. 201801 ML3
- NOTE: UNLESS OTHERWISE SPECIFIED

DATE	CODE IDENT NO	REV.
D 51360	201801 L3	B

SCALE: SHEET 5 OF 5



REVISIONS				
EDN	LTN	DESCRIPTION	DATE	APPROVED
A		ENABLE CORRECTIONS	6-24-75	ML
B		ADDED R50, C45, CR2, I.C. 2C4X 2D	7-2-76	ML



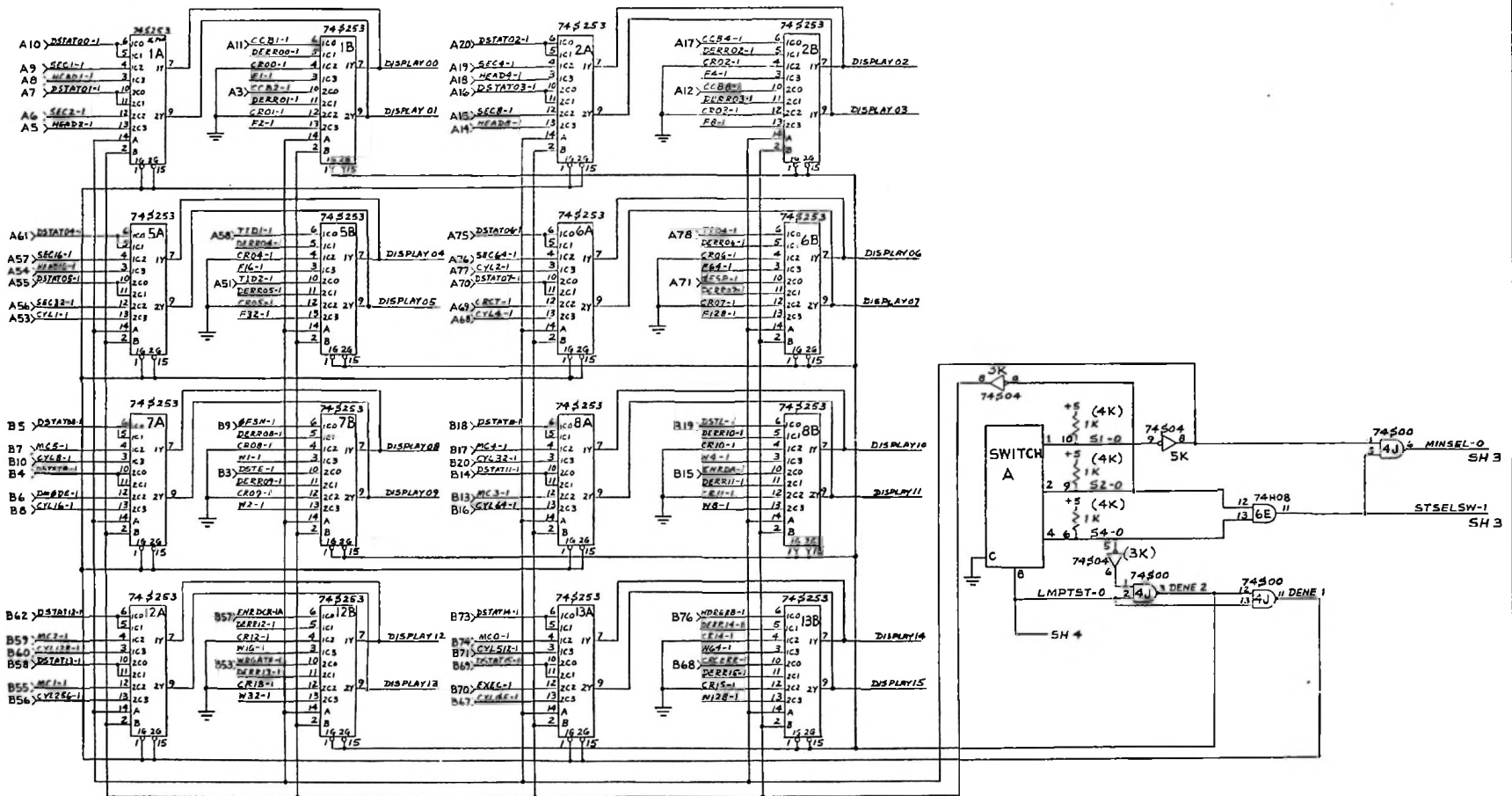
- 3. RESISTOR VALUES ARE IN OHMS $\pm 5\%$ 1/4W
- 2. REF MATERIAL LIST 201800 MLI
- 1. REF ASSY PART NO. 201800 A1
- NOTE: UNLESS OTHERWISE SPECIFIED

SI	SS
NC	3
C	2
NØ	1

UNLESS OTHERWISE SPECIFIED	
DIMENSIONS ARE IN INCHES	
TOLERANCES ON	
DIMENSIONS	ANGLES
Ø	± .01
Ø	± .01
Ø	± .01
MATERIAL	
DATE	
DESIGNED BY	
CHECKED BY	
DATE	
TESTED BY	
USED ON	
APPLICATION	

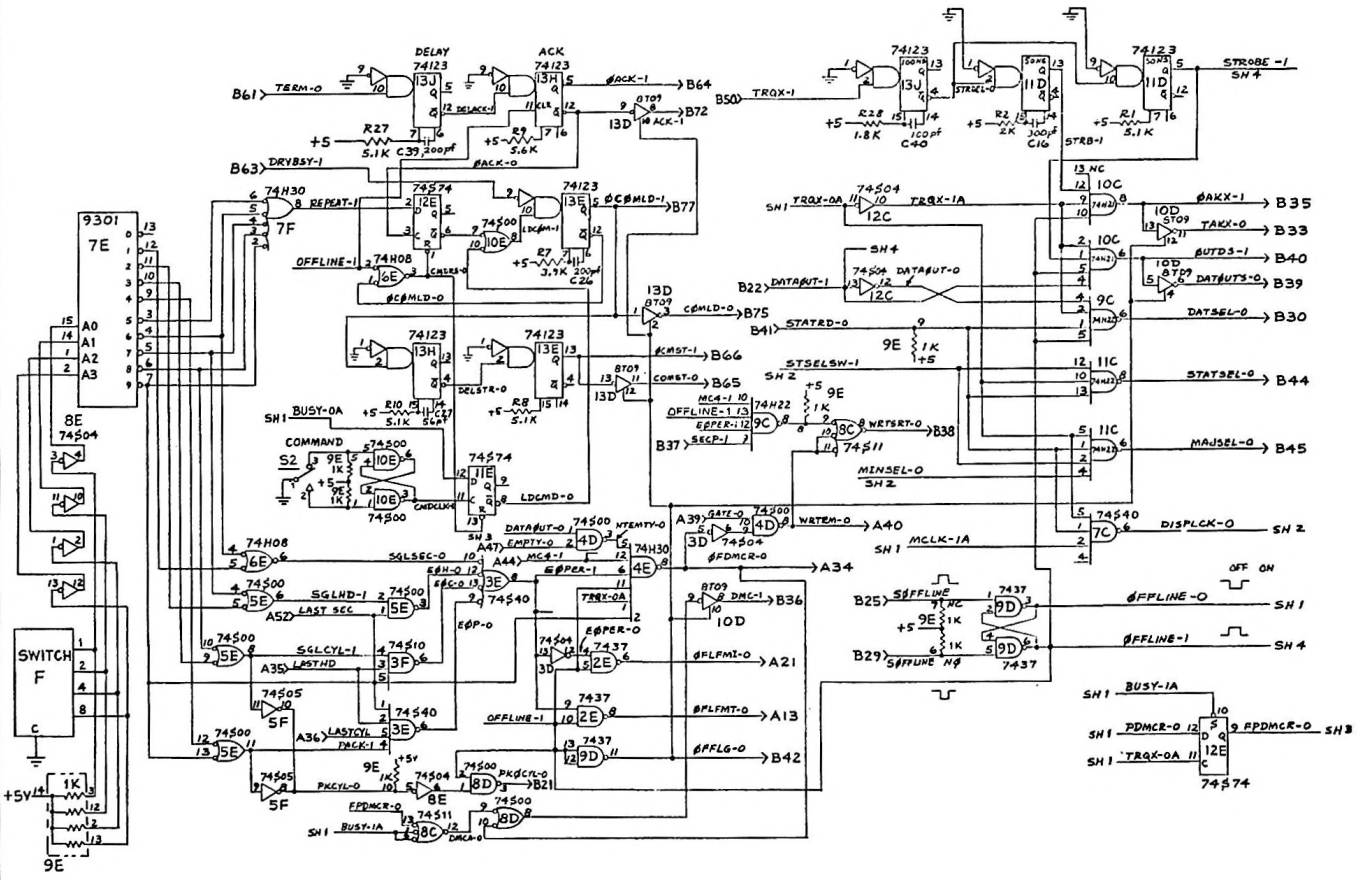
Telefile Computer Corporation Computer Products, Inc.	
LOGIC DIAGRAM - MAINTENANCE PANEL (DC-16-C)	
SIZE	201800 L1
REV	B
SCALE	SHEET 1 OF 4

REV	DATE	BY	CHKD	DESCRIPTION
A				SEE SHEET 1

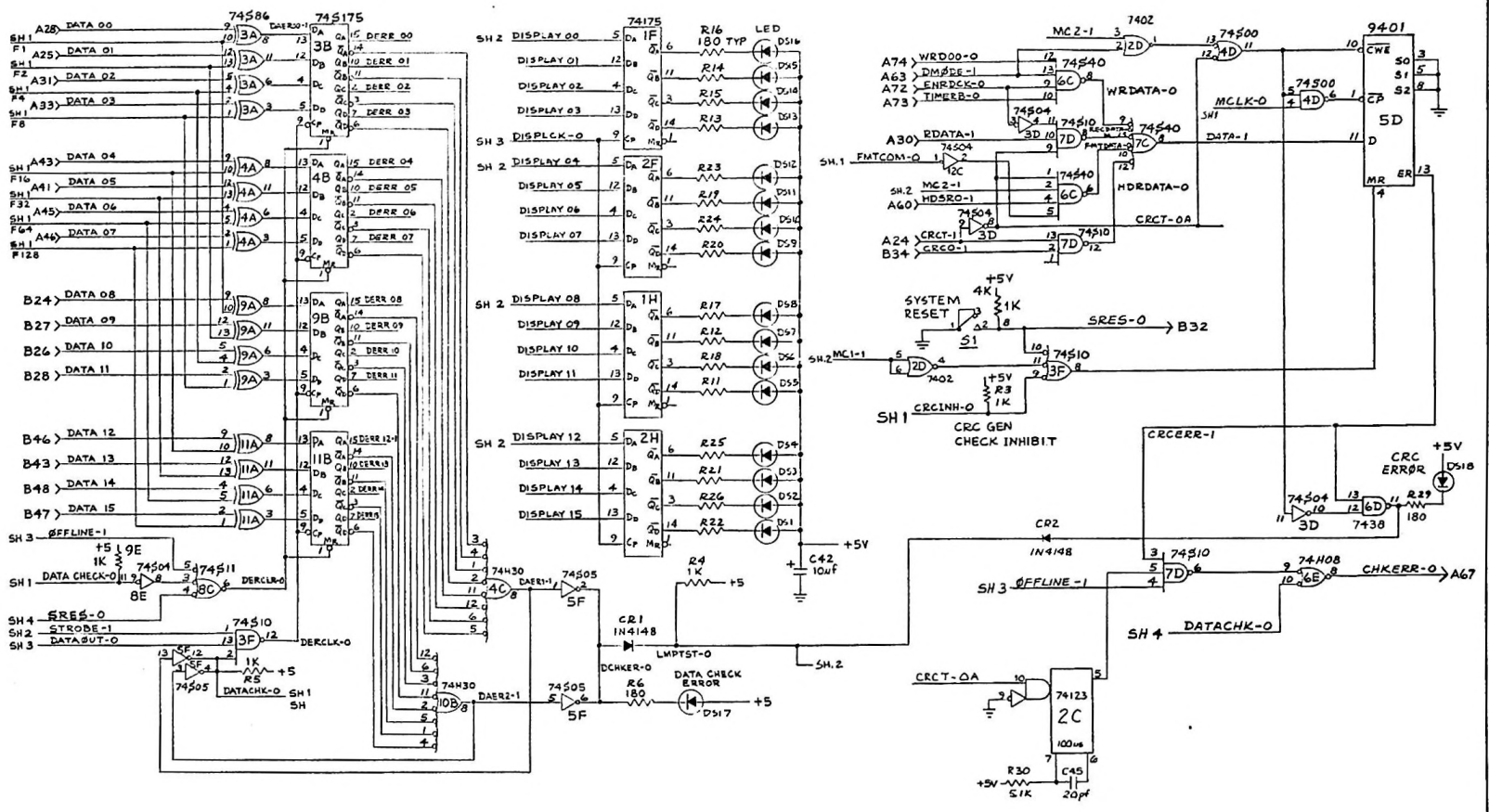


REV	COORDINATE NO	DATE	BY
D	51360	201800	L1
SCALE			SHEET 2 OF 4

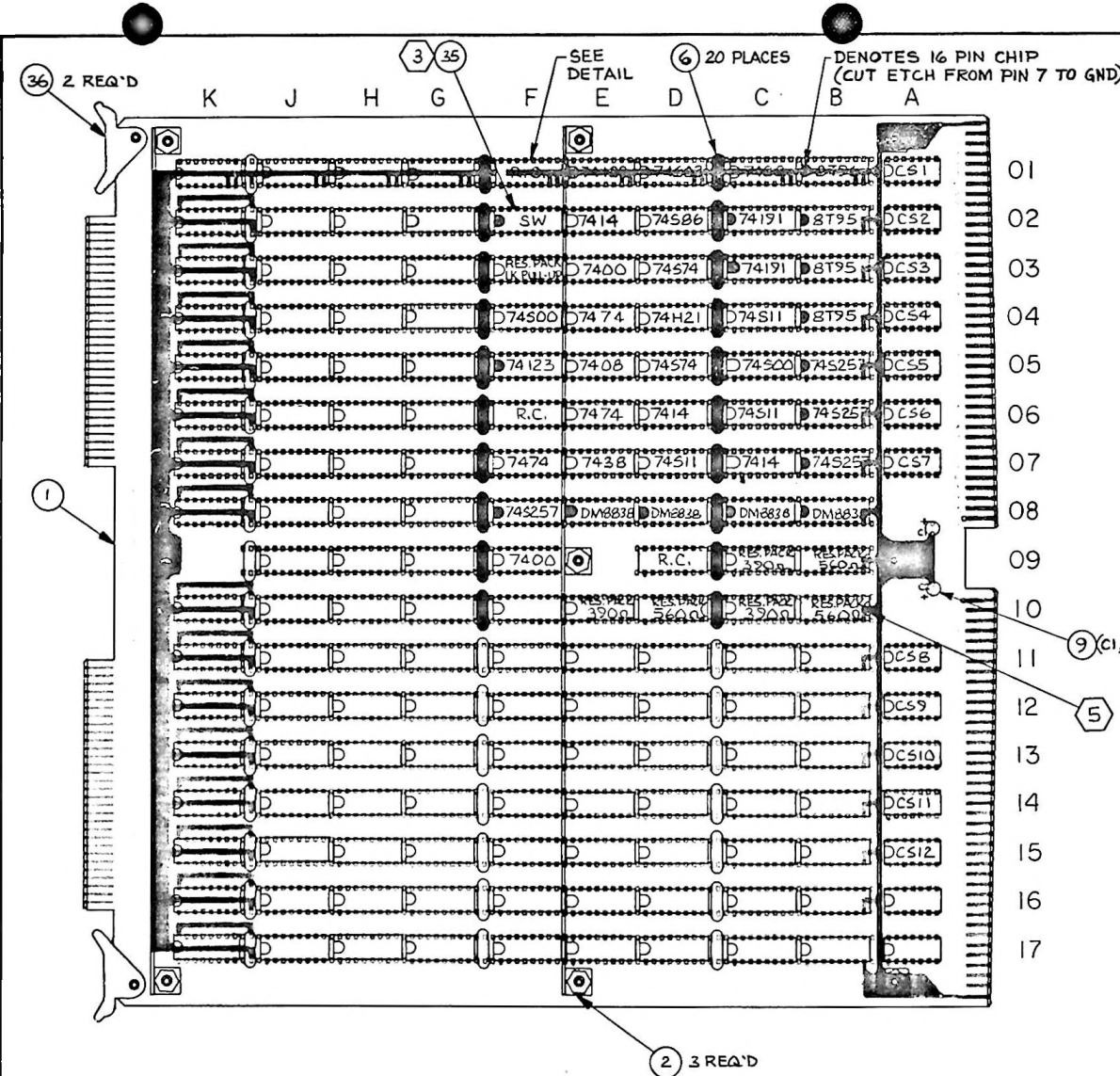
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
A	1	SEE SHEET 1		



REVISIONS			
ZONE	DATE	DESCRIPTION	APPROVED
A		SEE SHEET 1	

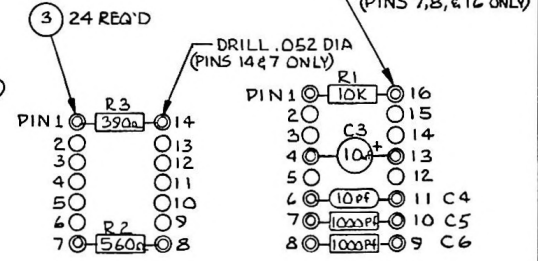
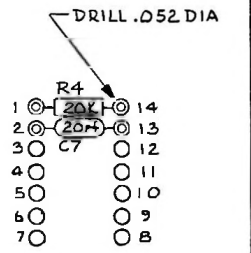


SIZE	COOL IDENT NO	REV
D	51360	201800 L1
SCALE		B



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INCORPORATED FINAL ENG. CHANGE	1-5-76	LS
	-	RECORD CHANGE	3-11-76	T.B.
	R	INCORPD EQ 0209	10-28-74	TS/SWE

HANDWIRE 26 AWG	
2493	TO 2486
2391	TO 2486
2592	TO 2686
2693	TO 2686
2894	TO 2886
2890	TO 2886
2792	TO 2885
2994	TO 3086
3092	TO 3086
2991	TO 3085



LOCATION D-09 F-01

DETAIL

INSTALL COMPONENTS AS SHOWN USING ITEM 3. DRILL .052 DIA HOLE AND INSERT SINGLE WRAP PIN (ITEM 3) AT FOLLOWING LOCATIONS: 2486, 2686, 2885, 2886, 3085, 3086

6. REF WIRE LIST 201823 WL1
- (5) INSTALL RESISTOR PACKS AS SHOWN. (B09, B10, D10)
4. CUT ETCH FROM PIN 7 TO GND AT C09, C10, E10, F03, F04
- (3) CUT ETCH ON VCC PIN ONLY AT B09, B10, D10, F02
2. INSTALL COMPONENTS PER 201823 MLI.
1. SEE 201823 LI FOR LOGIC DIAGRAM.

NOTE: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON		DRAWING STARTED		DATE		Telefile Computer Corporation Computer Products, Inc.	
DECIMALS ANGLES XX = ± .03 ± 0°30' XXX = ± .010		DRAWN S. Miller 9-15-75		DATE			
MATERIAL:		CHECKED		ENGR S. Miller 9/26/75		GENERAL INTERFACE	
FINISH:		NEXT ASSY		USED ON		DC-16-C	
APPLICATION		SCALE 1/1		CODE IDENT NO. C 51360		201823 A1	
						REV B	
						SHEET 1 OF 2	

INTERFACE CONNECTIONS

ZONE		LTR		REVISIONS		DATE	APPROVED
				- SEE SH 1			

FROM IC-PIN TO

A01-01 A17
 -02 A16
 -03 A15
 -04 A11
 -05 A12
 -06 A04
 -07 A13
 -08 A08
 -09 A05
 -10 A06
 -11 A07
 -12 A10
 -13 A09
 -14 A03

A02-01 A27
 -02 A26
 -03 A25
 -04 A24
 -05 A23
 -06 A22
 -10 A18
 -11 A19
 -12 A20
 -13 A21
 -14 A14

A03-01 A35
 -02 A34
 -03 A33
 -04 A32
 -10 A28
 -11 A29
 -12 A30
 -13 A31

A04-01 A46
 -02 A45
 -03 A44
 -04 A43
 -05 A42
 -08 A37
 -09 A36
 -10 A38
 -11 A39
 -12 A40
 -13 A41

A05-03 A54
 -04 A53
 -05 A52
 -08 A47
 -09 A48
 -11 A49
 -12 A50
 -13 A51

A06-01 A64
 -02 A63
 -03 A62
 -04 A61
 -08 A56
 -09 A55
 -10 A57
 -11 A58
 -12 A59
 -13 A60

A07-01 A78
 -02 A77
 -03 A76
 -04 A75
 -05 A74

A07-06 A73
 -07 A71
 -08 A66
 -09 A65
 -10 A67
 -11 A68
 -12 A69
 -13 A70
 -14 A72

+5 VOLTS A79
 (VCC) A80
 B01
 B02

GND A01
 (COMMON) A02
 B79
 B80

A11-01 B10
 -02 B09
 -03 B14
 -04 B13
 -05 B15
 -06 B16
 -07 B12
 -08 B07
 -09 B08
 -10 B05
 -11 B06
 -12 B03
 -13 B04
 -14 B11

A12-01 B21
 -02 B24
 -03 B23
 -04 B25
 -05 B26
 -08 B19
 -10 B22
 -11 B20
 -12 B17
 -13 B18

A13-03 B31
 -04 B34
 -05 B36
 -06 B33
 -08 B30
 -10 B29
 -11 B32
 -12 B27
 -13 B28

A14-01 B41
 -02 B44
 -03 B48
 -04 B45
 -05 B46
 -06 B43
 -08 B40
 -09 B39
 -10 B42
 -11 B37
 -12 B38
 -13 B35

A15-03 B58
 -04 B55
 -05 B56
 -06 B53

A15-08 B50
 -09 B47
 -10 B49
 -11 B52
 -12 B51
 -13 B54

A16-04 B63
 -05 B64
 -08 B57
 -09 B60
 -10 B59
 -11 B62
 -12 B61

A17-01 B73
 -02 B78
 -03 B72
 -04 B76
 -05 B75
 -06 B71
 -07 B77
 -08 B68
 -09 B67
 -10 B70
 -11 B69
 -12 B65
 -13 B66
 -14 B74

K02-01 XB04
 -02 XA05
 -03 XA04
 -04 XB03
 -05 XB02
 -10 XA01

K03-01 XB10
 -02 XA09
 -03 XB09
 -04 XB08
 -05 XA08

K04-01 XB15
 -02 XA14
 -03 XB14
 -04 XA13
 -05 XB13
 -09 XA12
 -10 XA10
 -11 XB11
 -12 XA11
 -13 XB12

K05-01 XB20
 -02 XA19
 -03 XB19
 -04 XA18
 -09 XA17
 -10 XA15
 -11 XB16
 -12 XA16
 -13 XB17

K06-01 XB25
 -02 XA24
 -03 XB24
 -04 XA23
 -05 XB23
 -09 XA22
 -10 XA20
 -11 XB21
 -12 XA21
 -13 XB22

K07-01 XA29
 -02 XB29
 -03 XA28
 -04 XA27
 -05 XB30
 -06 XA30
 -09 XB28
 -10 XB26
 -11 XA25
 -12 XA26
 -13 XB27

K11-01 YB05
 -02 YB04
 -03 YA04
 -04 YB03
 -05 YB02
 -10 YA01
 -11 YB01
 -12 YA02
 -13 YA03

K12-01 YA10
 -02 YB09
 -03 YA09
 -04 YB08
 -05 YA08
 -09 YA07
 -10 YA05
 -11 YA06
 -12 YB06
 -13 YB07

K13-01 YB15
 -02 YB14
 -03 YA14
 -04 YA13
 -05 YB13
 -09 YB12
 -10 YB10
 -11 YA11
 -12 YB11
 -13 YA12

K14-01 YB20
 -02 YA19
 -03 YB19
 -04 YA18
 -05 YB18
 -09 YA17
 -10 YA15
 -11 YB16
 -12 YA16
 -13 YB17

K15-01 YB25
 -02 YA24
 -03 YB24
 -04 YA23
 -05 YB23
 -09 YA22
 -10 YA20

K15-11 YB21
 -12 YA21
 -13 YB22

K16-01 YA29
 -02 YB29
 -03 YA28
 -04 YB28
 -05 YB30
 -06 YA30
 -09 YA27
 -10 YA25
 -11 YB26
 -12 YA26
 -13 YB27

D

D

C

C

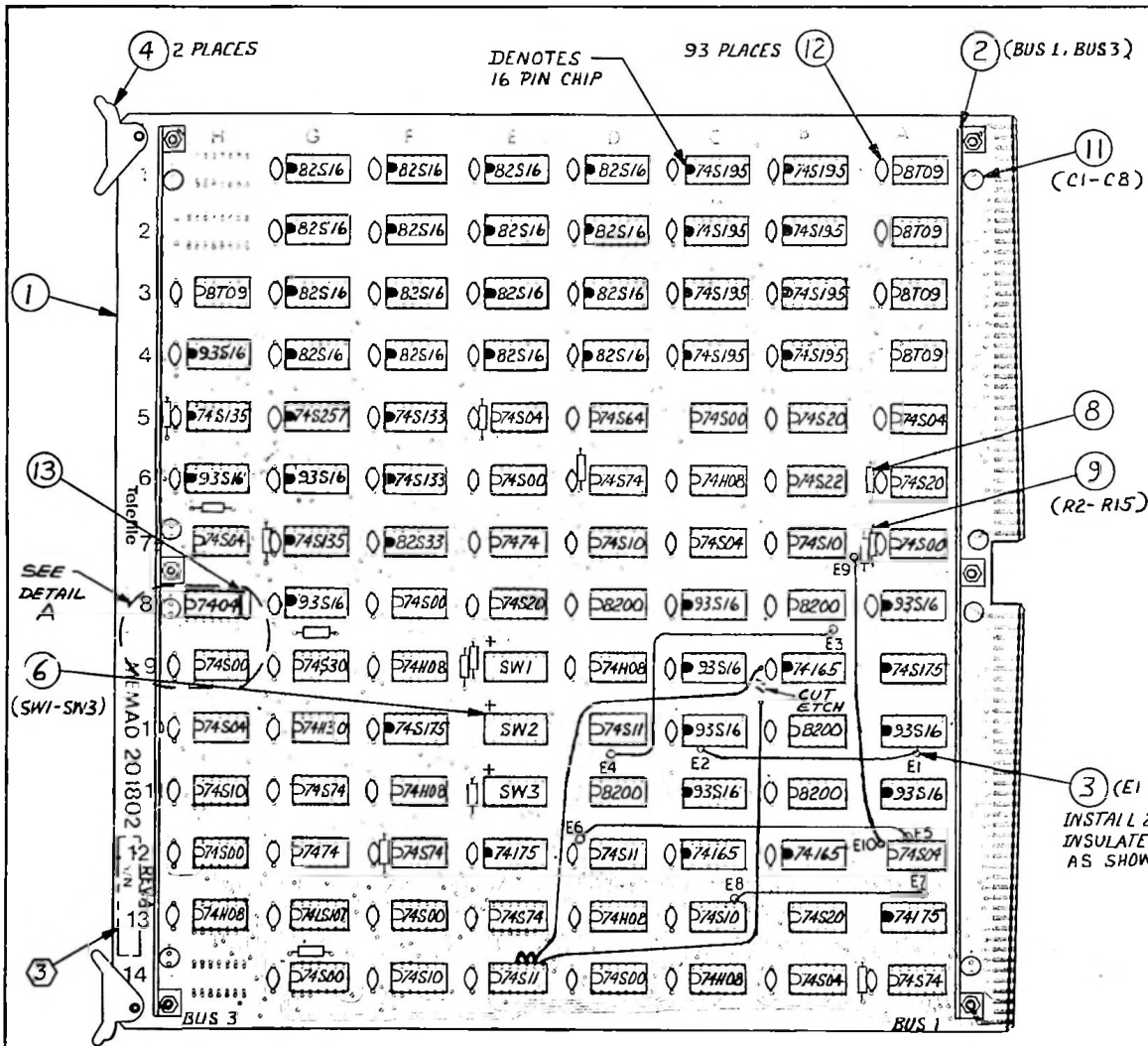
B

B

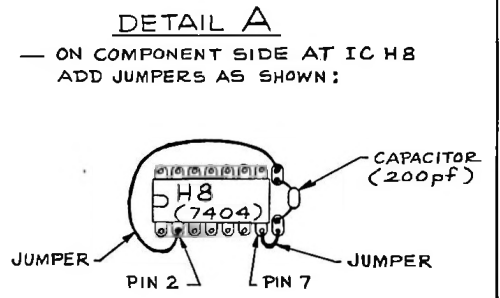
A

A

SIZE	CODE IDENT NO.	REV
C	51360	B
SCALE NONE		201823 A1
		SHEET 2 OF 2



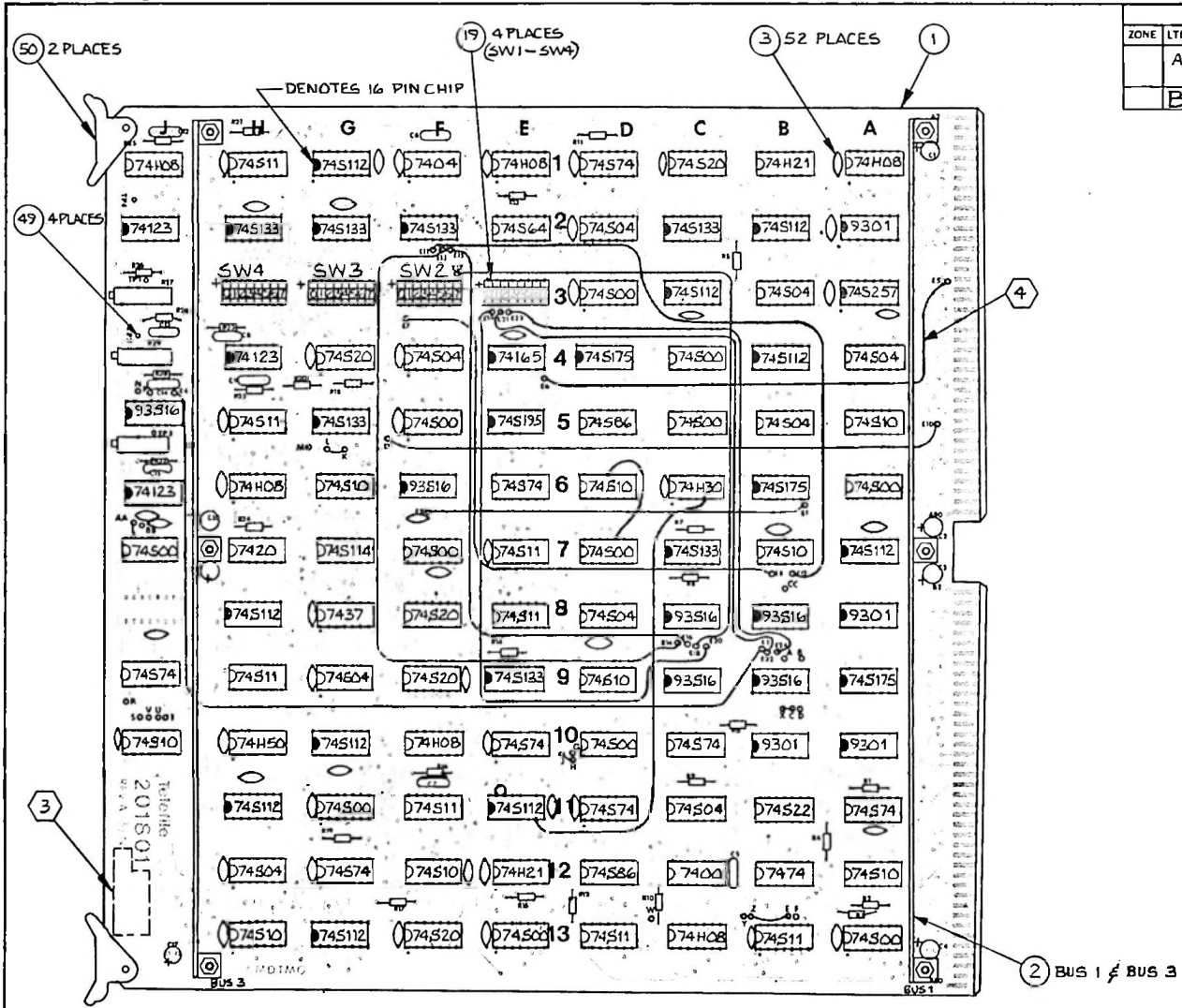
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
A		REVISED PER REV. NC CORRECTIONS	2-9-77	JJ/LS
B		INCORPD EQ'S 0200 & 0212	10-11-77	TS/SWE
C		REMOVED VIEW FROM DETAIL A (21E8, EST)	3-2-78	TS/AL



- DETAIL A REWORK:**
- ON SOLDER SIDE
 - 1. CUT ETCH TO H9-5
 - 2. ADD JUMPER FROM H8-1 TO CUT ETCH
 - ON COMP. SIDE
 - 3. ADD JUMPER FROM H8-2 TO H8-3
 - 4. ADD JUMPER FROM H8-7 TO H8-8
 - 5. ADD JUMPER FROM H8-4 TO H9-5

③ IDENTIFY (RUBBER STAMP) COMPLETED ASSEMBLY WITH ASSY NO. & SERIAL NO. WHERE SHOWN
 2. REF LOGIC DIAGRAM 201802 L3
 1. REF MATERIAL LIST 201802 ML3
 NOTE: UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON		DRAWING STARTED DATE		Telefile Computer Corporation Computer Products, Inc. PC BOARD ASSEMBLY — MEMORY/ADDRESS (DC-16-C)	
DECIMALS ANGLES XX - ±.03 ±0°30' XXX - ±.010		DRAWN T.W. SHOLLY 12-29-76			
MATERIAL:		CHECKED LARRY SCIBLOD-217		SIZE CODE IDENT NO.	
FINISH:		ENGR		C 51360 201802 A3	
NEXT ASSY USED ON				REV. C	
APPLICATION				SCALE 1/1 SHEET 1 OF 1	



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INCORPORATED ENGINEERING CHANGES	4-18-77	L.S.
	B	INCORPD E0 0204 ; ADDED JUMPERS	10-14-77	TS/SWE

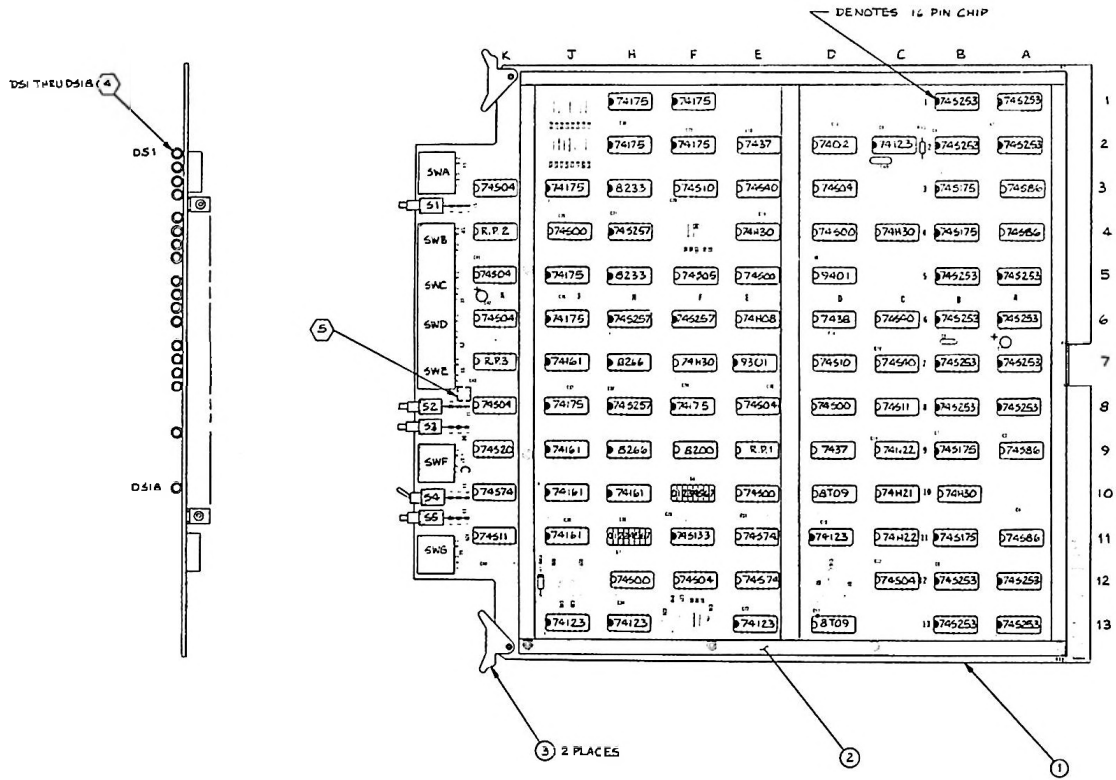
④ ADD JUMPERS :

FROM	TO	FROM	TO
E	Z	E1	E2
K	L	E3	E4
H	J	E5	E6
C	X	E7	E8
AA	J7-13	E9	E10
D06-11	D07-10	E11	E12
E11-07	C06-5	E13	E14
E11-14	E11-15	E15	E16
		E17	E18
		E19	E20
		E21	E22
		E23	E24

- ④ INSTALL 26 AWG INSULATED JUMPERS WHERE SHOWN
 - ③ IDENTIFY (RUBBER STAMP) COMPLETED ASSY SERIAL NO. WHERE SHOWN
 - 2. REF LOGIC DIAGRAM 201801 L3
 - 1. REF MATERIAL LIST 201801 ML3
- NOTE: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON		DRAWING STARTED	DATE
DECIMALS ANGLES		DRAWN	4-5-77
.XX - ± .03 ±0°30'		CHECKED	TOMMY SWOLLY 4-5-77
.XXX - ± .010		ENGR	
MATERIAL:		Telefile Computer Corporation Computer Products, Inc.	
FINISH:		PRINTED CIRCUIT BOARD ASSEMBLY— COMMAND/TIMING (DC-16-C)	
NEXT ASSY	USED ON	SIZE	CODE IDENT NO.
		C	51360
APPLICATION		REV	B
		SCALE	1/1/1
		SHEET	1 OF 1

REVISIONS				
FORM	NO.	DESCRIPTION	DATE	APPROVED
	B	ADDED R30, C45, C22 & I C 20, 2C	9-14-76	L.S.
	C	ADDED REWORK VIEW & CUT ETCH	3-8-77	W.A.
	D	REVISED AND REDRAWN	7-18-77	L.S.



- ⑤ MARK ASSEMBLY NO APPROX. WHERE SHOWN
 - ④ INSTALL LEADS ON SOLDER SIDE OF BOARD, AS SHOWN & TRIM LEADS AS REQ'D
 - 3 25' SOLDER SIDE OF BOARD SHOWN
 - 2 REF LOGIC DIAGRAM
 - 1 ASSEMBLE PER 201800 MLI
- NOTE: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DIMENSIONS ANGLES FRACTIONS DECIMALS FRACTIONS DECIMALS		DRAWING STARTED DATE	Telefile Computer Corporation Computer Products, Inc. P.C.B. ASSEMBLY MAINTENANCE/DISPLAY DC-16-C
MATERIAL	FINISH	DRAWN BY: <i>S. S. S. 9-14-76</i> CHECKED BY: <i>W. A. W. 9-15-76</i> ENGR.	
NEAT ASSY	USED ON	APPLICATION	SIZE CODE BENT NO. D 51360 201800 AI D SCALE 1/1 SHEET 1 OF 1

TELEFILE COMPUTER PRODUCTS, INC.
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	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	T.D.
	ACK	1	B	0172		S	MPNEL	00000400
	ACK	1	A	0427		S	CPUIF	00000500
	ACK	1	A	0558			DRVIF	00000600
*	1							
	ADDRIN	0	A	0275			MEMAD	00000650
	ADDRIN	0	B	0346		S	CMDTM	00000660
	AMDET	1	A	0324			CMDTM	00000700
*	2							
	B1	1	A	0359		S	CMDTM	00000800
*	3							
	B1024	1	B	0316		S	CMDTM	00000900
*	4							
	B128	1	B	0313		S	CMDTM	00001000
*	5							
	B16	1	B	0308		S	CMDTM	00001100
*	6							
	B2	1	A	0360		S	CMDTM	00001200
*	7							
	B2048	1	B	0317		S	CMDTM	00001300
*	8							
	B256	1	B	0314		S	CMDTM	00001400
*	9							
	B32	1	B	0309		S	CMDTM	00001500
*	10							
	B4	1	B	0303		S	CMDTM	00001600
*	11							
	B512	1	B	0315		S	CMDTM	00001800
*	12							
	B64	1	B	0310		S	CMDTM	00001900
*	13							
	B8	1	B	0307		S	CMDTM	00002000
*	14							
	RTCEN	1	A	0554		S	DRVIF	00002100
*	15							
	BUFFRW	0	A	0315		S	CMDTM	00002200
	BUFFRW	0	B	0543			DRVIF	00002300
	BUFWCTC	0	A	0368		S	CMDTM	00002400
	BUFWCTC	0	A	0426			CPUIF	00002500
	BUSY	1	B	0264			MEMAD	00002850
	BUSY	1	B	0344		S	CMDTM	00002900
	BUSY	1	A	0478			CPUIF	00003000
	BUSY	1	A	0515			DRVIF	00003100

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
CYL1	1	A	0153	MPNEL			00008500
CYL1	1	B	0235	MEMAD	S		00008600
CYL1	1	A	0446	CPUIF			00008700
CYL1	1	B	0510	DRVIF			00008800
CYL128	1	B	0160	MPNEL			00008900
CYL128	1	B	0243	MEMAD	S		00009000
CYL128	1	A	0449	CPUIF			00009100
CYL128	1	B	0519	DRVIF			00009200
CYL16	1	B	0108	MPNEL			00009300
CYL16	1	B	0240	MEMAD	S		00009400
CYL16	1	A	0441	CPUIF			00009500
CYL16	1	B	0516	DRVIF			00009600
CYL2	1	A	0177	MPNEL			00009700
CYL2	1	B	0237	MEMAD	S		00009800
CYL2	1	A	0444	CPUIF			00009900
CYL2	1	B	0513	DRVIF			00010000
CYL256	1	B	0156	MPNEL			00010100
CYL256	1	B	0244	MEMAD	S		00010200
CYL256	1	A	0463	CPUIF			00010300
CYL256	1	B	0520	DRVIF			00010400
CYL32	1	B	0120	MPNEL			00010500
CYL32	1	B	0241	MEMAD	S		00010600
CYL32	1	A	0453	CPUIF			00010700
CYL32	1	B	0517	DRVIF			00010800
CYL4	1	A	0168	MPNEL			00010900
CYL4	1	B	0238	MEMAD	S		00011000
CYL4	1	A	0442	CPUIF			00011100
CYL4	1	B	0514	DRVIF			00011200
CYL512	1	B	0171	MPNEL			00011300
CYL512	1	B	0245	MEMAD	S		00011400
CYL512	1	B	0521	DRVIF			00011500
CYL512	1	A	0461	CPUIF			00011550
CYL64	1	B	0116	MPNEL			00011600
CYL64	1	B	0242	MEMAD	S		00011700
CYL64	1	A	0447	CPUIF			00011800
CYL64	1	B	0518	DRVIF			00011900
CYL8	1	B	0110	MPNEL			00012000

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	CYL8	1	B	0239	MEMAD	S		00012100
	CYL8	1	A	0436	CPUIF			00012200
	CYL8	1	B	0515	DRVIF			00012300
	CYLEND	0	B	0232	MEMAD	S		00012600
	CYLEND	0	A	0331	CMDTM			00012700
	CYLOF	1	B	0167	MPNEL			00012800
* 20	DATAI00	1	A	0435	CPUIF	S		00013100
	DATAI00	1	B	0545	DRVIF			00013200
	DATAI01	1	B	0111	MPNEL	S		00013300
	DATAI01	1	A	0248	MEMAD			00013400
	DATAI01	1X	A	0434	CPUIF	S		00013500
	DATAI01	1X	B	0546	DRVIF			00013600
	DATAI02	1	B	0123	MPNEL	S		00013700
	DATAI02	1	A	0244	MEMAD			00013800
	DATAI02	1	A	0433	CPUIF	S		00013900
	DATAI02	1	B	0557	DRVIF			00014000
* 21	DATAI03	1	B	0112	MPNEL	S		00014100
	DATAI03	1	A	0243	MEMAD			00014200
	DATAI03	1	A	0432	CPUIF	S		00014300
	DATAI03	1	B	0559	DRVIF			00014400
* 22	DATAI04	1	A	0132	MPNEL	S		00014500
	DATAI04	1	A	0242	MEMAD			00014600
	DATAI04	1	A	0428	CPUIF	S		00014700
	DATAI04	1	B	0562	DRVIF			00014800
* 23	DATAI05	1	A	0429	CPUIF	S		00015100
	DATAI05	1	B	0563	DRVIF			00015200
	DATAI06	1	A	0240	MEMAD			00015400
	DATAI06	1	A	0274	MEMAD			00015500
	DATAI06	1	A	0424	CPUIF	S		00015600
	DATAI07	1	A	0166	MPNEL	S		00015700
	DATAI07	1	A	0239	MEMAD			00015800
	DATAI07	1	B	0268	MEMAD			00015900
	DATAI07	1	A	0423	CPUIF	S		00016000
* 24	DATAI08	1	B	0178	MPNEL	S		00016100

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	DMODE 1	A	0374	CMDTM		S		00021140
	DMODE 1	A	0163	MPNEL				00021150
	DMODE 1	B	0106	MPNEL				00021200
	DMODE 1	B	0261	MEMAD				00021300
	DRVALRT 1	B	0353	CMDTM				00021500
	DRVALRT 1	A	0557	DRVIF		S		00021600
	DRVBSY 0	A	0329	CMDTM				00021700
	DRVBSY 0	A	0555	DRVIF		S		00021800
	DRVBSY 1	B	0163	MPNEL				00021900
	DRVBSY 1	A	0356	CMDTM				00022000
*	30							
	DRVSKBY 0	B	0347	CMDTM				00022300
	DRVSKBY 0	B	0533	DRVIF		S		00022400
	DRWDAT 1	A	0507	DRVIF		S		00022500
*	31							
	DSTAT00 1	A	0128	MPNEL				00022550
	DSTAT00 1	A	0110	MPNEL				00022600
*	32							
	DSTAT00 1X	A	0212	MEMAD		S		00022800
	DSTAT00 1X	A	0477	CPUIF				00022900
	DSTAT00 1X	A	0523	DRVIF		S		00023000
*	33							
	DSTAT01 1	A	0125	MPNEL				00023050
	DSTAT01 1	A	0107	MPNEL				00023100
*	34							
	DSTAT01 1X	A	0211	MEMAD		S		00023300
	DSTAT01 1X	A	0476	CPUIF				00023400
	DSTAT01 1X	A	0524	DRVIF		S		00023500
*	35							
	DSTAT02 1	A	0131	MPNEL				00023550
	DSTAT02 1	A	0120	MPNEL				00023600
*	36							
	DSTAT02 1X	A	0215	MEMAD		S		00023800
	DSTAT02 1X	A	0475	CPUIF				00023900
	DSTAT02 1X	A	0525	DRVIF		S		00024000
*	37							
	DSTAT03 1	A	0133	MPNEL				00024050
	DSTAT03 1	A	0116	MPNEL				00024100
*	38							
	DSTAT03 1X	A	0216	MEMAD		S		00024300
	DSTAT03 1X	A	0474	CPUIF				00024400
	DSTAT03 1X	A	0526	DRVIF		S		00024500
*	39							

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	DSTAT04 1	A	0143	MPNEL				00024550
	DSTAT04 1	A	0161	MPNEL				00024600
	DSTAT04 1	A	0217	MEMAD		S		00024800
	DSTAT04 1	A	0473	CPUIF				00024900
	DSTAT04 1	A	0527	DRVIF		S		00025000
*	40							
	DSTAT05 1	A	0141	MPNEL				00025050
	DSTAT05 1	A	0155	MPNEL				00025100
	DSTAT05 1	A	0218	MEMAD		S		00025300
	DSTAT05 1	A	0471	CPUIF				00025400
	DSTAT05 1	A	0528	DRVIF		S		00025500
*	41							
	DSTAT06 1	A	0175	MPNEL				00025600
	DSTAT06 1	A	0145	MPNEL				00025650
	DSTAT06 1	A	0219	MEMAD		S		00025800
	DSTAT06 1	A	0466	CPUIF				00025900
	DSTAT06 1	A	0529	DRVIF		S		00026000
*	42							
	DSTAT07 1	A	0170	MPNEL				00026100
	DSTAT07 1	A	0146	MPNEL				00026150
	DSTAT07 1	A	0220	MEMAD		S		00026300
	DSTAT07 1	A	0465	CPUIF				00026400
	DSTAT07 1	A	0530	DRVIF		S		00026500
*	43							
	DSTAT08 1	B	0124	MPNEL				00026550
	DSTAT08 1	B	0105	MPNEL				00026600
	DSTAT08 1	A	0221	MEMAD		S		00026800
	DSTAT08 1	A	0467	CPUIF				00026900
	DSTAT08 1	A	0531	DRVIF		S		00027000
*	44							
	DSTAT09 1	B	0127	MPNEL				00027050
	DSTAT09 1	B	0104	MPNEL				00027100
	DSTAT09 1	A	0224	MEMAD		S		00027300
	DSTAT09 1	A	0468	CPUIF				00027400
	DSTAT09 1	A	0532	DRVIF		S		00027500
*	45							
	DSTAT10 1	B	0126	MPNEL				00027550
	DSTAT10 1	B	0118	MPNEL				00027600
	DSTAT10 1	A	0225	MEMAD		S		00027800
	DSTAT10 1	A	0469	CPUIF				00027900
	DSTAT10 1	A	0533	DRVIF		S		00028000
*	46							
	DSTAT11 1	B	0128	MPNEL				00028050
	DSTAT11 1	B	0114	MPNEL				00028100
	DSTAT11 1	A	0226	MEMAD		S		00028300
	DSTAT11 1	A	0470	CPUIF				00028400

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
* 47	DSTAT11 1	A	0534	DRVIF		S		00028500
	DSTAT12 1	B	0146	MPNEL				00028550
	DSTAT12 1	B	0162	MPNEL				00028600
	DSTAT12 1	A	0227	MEMAD		S		00028800
	DSTAT12 1	A	0335	CMDTM		S		00028900
	DSTAT12 1	A	0472	CPUIF				00029000
* 48	DSTAT13 1	B	0158	MPNEL				00029100
	DSTAT13 1	B	0143	MPNEL				00029150
	DSTAT13 1	A	0222	MEMAD		S		00029300
	DSTAT13 1	A	0336	CMDTM		S		00029400
	DSTAT13 1	B	0410	CPUIF				00029500
* 49	DSTAT14 1	B	0148	MPNEL				00029550
	DSTAT14 1	B	0173	MPNEL				00029600
	DSTAT14 1	A	0238	MEMAD		S		00029800
	DSTAT14 1	A	0337	CMDTM		S		00029900
	DSTAT14 1	B	0409	CPUIF				00030000
* 50	DSTAT15 1	B	0147	MPNEL				00030050
	DSTAT15 1	B	0169	MPNEL				00030100
	DSTAT15 1	A	0228	MEMAD		S		00030300
	DSTAT15 1	A	0338	CMDTM		S		00030400
	DSTAT15 1	B	0414	CPUIF				00030500
* 51	DSTE 1	B	0103	MPNEL				00030600
	DSTE 1	B	0260	MEMAD		S		00030700
	DSTE 1	B	0509	DRVIF				00030800
	JSTL 1	B	0119	MPNEL				00030900
	DSTL 1	B	0261	MEMAD		S		00031000
	DSTL 1	A	0575	DRVIF				00031100
* 52	DVIN4 0	A	0547	DRVIF				00031200
	EMPTY 0	A	0269	MEMAD		S		00031400
	EMPTY 0	B	0369	CMDTM				00031500
* 53	EV0430 1	A	0326	CMDTM				00031600
* 54	EV05 1	A	0333	CMDTM				00031700
* 55	EV07 1	A	0343	CMDTM				00031900
* 56	EM14 1	B	0334	CMDTM				00032100

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	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	ENDSEC	0	B 0214	MEMAD		S		00032600
	ENDSEC	0	A 0332	CMDTM				00032700
	ENDTRK	0	B 0227	MEMAD		S		00032800
	ENDTRK	0	B 0523	DRVIF				00032900
	ENDTRK	0	A 0440	CPUIF				00032950
	ENRDA	1	B 0115	MPNEL				00033000
	ENRDA	1	A 0325	CMDTM		S		00033100
	ENRDA	1	A 0569	DRVIF				00033200
	ENRDCK	0	A 0172	MPNEL				00033300
	ENRDCK	0	A 0210	MEMAD				00033400
* 57	ENRDCK	1	B 0157	MPNEL				00033550
	ENRDCK	1	A 0309	CMDTM		S		00033600
	ENRDCK	1	B 0536	DRVIF				00033700
	EOP	0	B 0351	CMDTM				00033900
	EOP	0	A 0552	DRVIF				00034000
* 58	ERGATE	1	B 0340	CMDTM		S		00034100
* 59	EVENSTG	0	B 0558	DRVIF				00034200
* 60	EXEC	1	B 0275	MEMAD				00034500
	EXEC	1	B 0306	CMDTM		S		00034600
	EXEC	1	A 0439	CPUIF				00034700
	EXECEN	1	B 0318	CMDTM				00034750
	EXECEN	1	A 0425	CPUIF				00034800
* 61	EXEN	1	B 0540	DRVTF		S		00034900
* 62	FMTCOM	0	B 0149	MPNEL				00035000
	FMTCOM	0	A 0272	MEMAD				00035050
	FMTCOM	0	A 0323	CMDTM		S		00035100
	FMTMC2	1	B 0209	MEMAD				00035400
	FMTMC2	1	B 0375	CMDTM		S		00035500
	F4WSHR	0	A 0307	CMDTM		S		00035600
	F4WSHR	0	A 0560	DRVIF				00035700
	FT2	1	B 0311	CMDTM		S		00035800
	FT2	1	A 0570	DRVIF				00035900

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
FT4	1	B	0312	CMDTM			00036000
FT4	1	A	0568	DRVIF			00036100
FULL	1	A	0341	CMDTM			00036120
FULL	1	A	0230	MEMAD	S		00036140
GATE	0	A	0139	MPNEL			00036150
GATE	0	B	0265	MEMAD			00036200
GATE	0	B	0338	CMDTM	S		00036300
GT7	1	A	0353	CMDTM	S		00036600
GT7	1	A	0573	DRVIF			00036700
HDRD80	0	A	0252	MEMAD			00037000
HDRD80	0	B	0357	CMDTM	S		00037100
HDRERB	1	B	0176	MPNEL			00037200
HDRERB	1	B	0335	CMDTM			00037300
* 63							
HDRMWRT	0	A	0246	MEMAD			00037500
HDRMWRT	0	B	0355	CMDTM	S		00037600
HDSRD	1	A	0160	MPNEL			00037700
HDSRD	1	B	0262	MEMAD	S		00037900
HEAD1	1	A	0108	MPNEL			00038100
HEAD1	1	B	0233	MEMAD	S		00038200
HEAD1	1	A	0448	CPUIF			00038300
HEAD1	1	B	0505	DRVIF			00038400
HEAD16	1	A	0154	MPNEL			00038500
HEAD16	1	B	0221	MEMAD	S		00038600
HEAD16	1	A	0457	CPUIF			00038700
HEAD16	1	B	0574	DRVIF			00038750
HEAD2	1	A	0105	MPNEL			00038800
HEAD2	1	B	0234	MEMAD	S		00038900
HEAD2	1	A	0450	CPUIF			00039000
HEAD2	1	B	0506	DRVIF			00039100
HEAD4	1	A	0118	MPNEL			00039200
HEAD4	1	B	0236	MEMAD	S		00039300
HEAD4	1	A	0462	CPUIF			00039400
HEAD4	1	B	0507	DRVIF			00039500
HEAD9	1	A	0114	MPNEL			00039600

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	HEAD8	1	B	0231	MEMAD	S		00039700
	HEAD8	1	A	0456	CPUIF			00039800
	HEAD8	1	B	0573	DRVIF			00039850
* 64	IN18708	1	A	0567	DRVIF			00039900
	IN2050	1	A	0566	DRVIF			00040000
* 65	INXP	1	B	0535	DRVIF	S		00040800
* 66	I000	1	A	0268	MEMAD			00040900
	I000	1	B	0548	DRVIF	S		00041000
	I001	1	A	0266	MEMAD			00041100
	I001	1	B	0554	DRVIF	S		00041200
	I002	1	A	0265	MEMAD			00041300
	I002	1	B	0560	DRVIF	S		00041400
	I003	1	A	0277	MEMAD			00041500
	I003	1	B	0561	DRVIF	S		00041600
	I004	1	A	0278	MEMAD			00041700
	I004	1	B	0564	DRVIF	S		00041800
	I005	1	A	0273	MEMAD			00041900
	I005	1	B	0572	DRVIF	S		00042100
* 67	IOTRM	0	B	0341	CMOTM			00042200
	LASTCYL	1	A	0136	MPNEL			00042500
	LASTCYL	1	B	0246	MEMAD	S		00042600
	LASTHD	1	A	0135	MPNEL			00042700
	LASTHD	1	B	0226	MEMAD	S		00042800
	LASTSEC	1	A	0152	MPNEL			00042900
	LASTSEC	1	B	0225	MEMAD	S		00043000
	LOAD2	1	B	0276	MEMAD			00043400
	LOAD2	1	B	0370	CMOTM	S		00043500
	LSOSK	0	B	0349	CMOTM			00043700
* 68	LSOSK	0	B	0522	DRVIF			00043750
	M1SE	0	A	0213	MEMAD			00043800

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	M1SB	0	A	0328	CMDTM	S		00043900
	MAJSEL	0	B	0145	MPNEL	S		00044000
	MAJSEL	0	B	0367	CMDTM			00044100
	MAJSEL	0	A	0408	CPUIF	S		00044200
	MAJSEL	0	B	0567	DRVIF			00044300
* 69	MCO	0	A	0330	CMDTM			00044400
	MCO	0	A	0421	CPUIF			00044500
	MCO	0	B	0566	DRVIF	S		00044600
	MCO	1	B	0174	MPNEL			00044700
	MCO	1	B	0542	DRVIF	S		00044800
	MC1	1	B	0155	MPNEL			00045100
	MC1	1	A	0363	CMDTM	S		00045200
	MC13	0	B	0267	MEMAD			00045400
	MC13	0	A	0334	CMDTM	S		00045500
* 70	MC2	0	A	0378	CMDTM	S		00045600
	MC2	1	B	0159	MPNEL			00045700
	MC2	1	A	0377	CMDTM	S		00045800
	MC2B0N	1	A	0214	MEMAD			00045900
	MC2B0N	1	B	0358	CMDTM	S		00046000
	MC3	1	B	0113	MPNEL			00046100
	MC3	1	A	0376	CMDTM	S		00046200
	MC4	1	A	0144	MPNEL			00046550
	MC4	1	B	0117	MPNEL			00046600
	MC4	1	A	0375	CMDTM	S		00046700
	MC4	1	A	0521	DRVIF			00046800
	MCLK	0	A	0355	CMDTM			00047100
	MCLK	0	B	0544	DRVIF	S		00047200
* 71	MINST00	0	A	0548	DRVIF			00047400
	MINST01	0	A	0549	DRVIF			00047500
* 72	MINST02	0	A	0550	DRVIF			00047600
* 73	MPWP	1	A	0129	MPNEL	S		00048100

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	MPWP	1	0211	MEMAD				00048200
* 74	OACK	1	0164	MPNEL		S		00048500
* 75	OAKX	1	0135	MPNEL		S		00048600
* 76	DCMST	1	0166	MPNEL		S		00048700
* 77	DCOMLD	1	0177	MPNEL		S		00048800
* 78	DFDMCR	0	0134	MPNEL		S		00048900
* 79	OFFLG	0	0142	MPNEL		S		00049000
	OFLFMI	0	0121	MPNEL		S		00049100
	OFLFMI	0	0361	CMDTM				00049200
	OFLFMT	0	0113	MPNEL		S		00049300
	OFLFMT	0	0363	CMDTM				00049400
	OFSN	1	0109	MPNEL				00049500
	OFSN	1	0259	MEMAD		S		00049600
	OFSN	1	0577	DRVIF				00049700
	OFSP	1	0171	MPNEL				00049800
	OFSP	1	0257	MEMAD		S		00049900
* 80	OUTDS	1	0140	MPNEL		S		00050100
* 81	RDATA	0	0513	DRVIF		S		00050400
	RDATA	1	0229	MEMAD				00050600
* 82	RDATA	1	0365	CMDTM				00050700
	RDHWSH	0	0312	CMDTM		S		00050900
	RDHWSH	0	0561	DRVIF				00051000
	RDWHDR	0	0318	CMDTM		S		00051100
	RDWHDR	0	0559	DRVIF				00051200
	RECL	0	0276	MEMAD				00051300
	RECL	0	0314	CMDTM		S		00051400
	RECL	0	0508	DRVIF				00051500
	SEC1	1	0109	MPNEL				00051600
	SEC1	1	0217	MEMAD		S		00051700

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	SEC1	1	A	0445	CPUIF			00051800
	SEC1	1	B	0555	DRVIF		SECINA	00051850
	SEC16	1	A	0157	MPNEL			00051900
	SEC16	1	B	0220	MEMAD	S		00052000
	SEC16	1	A	0454	CPUIF			00052100
	SEC16	1	B	0552	DRVIF		SECINE	00052150
	SEC2	1	A	0106	MPNEL			00052200
	SEC2	1	B	0218	MEMAD	S		00052300
	SEC2	1	A	0443	CPUIF			00052400
	SEC2	1	B	0556	DRVIF		SECINB	00052450
	SEC32	1	A	0156	MPNEL			00052500
	SEC32	1	B	0223	MEMAD	S		00052600
	SEC32	1	A	0452	CPUIF			00052700
	SEC32	1	B	0551	DRVIF		SECINF	00052750
	SEC4	1	A	0119	MPNEL			00052800
	SEC4	1	B	0222	MEMAD	S		00052900
	SEC4	1	A	0437	CPUIF			00053000
	SEC4	1	B	0553	DRVIF		SECINC	00053050
	SEC8	1	A	0115	MPNEL			00053100
	SEC8	1	B	0219	MEMAD	S		00053200
	SEC8	1	A	0438	CPUIF			00053300
	SEC8	1	B	0547	DRVIF		SECIND	00053350
	SECP	1	B	0137				00053900
	SECP	1	B	0270	MEMAD			00054000
	SECP	1	A	0327	CMDTM			00054100
	SECP	1	B	0539	DRVIF	S		00054200
	SEEK	0	B	0230	MEMAD			00054300
	SEEK	0	A	0313	CMDTM	S		00054400
	SELCK	0	B	0258	MEMAD			00054600
	SELCK	0	A	0365	CMDTM	S		00054700
	SELCK	0	A	0551	DRVIF			00054800
	SPECCOM	0	A	0305	CMDTM	S		00055700
*	83							
	SPECRD	0	A	0317	CMDTM	S		00055800
*	84							
	SRCH	1	B	0336	CMDTM	S		00055900
*	85							

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	SRCHFIN 1	B	0374	CMDTM				00056400
	SRCHFIN 1	A	0430	CPUIF		S		00056500
	SRES 0	B	0132	MPNEL		S		00056800
	SRES 0	A	0344	CMDTM				00056900
	SRES 0	A	0406	CPUIF		S		00057000
* 86	STATRD 0	B	0141	MPNEL				00057400
	STATRD 0	B	0404	CPUIF		S		00057450
	STATSEL 0	B	0144	MPNEL		S		00057500
	STATSEL 0	B	0368	CMDTM				00057600
	STATSEL 0	A	0405	CPUIF		S		00057700
* 87	SWPONC 1	A	0546	DRVIF				00057900
* 88	SWP1NC 1	A	0545	DRVIF				00058000
* 89	SWP2NC 1	A	0544	DRVIF				00058100
* 90	SWP3NC 1	A	0543	DRVIF				00058200
* 91	TAKX 0	B	0133	MPNEL		S		00058300
	TAKX 0	B	0208	MEMAD				00058400
	TAKX 0	A	0412	CPUIF		S		00058500
* 92	TC1 1	B	0269	MEMAD				00058600
	TC1 1	A	0339	CMDTM		S		00058700
* 93	TCB32 1	A	0340	CMDTM		S		00058800
	TERM 0	B	0161	MPNEL				00058900
	TERM 0	B	0345	CMDTM		S		00059000
	TERM 0	A	0464	CPUIF				00059100
	TID1 1	A	0158	MPNEL				00059300
	TID1 1	B	0254	MEMAD		S		00059400
	TID2 1	A	0151	MPNEL				00059500
	TID2 1	B	0255	MEMAD		S		00059600
	TID2 1	A	0537	DRVIF				00059650
	TID4 1	A	0173	MPNEL				00059700
	TID4 1	B	0216	MEMAD		S		00059800
	TID4 1	A	0311	CMDTM			INH TD	00059900
	TID4 1	B	0416	CPUIF				00060000

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	TIMERR	0	A	0270	MEMAD	S		00060200
	TIMERR	0	B	0305	CMDTM			00060250
	TRQX	0	B	0215	MEMAD	S		00060600
	TRQX	0	A	0361	CMDTM			00060700
	TRQX	0	A	0451	CPUIF			00060750
	TRQX	1	B	0150	MPNEL			00060800
	TRQX	1	A	0261	MEMAD	S		00060900
	WGB0480	0	B	0451	CPUIF			00062200
* 94	WGND04	0	A	0458	CPUIF			00062410
	WGND04	0	A	0459	CPUIF			00062420
	WGND04	0	A	0455	CPUIF			00062430
	WGND04	0	A	0522	DRVIF			00062440
	WGND04	0	A	0501	DRVIF			00062450
* 95	WRD00	1	A	0174	MPNEL			00062700
	WRD00	1	A	0208	MEMAD	S		00062800
	WRGATE	1	B	0153	MPNEL			00063200
	WRGATE	1	B	0337	CMDTM	S		00063300
	WRJTE	0	B	0252	MEMAD			00063500
	WRITE	0	A	0372	CMDTM	S		00063600
	WRPERR	0	B	0359	CMDTM	S		00063700
	WRPERR	0	A	0563	DRVIF			00063800
	WRPROT	1	B	0360	CMDTM			00063900
	WRPROT	1	A	0538	DRVIF	S		00064000
	WRTSRT	0	B	0138	MPNEL	S		00064040
	WRTSRT	0	B	0354	CMDTM			00064060
	XTERR	0	B	0342	CMDTM	S		00064100
	XTERR	0	A	0553	DRVIF			00064200

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A		0103	CCB2	1	MPNEL			00004900
A		0104	DATAI09	1	MPNEL	S		00016500
A		0105	HEAD2	1	MPNEL			00038800
A		0106	SEC2	1	MPNEL			00052200
A		0107	DSTAT01	1	MPNEL			00023100
A		0108	HEAD1	1	MPNEL			00038100
A		0109	SEC1	1	MPNEL			00051600
A		0110	DSTAT00	1	MPNEL			00022600
A		0111	CCB1	1	MPNEL			00004700
A		0112	CCB8	1	MPNEL			00005300
A		0113	OFLFMT	0	MPNEL	S		00049300
A		0114	HEAD8	1	MPNEL			00039600
A		0115	SEC8	1	MPNEL			00053100
A		0116	DSTAT03	1	MPNEL			00024100
A		0117	CCB4	1	MPNEL			00005100
A		0118	HEAD4	1	MPNEL			00039200
A		0119	SEC4	1	MPNEL			00052800
A		0120	DSTAT02	1	MPNEL			00023600
A		0121	OFLFMI	0	MPNEL	S		00049100
A		0124	CRCT	1	MPNEL			00008200
A		0125	DSTAT01	1	MPNEL			00023050
A		0127	CLRM0DE	0A	MPNEL			00005650
A		0128	DSTAT00	1	MPNEL			00022550
A		0129	MPWP	1	MPNEL	S		00048100
A		0131	DSTAT02	1	MPNEL			00023550
A		0132	DATAI04	1	MPNEL	S		00014500
A		0133	DSTAT03	1	MPNEL			00024050
A		0134	QFDMCR	0	MPNEL	S		00048900
A		0135	LASTHD	1	MPNEL			00042700
A		0136	LASTCYL	1	MPNEL			00042500
A		0139	GATE	0	MPNEL			00036150
A		0141	DSTAT05	1	MPNEL			00025050
A		0143	DSTAT04	1	MPNEL			00024550
A		0144	MC4	1	MPNEL			00046550
A		0145	DSTAT06	1	MPNEL			00025650
A		0146	DSTAT07	1	MPNEL			00026150
A		0149	DATAI12	1	MPNEL	S		00017900
A		0150	DATAI14	1	MPNEL	S		00018700
A		0151	TID2	1	MPNEL			00059500
A		0152	LASTSEC	1	MPNEL			00042900
A		0153	CYL1	1	MPNEL			00008500
A		0154	HEAD16	1	MPNEL			00038500
A		0155	DSTAT05	1	MPNEL			00025100

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A		0156 SEC32	1	MPNEL				00052500
A		0157 SEC16	1	MPNEL				00051900
A		0158 TID1	1	MPNEL				00059300
A		0160 HDSRO	1	MPNEL				00037700
A		0161 DSTAT04	1	MPNEL				00024600
A		0162 DATAT10	1	MPNEL		S		00017000
A		0163 DMODE	1	MPNEL				00021150
A		0164 DATAT11	1	MPNEL		S		00017500
A		0166 DATAT07	1	MPNEL		S		00015700
A		0168 CYL4	1	MPNEL				00010900
A		0169 CRCT	1	MPNEL				00008250
A		0170 DSTAT07	1	MPNEL				00026100
A		0171 OFSP	1	MPNEL				00049800
A		0172 ENRDCK	0	MPNEL				00033300
A		0174 WRD00	1	MPNEL				00062700
A		0175 DSTAT06	1	MPNEL				00025600
A		0177 CYL2	1	MPNEL				00009700
A		0178 TID4	1	MPNEL				00059700
A		0205 CRCT	0	MEMAD				00008000
A		0206 CRCT	1	MEMAD				00008150
A		0208 WRD00	1	MEMAD		S		00062800
A		0210 ENRDCK	0	MEMAD				00033400
A		0211 DSTAT01	1X	MEMAD		S		00023300
A		0212 DSTAT00	1X	MEMAD		S		00022800
A		0213 MISB	0	MEMAD				00043800
A		0214 MC280N	1	MEMAD				00045900
A		0215 DSTAT02	1X	MEMAD		S		00023800
A		0216 DSTAT03	1X	MEMAD		S		00024300
A		0217 DSTAT04	1	MEMAD		S		00024800
A		0218 DSTAT05	1	MEMAD		S		00025300
A		0219 DSTAT06	1	MEMAD		S		00025800
A		0220 DSTAT07	1	MEMAD		S		00026300
A		0221 DSTAT08	1	MEMAD		S		00026800
A		0222 DSTAT13	1	MEMAD		S		00029300
A		0223 DATAT14	1	MEMAD				00018800
A		0224 DSTAT09	1	MEMAD		S		00027300
A		0225 DSTAT10	1	MEMAD		S		00027800
A		0226 DSTAT11	1	MEMAD		S		00028300
A		0227 DSTAT12	1	MEMAD		S		00028800
A		0228 DSTAT15	1	MEMAD		S		00030300
A		0229 RDATA	1	MEMAD				00050600
A		0230 FULL	1	MEMAD		S		00036140

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	0232	DATA13	1	MEMAD			00018400
A	0233	DATA12	1	MEMAD			00018000
A	0234	DATA11	1	MEMAD			00017700
A	0235	DATA10	1	MEMAD			00017200
A	0236	DATAI08	1	MEMAD			00016300
A	0237	DATAI09	1	MEMAD			00016700
A	0238	DSTAT14	1	MEMAD	S		00029800
A	0239	DATAI07	1	MEMAD			00015800
A	0240	DATAI06	1	MEMAD			00015400
A	0242	DATAI04	1	MEMAD			00014600
A	0243	DATAI03	1	MEMAD			00014200
A	0244	DATAI02	1	MEMAD			00013800
A	0246	HDRMVRT	0	MEMAD			00017500
A	0248	DATAI01	1	MEMAD			00013400
A	0252	HDRD80	0	MEMAD			00037000
A	0255	DATOUTS	0	MEMAD			00020000
A	0260	DMC	1	MEMAD			00020800
A	0261	TRQX	1	MEMAD	S		00060900
A	0265	I002	1	MEMAD			00041300
A	0266	I001	1	MEMAD			00041100
A	0267	COMLD	0	MEMAD			00006700
A	0268	I000	1	MEMAD			00040900
A	0269	EMPTY	0	MEMAD	S		00031400
A	0270	TIMER8	0	MEMAD	S		00060200
A	0272	FMTCDM	0	MEMAD			00035050
A	0273	I005	1	MEMAD			00041900
A	0274	DATAI06	1	MEMAD			00015500
A	0275	ADRRIN	0	MEMAD			00000650
A	0276	RECL	0	MEMAD			00051300
A	0277	I003	1	MEMAD			00041500
A	0278	I004	1	MEMAD			00041700
A	0305	SPECCOM	0	CMDTM	S		00055700
A	0307	FMWSHR	0	CMDTM	S		00035600
A	0309	ENRDCK	1	CMDTM	S		00033600
A	0311	TID4	1	CMDTM		INHID	00059900
A	0312	RDHWSH	0	CMDTM	S		00050900
A	0313	SEEK	0	CMDTM	S		00054400
A	0314	RECL	0	CMDTM	S		00051400
A	0315	BUFFRW	0	CMDTM	S		00002200
A	0316	DATADUT	1	CMDTM	S		00019700
A	0317	SPECRD	0	CMDTM	S		00055800
A	0318	RDWHDR	0	CMDTM	S		00051100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	0319	DATA112	1	CMDTM			00018100
A	0320	DATA113	1	CMDTM			00018500
A	0323	FMTCOM	0	CMDTM	S		00035100
A	0324	AMDET	1	CMDTM			00000700
A	0325	ENRDA	1	CMDTM	S		00033100
A	0326	EN0430	1	CMDTM			00031600
A	0327	SECP	1	CMDTM			00054100
A	0328	MISA	0	CMDTM	S		00043900
A	0329	DRVBSY	0	CMDTM			00021700
A	0330	MCO	0	CMDTM			00044400
A	0331	CYLEND	0	CMDTM			00012700
A	0332	ENDSEC	0	CMDTM			00032700
A	0333	EN05	1	CMDTM			00031700
A	0334	MC13	0	CMDTM	S		00045500
A	0335	DSTAT12	1	CMDTM	S		00028900
A	0336	DSTAT13	1	CMDTM	S		00029400
A	0337	DSTAT14	1	CMDTM	S		00029900
A	0338	DSTAT15	1	CMDTM	S		00030400
A	0339	TC1	1	CMDTM	S		00058700
A	0340	TCB32	1	CMDTM	S		00058800
A	0341	FULL	1	CMDTM			00036120
A	0343	EN07	1	CMDTM			00031900
A	0344	SRES	0	CMDTM			00056900
A	0346	COMST	0	CMDTM			00007100
A	0347	CRCT	0	CMDTM	S		00008100
A	0352	CLRM0DE	0A	CMDTM	S		00005700
A	0353	GT7	1	CMDTM	S		00036600
A	0355	MCLK	0	CMDTM			00047100
A	0356	DRVBSY	1	CMDTM			00022000
A	0359	B1	1	CMDTM	S		00000800
A	0360	B2	1	CMDTM	S		00001200
A	0361	TRQX	0	CMDTM			00060700
A	0363	MC1	1	CMDTM	S		00045200
A	0365	SELCK	0	CMDTM	S		00054700
A	0367	COMCLK	0	CMDTM	S		00006500
A	0368	BUFWCTC	0	CMDTM	S		00002400
A	0372	WRITE	0	CMDTM	S		00063600
A	0373	DMODE	0	CMDTM	S		00021100
A	0374	DMODE	1	CMDTM	S		00021140
A	0375	MC4	1	CMDTM	S		00046700
A	0376	MC3	1	CMDTM	S		00046200
A	0377	MC2	1	CMDTM	S		00045800
A	0378	MC2	0	CMDTM	S		00045600

P	LOCATTON	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A	0405	STATSEL	0	CPUIF		S		00057700
A	0406	SRES	0	CPUIF		S		00057000
A	0408	MAJSEL	0	CPUIF		S		00044200
A	0411	DMC	1	CPUIF		S		00021800
A	0412	TAKX	0	CPUIF		S		00058500
A	0415	DATOUTS	0	CPUIF		S		00020100
A	0416	COMST	0	CPUIF		S		00007200
A	0417	COMLD	0	CPUIF		S		00006800
A	0419	DATAI10	1	CPUIF		S		00017300
A	0421	MCO	0	CPUIF		S		00044500
A	0423	DATAI07	1	CPUIF		S		00016000
A	0424	DATAI06	1	CPUIF		S		00015600
A	0425	EXECEN	1	CPUIF		S		00034800
A	0426	BUFWCTC	0	CPUIF		S		00002500
A	0427	ACK	1	CPUIF		S		00000500
A	0428	DATAI04	1	CPUIF		S		00014700
A	0429	DATAI05	1	CPUIF		S		00015100
A	0430	SRCHF1N	1	CPUIF		S		00056500
A	0432	DATAI03	1	CPUIF		S		00014300
A	0433	DATAI02	1	CPUIF		S		00013900
A	0434	DATAI01	1X	CPUIF		S		00013500
A	0435	DATAI00	1	CPUIF		S		00013100
A	0436	CYL8	1	CPUIF		S		00012200
A	0437	SEC4	1	CPUIF		S		00053000
A	0438	SEC8	1	CPUIF		S		00053300
A	0439	EXEC	1	CPUIF		S		00034700
A	0440	ENDTRK	0	CPUIF		S		00032950
A	0441	CYL16	1	CPUIF		S		00009500
A	0442	CYL4	1	CPUIF		S		00011100
A	0443	SEC2	1	CPUIF		S		00052400
A	0444	CYL2	1	CPUIF		S		00009900
A	0445	SEC1	1	CPUIF		S		00051800
A	0446	CYL1	1	CPUIF		S		00008700
A	0447	CYL64	1	CPUIF		S		00011800
A	0448	HEAD1	1	CPUIF		S		00038300
A	0449	CYL128	1	CPUIF		S		00009100
A	0450	HEAD2	1	CPUIF		S		00039000
A	0451	TRQX	0	CPUIF		S		00060750
A	0452	SEC32	1	CPUIF		S		00052700
A	0453	CYL32	1	CPUIF		S		00010700
A	0454	SEC16	1	CPUIF		S		00052100
A	0455	WGND04	0	CPUIF		S		00062430
A	0456	HEADR	1	CPUIF		S		00039800

P	LOCATTON	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A		0457	HEAD16	1			CPUIF	00038700
A		0458	WGND04	0			CPUIF	00062410
A		0459	WGND04	0			CPUIF	00062420
A		0460	DATAOUT	1			CPUIF	00019800
A		0461	CYL512	1			CPUIF	00011550
A		0462	HEAD4	1			CPUIF	00039400
A		0463	CYL256	1			CPUIF	00010300
A		0464	TERM	0			CPUIF	00059100
A		0465	DSTAT07	1			CPUIF	00026400
A		0466	DSTAT06	1			CPUIF	00025900
A		0467	DSTAT08	1			CPUIF	00026900
A		0468	DSTAT09	1			CPUIF	00027400
A		0469	DSTAT10	1			CPUIF	00027900
A		0470	DSTAT11	1			CPUIF	00028400
A		0471	DSTAT05	1			CPUIF	00025400
A		0472	DSTAT12	1			CPUIF	00029000
A		0473	DSTAT04	1			CPUIF	00024900
A		0474	DSTAT03	1X			CPUIF	00024400
A		0475	DSTAT02	1X			CPUIF	00023900
A		0476	DSTAT01	1X			CPUIF	00023400
A		0477	DSTAT00	1X			CPUIF	00022900
A		0478	BUSY	1			CPUIF	00003000
A		0501	WGND04	0			DRVIF	00062450
A		0507	DRWDAT	1		S	DRVIF	00022500
A		0512	CLRSTAT	0A			DRVIF	00006100
A		0513	RDATA	0		S	DRVIF	00050400
A		0515	BUSY	1			DRVIF	00003100
A		0521	MC4	1			DRVIF	00046800
A		0522	WGND04	0			DRVIF	00062440
A		0523	DSTAT00	1X		S	DRVIF	00023000
A		0524	DSTAT01	1X		S	DRVIF	00023500
A		0525	DSTAT02	1X		S	DRVIF	00024000
A		0526	DSTAT03	1X		S	DRVIF	00024500
A		0527	DSTAT04	1		S	DRVIF	00025000
A		0528	DSTAT05	1		S	DRVIF	00025500
A		0529	DSTAT06	1		S	DRVIF	00026000
A		0530	DSTAT07	1		S	DRVIF	00026500
A		0531	DSTAT08	1		S	DRVIF	00027000
A		0532	DSTAT09	1		S	DRVIF	00027500
A		0533	DSTAT10	1		S	DRVIF	00028000
A		0534	DSTAT11	1		S	DRVIF	00028500
A		0537	TID2	1			DRVIF	00059650

P	LOCATTON	SIGNAL		TYPE	SH	S	COMMENTS	I-D.
A	0538	WRPROT	1	DRVIF		S		00064000
A	0543	SWP3NC	1	DRVIF				00058200
A	0544	SWP2NC	1	DRVIF				00058100
A	0545	SWP1NC	1	DRVIF				00058000
A	0546	SWP0NC	1	DRVIF				00057900
A	0547	DVIN4	0	DRVIF				00031200
A	0548	MINST00	0	DRVIF				00047400
A	0549	MINST01	0	DRVIF				00047500
A	0550	MINST02	0	DRVIF				00047600
A	0551	SELCK	0	DRVIF				00054800
A	0552	EOP	0	DRVIF				00034000
A	0553	XTERR	0	DRVIF				00064200
A	0554	BTCEN	1	DRVIF		S		00002100
A	0555	DRVBSY	0	DRVIF		S		00021800
A	0557	DRVALRT	1	DRVIF		S		00021600
A	0558	ACK	1	DRVIF				00000600
A	0559	RDWHDR	0	DRVIF				00051200
A	0560	FMWSHR	0	DRVIF				00035700
A	0561	RDHWSH	0	DRVIF				00051000
A	0562	DEFTRK	0	DRVIF				00020600
A	0563	WRPERR	0	DRVIF				00063800
A	0566	IN2050	1	DRVIF				00040000
A	0567	IN1370R	1	DRVIF				00039900
A	0568	FT4	1	DRVIF				00036100
A	0569	ENRDA	1	DRVIF				00033200
A	0570	FT2	1	DRVIF				00035900
A	0573	GT7	1	DRVIF				00036700
A	0575	DSTL	1	DRVIF				00031100
A	0577	OFSN	1	DRVIF				00049700
B	0103	DSTE	1	MPNEL				00030600
B	0104	DSTAT09	1	MPNEL				00027100
B	0105	DSTAT08	1	MPNEL				00026600
B	0106	DMDDE	1	MPNEL				00021200
B	0108	CYL16	1	MPNEL				00009300
B	0109	OFSN	1	MPNEL				00049500
B	0110	CYL8	1	MPNEL				00012000
B	0111	DATAI01	1	MPNEL		S		00013300
B	0112	DATAI03	1	MPNEL		S		00014100
B	0113	MC3	1	MPNEL				00046100
B	0114	DSTAT11	1	MPNEL				00028100
B	0115	ENRDA	1	MPNEL				00033000
B	0116	CYL64	1	MPNEL				00011600

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B		0117 MC4	1	MPNEL			00046600
B		0118 DSTAT10	1	MPNEL			00027600
B		0119 DSTL	1	MPNEL			00030900
B		0120 CYL32	1	MPNEL			00010500
B		0123 DATAI02	1	MPNEL	S		00013700
B		0124 DSTAT08	1	MPNEL			00026550
B		0126 DSTAT10	1	MPNEL			00027550
B		0127 DSTAT09	1	MPNEL			00027050
B		0128 DSTAT11	1	MPNEL			00028050
B		0130 DATSEL	0	MPNEL	S		00020200
B		0132 SRES	0	MPNEL	S		00056800
B		0133 TAKX	0	MPNEL	S		00058300
B		0135 OAKX	1	MPNEL	S		00048600
B		0136 DMC	1	MPNEL	S		00020700
B		0137 SECP	1				00053900
B		0138 WRTSRT	0	MPNEL	S		00064040
B		0139 DATOUTS	0	MPNEL	S		00019900
B		0140 OUTDS	1	MPNEL	S		00050100
B		0141 STATRD	0	MPNEL			00057400
B		0142 OFFLG	0	MPNEL	S		00049000
B		0143 DSTAT13	1	MPNEL			00029150
B		0144 STATSEL	0	MPNEL	S		00057500
B		0145 MAJSEL	0	MPNEL	S		00044000
B		0146 DSTAT12	1	MPNEL			00028550
B		0147 DSTAT15	1	MPNEL			00030050
B		0148 DSTAT14	1	MPNEL			00029550
B		0149 FMTCOM	0	MPNEL			00035000
B		0150 TRQX	1	MPNEL			00060800
B		0153 WRGATE	1	MPNEL			00063200
B		0155 MC1	1	MPNEL			00045100
B		0156 CYL256	1	MPNEL			00010100
B		0157 ENRDCK	1	MPNEL			00033550
B		0158 DSTAT13	1	MPNEL			00029100
B		0159 MC2	1	MPNEL			00045700
B		0160 CYL128	1	MPNEL			00008900
B		0161 TERM	0	MPNEL			00058900
B		0162 DSTAT12	1	MPNEL			00028600
B		0163 DRV8SY	1	MPNEL			00021900
B		0164 OACK	1	MPNEL	S		00048500
B		0165 COMST	0	MPNEL	S		00007000
B		0166 OCMST	1	MPNEL	S		00048700
B		0167 CYLOF	1	MPNEL			00012800
B		0168 CRCERR	1	MPNEL			00007800

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B		0169 DSTAT15	1	MPNEL			00030100
B		0171 CYL512	1	MPNEL			00011300
B		0172 ACK	1	MPNEL	S		00000400
B		0173 DSTAT14	1	MPNEL			00029600
B		0174 MCO	1	MPNEL			00044700
B		0175 COMLD	0	MPNEL	S		00006600
B		0176 HDRERB	1	MPNEL			00037200
B		0177 OCOMLD	1	MPNEL	S		00048800
B		0178 DATAI08	1	MPNEL	S		00016100
B		0203 DATAI08	1	MEMAD			00016200
B		0205 COMCLK	0	MEMAD			00006400
B		0206 DATAI10	1	MEMAD			00017100
B		0207 DATAI09	1	MEMAD			00016600
B		0208 TAKX	0	MEMAD			00058400
B		0209 FMTMC2	1	MEMAD			00035400
B		0210 DATAI11	1	MEMAD			00017600
B		0211 MPWP	1	MEMAD			00048200
B		0213 DATAOUT	1	MEMAD			00019600
B		0214 ENDSEC	0	MEMAD	S		00032600
B		0215 TRQX	0	MEMAD	S		00060600
B		0216 VID4	1	MEMAD	S		00059800
B		0217 SEC1	1	MEMAD	S		00051700
B		0218 SEC2	1	MEMAD	S		00052300
B		0219 SEC8	1	MEMAD	S		00053200
B		0220 SEC16	1	MEMAD	S		00052000
B		0221 HEAD16	1	MEMAD	S		00038600
B		0222 SEC4	1	MEMAD	S		00052900
B		0223 SEC32	1	MEMAD	S		00052600
B		0225 LASTSEC	1	MEMAD	S		00043000
B		0226 LASTHD	1	MEMAD	S		00042800
B		0227 ENDTRK	0	MEMAD	S		00032800
B		0230 SEEK	0	MEMAD			00054300
B		0231 HEAD8	1	MEMAD	S		00039700
B		0232 CYLEND	0	MEMAD	S		00012600
B		0233 HEAD1	1	MEMAD	S		00038200
B		0234 HEAD2	1	MEMAD	S		00038900
B		0235 CYL1	1	MEMAD	S		00008600
B		0236 HEAD4	1	MEMAD	S		00039300
B		0237 CYL2	1	MEMAD	S		00009800
B		0238 CYL4	1	MEMAD	S		00011000
B		0239 CYL8	1	MEMAD	S		00012100
B		0240 CYL16	1	MEMAD	S		00009400

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.O.
B	0241	CYL32	1	MEMAD		S		00010600
B	0242	CYL64	1	MEMAD		S		00011700
B	0243	CYL128	1	MEMAD		S		00009000
B	0244	CYL256	1	MEMAD		S		00010200
B	0245	CYL512	1	MEMAD		S		00011400
B	0246	LASTCYL	1	MEMAD		S		00042600
B	0252	WRITE	0	MEMAD				00063500
B	0254	TID1	1	MEMAD		S		00059400
B	0255	TID2	1	MEMAD		S		00059600
B	0257	DFSP	1	MEMAD		S		00049900
B	0258	SELCK	0	MEMAD				00054600
B	0259	DFSN	1	MEMAD		S		00049600
B	0260	DSTE	1	MEMAD		S		00030700
B	0261	DSTL	1	MEMAD		S		00031000
B	0262	HDSRD	1	MEMAD		S		00037900
B	0263	DMODE	1	MEMAD				00021300
B	0264	BUSY	1	MEMAD				00002850
B	0265	GATE	0	MEMAD				00036200
B	0267	MC13	0	MEMAD				00045400
B	0268	DATAI07	1	MEMAD				00015900
B	0269	TC1	1	MEMAD				00058600
B	0270	SECP	1	MEMAD				00054000
B	0271	DATSEL	0	MEMAD				00020300
B	0274	CMPLSE	0	MEMAD				00006200
B	0275	EXEC	1	MEMAD				00034500
B	0276	LOAD2	1	MEMAD				00043400
B	0303	B4	1	CMDTM		S		00001600
B	0305	TIMERB	0	CMDTM				00060250
B	0306	EXEC	1	CMDTM		S		00034600
B	0307	B8	1	CMDTM		S		00002000
B	0309	B16	1	CMDTM		S		00001100
B	0309	B32	1	CMDTM		S		00001500
B	0310	B64	1	CMDTM		S		00001900
B	0311	FT2	1	CMDTM		S		00035800
B	0312	FT4	1	CMDTM		S		00036000
B	0313	B128	1	CMDTM		S		00001000
B	0314	B256	1	CMDTM		S		00001400
B	0315	B512	1	CMDTM		S		00001800
B	0316	B1024	1	CMDTM		S		00000900
B	0317	B2048	1	CMDTM		S		00001300
B	0318	EXECEN	1	CMDTM				00034750
B	0321	CC34	1	CMDTM		S		00005200

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
B	0322	CCR2	1	CMDTM		S		00005000
B	0323	CC81	1	CMDTM		S		00004800
B	0326	CC98	1	CMDTM		S		00005400
B	0333	BY7	0	CMDTM		S		00004600
B	0334	EN14	1	CMDTM				00032100
B	0335	HDRERB	1	CMDTM				00037300
B	0336	SRCH	1	CMDTM		S		00055900
B	0337	WRGATE	1	CMDTM		S		00063300
B	0338	GATE	0	CMDTM		S		00036300
B	0339	CRCERR	1	CMDTM		S		00007900
B	0340	ERGATE	1	CMDTM		S		00034100
B	0341	IDTRM	0	CMDTM				00042200
B	0342	XTERR	0	CMDTM		S		00064100
B	0343	DEFTRK	0	CMDTM		S		00020500
B	0344	BUSY	1	CMDTM		S		00002900
B	0345	TERM	0	CMDTM		S		00059000
B	0346	ADRRIN	0	CMDTM		S		00000660
B	0347	DRVSKBY	0	CMDTM				00022300
B	0349	LSOSK	0	CMDTM				00043700
B	0351	EOP	0	CMDTM				00033900
B	0353	DRVALRT	1	CMDTM				00021500
B	0354	WRTSRT	0	CMDTM				00064060
B	0355	HDRMVRT	0	CMDTM		S		00037600
B	0357	HDRDBO	0	CMDTM		S		00037100
B	0358	MC280N	1	CMDTM		S		00046000
B	0359	WRPERR	0	CMDTM		S		00063700
B	0360	WRPROT	1	CMDTM				00063900
B	0361	OFLFMI	0	CMDTM				00049200
B	0363	OFLFMT	0	CMDTM				00049400
B	0365	RDATA	1	CMDTM				00050700
B	0366	CMPLSE	0	CMDTM		S		00006300
B	0367	MAJSEL	0	CMDTM				00044100
B	0368	STATSEL	0	CMDTM				00057600
B	0369	EMPTY	0	CMDTM				00031500
B	0370	LOAD2	1	CMDTM		S		00043500
B	0373	CLRSTAT	0A	CMDTM		S		00006000
B	0374	SRCHFIM	1	CMDTM				00056400
B	0375	FMTMC2	1	CMDTM		S		00035500
B	0376	DMC	1	CMDTM				00020650
B	0404	STATRD	0	CPUIF		S		00057450
B	0409	DSTAT14	1	CPUIF				00030000
B	0410	DSTAT13	1	CPUIF				00029500

P	LOCATTON	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B	0414	DSTAT15	1	CPUIF			00030500
B	0416	TID4	1	CPUIF			00060000
B	0451	WGB0480	0	CPUIF			00062200
B	0505	HEAD1	1	DRVIF			00038400
B	0506	HEAD2	1	DRVIF			00039100
B	0507	HEAD4	1	DRVIF			00039500
B	0508	RECL	0	DRVIF			00051500
B	0509	DSTE	1	DRVIF			00030800
B	0510	CYL1	1	DRVIF			00008800
B	0513	CYL2	1	DRVIF			00010000
B	0514	CYL4	1	DRVIF			00011200
B	0515	CYL8	1	DRVIF			00012300
B	0516	CYL16	1	DRVIF			00009600
B	0517	CYL32	1	DRVIF			00010800
B	0518	CYL64	1	DRVIF			00011900
B	0519	CYL128	1	DRVIF			00009200
B	0520	CYL256	1	DRVIF			00010400
B	0521	CYL512	1	DRVIF			00011500
B	0522	LSOSK	0	DRVIF			00043750
B	0523	ENDTRK	0	DRVIF			00032900
B	0524	CLRMODE	0A	DRVIF			00005800
B	0533	DRVSKBY	0	DRVIF	S		00022400
B	0535	INXP	1	DRVIF	S		00040800
B	0536	ENRDCK	1	DRVIF			00033700
B	0539	SECP	1	DRVIF	S		00054200
B	0540	EXEN	1	DRVIF	S		00034900
B	0542	MCO	1	DRVIF	S		00044800
B	0543	BUFFRW	0	DRVIF			00002300
B	0544	MCLK	0	DRVIF	S		00047200
B	0545	DATAI00	1	DRVIF			00013200
B	0546	DATAI01	1X	DRVIF			00013600
B	0547	SECB	1	DRVIF		SECIND	00053350
B	0548	ID00	1	DRVIF	S		00041000
B	0551	SEC32	1	DRVIF		SECINF	00052750
B	0552	SEC16	1	DRVIF		SECINE	00052150
B	0553	SEC4	1	DRVIF		SECINC	00053050
B	0554	ID01	1	DRVIF	S		00041200
B	0555	SEC1	1	DRVIF		SECINA	00051850
B	0556	SEC2	1	DRVIF		SECINB	00052450
B	0557	DATAT02	1	DRVIF			00014000
B	0558	EVENSTG	0	DRVIF			00034200
B	0559	DATAI03	1	DRVIF			00014400

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
B	0560	I002	1	DRVIF		S		00041400
B	0561	I003	1	DRVIF		S		00041600
B	0562	DATAI04	1	DRVIF				00014800
B	0563	DATAI05	1	DRVIF				00015200
3	0564	I004	1	DRVIF		S		00041800
B	0566	MC0	0	DRVIF		S		00044600
B	0567	MAJSEL	0	DRVIF				00044300
B	0572	I005	1	DRVIF		S		00042100
B	0573	HEAD8	1	DRVIF				00039850
B	0574	HEAD16	1	DRVIF				00038750
B	0576	COMLD	0	DRVIF				00006900

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
ACK	1	B B 02 11 0384	9T95		S		00000200
ACK	1	A A 02 01 0489	CONN			A27 4	00000300
BUFWCTC	0	B C 02 11 0375	74191				00000400
BUFWCTC	0	A A 02 02 0490	CONN		S	A26 4	00000500
BUFWCTC	0	B C 03 11 0575	74191				00000600
BUSY	0A	B F 02 01 0441	DTPSW				00000700
BUSY	0A	A D 06 12 1161	74S04		S		00000800
BUSY	1	A F 07 01 1441	7474				00000840
BUSY	1	A D 01 13 0160	74S03				00000850
BUSY	1	A F 04 05 0845	74S00				00000900
BUSY	1	A D 06 13 1160	74S04				00001000
BUSY	1	A D 07 13 1360	74S11				00001100
BUSY	1	A D 07 01 1459	74S11				00001200
BUSY	1	A A 07 01 1489	CONN		S	A78 4	00001300
CAPA	1	A E 01 11 0153	74122		S		00001400
CAPA	1	B F 01 06 0246	RC				00001500
CAPB	1	B F 01 11 0146	RC				00001600
CAPB	1	A E 01 13 0151	74122		S		00001700
COMACK	0	A E 07 06 1455	7438		S		00001800
COMACK	0	A C 09 08 1776	RES				00001900
COMACK	0	A B 09 08 1785	RES				00002000
COMACK	0	A A 12 02 2490	CONN			B24 4	00002100
COMLD	0	B B 01 03 0281	3T96		S		00002200
COMLD	0	A A 01 01 0289	CONN			A17 4	00002300
COMO	0	A D 06 01 1259	74S04				00002400
COMO	0	A B 09 14 1779	RES				00002500
COMO	0	A C 09 07 1876	RES				00002600
COMO	0	A A 13 03 2691	CONN		S	B31 4	00002700
COMST	0	B B 01 05 0283	9T96		S		00002800
COMST	0	A A 01 02 0290	CONN			A16 4	00002900
CPUSTAT	0	A C 06 04 1273	74S11				00002950
CPUSTAT	0	A F 09 06 1846	7400		S		00002960
CYL1	1	A A 04 01 0889	CONN		S	446 4	00003000
CYL1	1	B B 05 02 1080	S257				00003100

STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.	
CYL128	1	A A 05 11 0992	CONN		S	A49	4	00003200
CYL128	1	B B 06 14 1181	S257					00003300
CYL16	1	A A 04 13 0790	CONN		S	A41	4	00003400
CYL16	1	B B 06 02 1280	S257					00003500
CYL2	1	A A 04 03 0891	CONN		S	A44	4	00003600
CYL2	1	B B 05 05 1083	S257					00003700
CYL256	1	A A 06 02 1290	CONN		S	A63	4	00003800
CYL256	1	B B 07 02 1480	S257					00003900
CYL32	1	A A J5 04 1092	CONN		S	A53	4	00004000
CYL32	1	B B 06 05 1283	S257					00004100
CYL4	1	A A 04 05 0893	CONN		S	A42	4	00004200
CYL4	1	B B 05 11 0984	S257					00004300
CYL512	1	A A 06 04 1292	CONN		S	A61		00004400
CYL512	1	B B 07 05 1483	S257					00004500
CYL64	1	A A 05 08 0995	CONN		S	A47	4	00004600
CYL64	1	B B 06 11 1184	S257					00004700
CYL9	1	A A 04 09 0794	CONN		S	A36	4	00004800
CYL8	1	B B 05 14 0981	S257					00004900
CYLSTAT	0	A C 07 03 1472	74S04					00005000
CYLSTAT	0	A C 09 02 1871	RES					00005100
CYLSTAT	0	A B 09 02 1880	RES					00005200
CYLSTAT	0	A A 12 08 2395	CONN		S	B19	4	00005300
DATAI00	1	B C 02 15 0371	74191					00005400
DATAI00	1	A A 03 01 0689	CONN			A35	4	00005600
DATAI00	1	B B 04 03 0881	8T95		S			00005700
DATAI01	1	B C 02 01 0470	74191					00005750
DATAI01	1	A A J3 02 0690	CONN			A34	4	00005800
DATAI01	1	B B 04 05 0883	8T95		S			00005900
DATAI02	1	B C 02 10 0376	74191					00006000
DATAI02	1	A A 03 03 0691	CONN			A33	4	00006100
DATAI02	1	B B 04 07 0885	8T95		S			00006200
DATAI03	1	B C 02 09 0377	74191					00006300
DATAI03	1	A A 03 04 0692	CONN			A32	4	00006400

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STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DATAI03 1	B B	04 09 0786	RT95		S		00006500
DATAI04 1	B C	03 15 0571	74191				00006600
DATAI04 1	A A	03 10 0593	CONN			A28 4	00006700
DATAI04 1	B B	04 11 0784	RT95		S		00006800
DATAI05 1	A A	03 11 0592	CONN			A29 4	00006900
DATAI05 1	B C	03 01 0670	74191				00007000
DATAI05 1	B B	04 13 0782	RT95		S		00007100
DATAI06 1	A A	02 04 0492	CONN			A24 4	00007200
DATAI06 1	B C	03 10 0576	74191				00007300
DATAI06 1	B B	03 03 0681	RT95		S		00007400
DATAI07 1	A A	02 05 0493	CONN			A23 4	00007500
DATAI07 1	B C	03 09 0577	74191				00007600
DATAI07 1	B B	03 05 0683	RT95		S		00007700
DATAI08 1	A A	02 06 0494	CONN			A22 4	00007800
DATAI08 1	B B	03 07 0685	RT95		S		00007900
DATAI09 1	A A	02 10 0393	CONN			A18 4	00008000
DATAI09 1	B B	03 09 0586	RT95		S		00008100
DATAI10 1	A A	02 11 0392	CONN			A19 4	00008200
DATAI10 1	B B	03 11 0584	RT95		S		00008300
DATAI11 1	A A	02 12 0391	CONN			A20 4	00008400
DATAI11 1	B B	03 13 0582	RT95		S		00008500
DATAI12 1	A A	01 11 0192	CONN			A07 4	00008600
DATAI12 1	B B	02 03 0481	RT95		S		00008700
DATAI13 1	A A	01 12 0191	CONN			A10 4	00008800
DATAI13 1	B B	02 05 0483	RT95		S		00008900
DATAI14 1	A A	01 13 0190	CONN			A09 4	00009000
DATAI14 1	B B	02 07 0495	RT95		S		00009100
DATAI15 1	A A	01 07 0295	CONN			A13 4	00009200
DATAI15 1	B B	02 09 0386	RT95		S		00009300
DATAOUT 0	A C	04 09 1175	74S11				00009350
DATAOUT 0	A C	05 01 1070	74S00				00009400
DATAOUT 0	A C	07 02 1471	74S04		S		00009500
DATAOUT 0	A D	02 12 0361	74S86				00009550

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DATAOUT 0	A	D 01 12 0161	74S03				00009560
DATAOUT 1	A	A 06 13 1190	CONN		S	A60 4	00009700
DATAOUT 1	A	C 07 01 1470	74S04				00010000
DATAOUT 1A	A	D 02 11 0362	74S86		S		00010020
DATAOUT 1A	A	C 04 05 0874	74S11				00010030
DATAOUT 1A	A	E 07 01 1450	7438				00010040
DATAOUT 1A	A	E 07 02 1451	7438				00010050
DATAINH 1	B	B 02 01 0479	8T95				00010060
DATAINH 1	B	B 03 15 0580	8T95				00010065
DATAINH 1	B	B 03 01 0679	8T95				00010070
DATAINH 1	B	B 04 15 0780	8T95				00010075
DATAINH 1	B	B 04 01 0879	8T95				00010080
DATAINH 1	A	F 04 11 0744	74S00		S		00010085
DATOUTS 0	B	B 01 07 0285	8T96		S		00010100
DATOUTS 0	A	A 01 03 0291	CONN			A15 4	00010200
DATSEL 0	A	C 01 03 0272	74S03		S		00010300
DATSEL 0	A	A 02 14 0389	CONN			A14 4	00010400
D900 0	B	B 08 15 1580	8838		S		00010500
D900 0	A	C 10 01 2070	RES				00010600
D800 0	A	B 10 01 2079	RES				00010700
D800 0	A	A 13 13 2590	CONN			B28 4	00010800
D801 0	B	B 08 12 1583	8838		S		00010900
D801 0	A	C 10 02 2071	RES				00011000
D801 0	A	B 10 02 2080	RES				00011100
D801 0	A	A 14 01 2889	CONN			B41 4	00011200
D902 0	B	B 08 01 1679	8838		S		00011300
D802 0	A	C 10 03 2072	RES				00011400
D802 0	A	B 10 03 2081	RES				00011500
D902 0	A	A 14 03 2891	CONN			B48 4	00011600
D903 0	B	B 08 04 1682	8838		S		00011700
D803 0	A	C 10 04 2073	RES				00011800
D803 0	A	B 10 04 2082	RES				00011900
D903 0	A	A 14 04 2892	CONN			B45 4	00012000
D804 0	B	C 08 15 1571	8838		S		00012100
D904 0	A	C 10 05 2074	RES				00012200
D904 0	A	B 10 05 2083	RES				00012300

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
D8C4	0	A A 14 05 2893	CONN			B46 4	00012400
D305	0	B C 08 12 1574	3838		S		00012500
D305	0	A C 10 06 2075	RES				00012600
D305	0	A B 10 06 2084	RES				00012700
D305	0	A A 14 08 2795	CONN			B40 4	00012800
D305	0	B C 08 01 1670	8838		S		00012900
D805	0	A C 10 08 1976	RES				00013000
D806	0	A B 10 08 1985	RES				00013100
D806	0	A A 14 09 2794	CONN			B39 4	00013200
D807	0	B C 08 04 1673	3838		S		00013300
D807	0	A C 10 09 1975	RES				00013400
D807	0	A B 10 09 1984	RES				00013500
D807	0	A A 14 10 2793	CONN			B42 4	00013600
D308	0	B D 08 15 1560	3838		S		00013700
D808	0	A E 10 01 2050	RES				00013800
D808	0	A D 10 01 2059	RES				00013900
D808	0	A A 14 12 2791	CONN			B38 4	00014000
D809	0	B D 08 12 1563	3838		S		00014100
D809	0	A E 10 02 2051	RES				00014200
D809	0	A D 10 02 2060	RES				00014300
D809	0	A A 14 13 2790	CONN			B35 4	00014400
D810	0	B D 08 01 1659	3838		S		00014500
D810	0	A E 10 03 2052	RES				00014600
D810	0	A D 10 03 2061	RES				00014700
D810	0	A A 15 03 3091	CONN			B58 4	00014800
D811	0	B D 08 04 1662	3838		S		00014900
D811	0	A E 10 04 2053	RES				00015000
D811	0	A D 10 04 2062	RES				00015100
D811	0	A A 15 05 3093	CONN			B56 4	00015200
D812	0	B E 08 15 1551	3838		S		00015300
D812	0	A E 10 05 2054	RES				00015400
D812	0	A D 10 05 2063	RES				00015500
D812	0	A A 15 06 3094	CONN			B53 4	00015600
D813	0	B E 09 12 1554	3838		S		00015700
D813	0	A E 10 06 2055	RES				00015800
D813	0	A D 10 06 2064	RES				00015900
D813	0	A A 15 08 2995	CONN			B50 4	00016000

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
D814	0	B E 08 01 1650	8838		S		00016100
D914	0	A E 10 08 1956	RES				00016200
D314	0	A D 10 08 1965	RES				00016400
D514	0	A A 15 10 2993	CONN			849 4	00016500
D915	0	B E 08 04 1653	8838		S		00016600
D915	U	A E 10 09 1955	RES				00016700
D915	0	A A 15 11 2992	CONN			852 4	00016800
D915	0	A O 10 09 1964	RES				00016820
DMAACK	0	A O 07 04 1462	74S11				00016900
DMAACK	0	A D 09 08 1765	RES				00017000
DMAACK	0	A D 09 01 1859	RES				00017100
DMAACK	0	A A 13 06 2694	CONN		S	833 4	00017200
DMAREQ	U	A E 07 08 1356	7438		S		00017300
DMAREQ	0	A C 09 09 1775	RES				00017400
DMAREQ	0	A B 09 12 1781	RES				00017500
DMAREQ	0	A A 12 03 2491	CONN			823 4	00017600
DMASTRB	0	A C 07 13 1371	74S04				00017700
DMASTRB	0	A C 09 11 1773	RES				00017800
DMASTRB	0	A B 09 10 1783	RES				00017900
DMASTRB	0	A A 13 08 2595	CONN		S	830 4	00018000
DMC	1	B B 01 09 0186	8196		S		00018100
DMC	1	A A 01 04 0292	CONN			A11 4	00018200
DOUT	0	A E 07 03 1452	7438		S		00018300
DOUT	0	A C 09 01 1870	RES				00018400
DOUT	0	A B 09 01 1879	RES				00018500
DOUT	0	A A 12 01 2489	CONN			821 4	00018600
DOUTBSY	1	A D 01 11 0162	74S03		S		00018620
DOUTBSY	1	A F 03 04 0644	1KRES				00018630
DOUTBSY	1	A F 04 13 0742	74S00				00018640
DSTAT00	1	B B 05 04 1082	S257		S		00018700
DSTAT00	1	A A 07 02 1490	CONN		S	A77 4	00018800
DSTAT00	1	B B 08 14 1581	8838				00018900
DSTAT01	1	B B 05 07 1085	S257		S		00019000
DSTAT01	1	A A 07 03 1491	CONN		S	A76 4	00019100
DSTAT01	1	B B 09 11 1584	8838				00019200
DSTAT02	1	B B 05 09 0986	S257		S		00019300

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	DSTAT02 1	A	A 07 04 1492	CONN		S	A75 4	00019400
	DSTAT02 1	B	B 09 02 1680	9838				00019500
*	3							
	DSTAT03 1	B	B 05 12 0983	S257		S		00019600
	DSTAT03 1	A	A 07 05 1493	CONN		S	A74 4	00019700
	DSTAT03 1	B	B 08 05 1683	9838				00019800
*	4							
	DSTAT04 1	B	B 06 04 1282	S257		S		00019900
	DSTAT04 1	A	A 07 06 1494	CONN		S	A73 4	00020000
	DSTAT04 1	B	C 08 14 1572	8838				00020100
*	5							
	DSTAT05 1	B	A 06 07 1285	S257		S		00020200
	DSTAT05 1	A	A 07 07 1495	CONN		S	A71 4	00020300
	DSTAT05 1	B	C 08 11 1575	8838				00020400
*	6							
	DSTAT06 1	B	B 06 09 1186	S257		S		00020500
	DSTAT06 1	A	A 07 08 1395	CONN		S	A66 4	00020600
	DSTAT06 1	B	C 08 02 1671	9838				00020700
*	7							
	DSTAT07 1	B	B 06 12 1183	S257		S		00020800
	DSTAT07 1	A	A 07 09 1394	CONN		S	A65 4	00020900
	DSTAT07 1	B	C 08 05 1674	9838				00021000
*	8							
	DSTAT08 1	A	A 07 10 1393	CONN		S	A67 4	00021100
	DSTAT08 1	B	B 07 04 1482	S257		S		00021200
	DSTAT08 1	B	D 08 14 1561	8838				00021300
*	9							
	DSTAT09 1	A	A 07 11 1392	CONN		S	A68 4	00021400
	DSTAT09 1	B	B 07 07 1485	S257		S		00021500
	DSTAT09 1	B	D 08 11 1564	8838				00021600
*	10							
	DSTAT10 1	B	B 07 09 1386	S257		S		00021700
	DSTAT10 1	A	A 07 12 1391	CONN		S	A69 4	00021800
	DSTAT10 1	B	D 08 02 1660	8838				00021900
*	11							
	DSTAT11 1	B	B 07 12 1383	S257		S		00022000
	DSTAT11 1	A	A 07 13 1390	CONN		S	A70 4	00022100
	DSTAT11 1	B	D 08 05 1663	9838				00022200
*	12							
	DSTAT12 1	A	A 07 14 1389	CONN		S	A72 4	00022300
	DSTAT12 1	B	E 08 14 1552	9838				00022400
	DSTAT12 1	B	F 08 04 1644	S257		S		00022500
*	13							
	DSTAT13 1	B	F 08 07 1647	S257		S		00022600
	DSTAT13 1	B	E 08 11 1555	9838				00022700
	DSTAT13 1	A	A 11 01 2289	CONN		S	B10 4	00022800
*	14							

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
	DSTAT14	1	B F 08 09 1548	S257		S		00022900
	DSTAT14	1	B E 08 02 1651	8838				00023000
	DSTAT14	1	A A 11 02 2290	CONN		S	B09 4	00023100
*	15							
	DSTAT15	1	B F 08 12 1545	S257		S		00023200
	DSTAT15	1	B E 08 05 1654	8838				00023300
	DSTAT15	1	A A 11 03 2291	CONN		S	B14 4	00023400
*	16							
	ENDTRK	0	A A 04 12 0791	CONN		S	A40	00023500
	ENDTRK	0	A D 06 09 1164	74S04				00023600
	ENDTRK	1A	A D 06 08 1165	74S04		S		00023700
	ENDTRK	1A	A C 04 10 0774	74S11				00023800
	ENDTRK	1A	A C 05 10 0974	74S00				00023850
	EOXC	1	A F 06 13 1142	RC				00023860
	EOXC	1	B F 05 14 0943	74123		S		00023870
	EOXFR	0	B F 02 02 0442	DIPSW				00023890
	EOXFR	0	B F 05 01 1041	74123				00023900
	EOXFR	0	A C 09 10 1774	RES				00024000
	EOXFR	0	A B 09 11 1782	RES				00024100
	EOXFR	0	A A 13 10 2593	CONN		S	B29 4	00024200
	EOXFRA	0	B F 02 14 0143	DIPSW				00024210
	EOXFRA	0	B F 02 15 0142	DIPSW		S		00024215
	EOXFRA	0	A D 07 02 1460	74S11				00024220
	EOXFRB	0	B F 02 03 0443	DIPSW				00024230
	EOXFRB	0	A F 07 06 1446	7474		S		00024235
	EOXOS	0	B F 05 04 1044	74123		S		00024240
	EOXOS	0	A F 07 03 1443	7474				00024250
	EOXRC	1	A F 06 01 1241	RC				00024260
	EOXRC	1	A F 06 02 1242	RC				00024265
	EOXRC	1	B F 05 15 0942	74123		S		00024270
	EXEC	1	A A 04 11 0792	CONN		S	A39 4	00024300
	EXEC	1	A C 05 09 0975	74S00				00024400
	EXECEN	0A	A E 02 08 0356	74S04		S		00024500
	EXECEN	0A	A E 03 10 0554	7400				00024600
	EXECEN	1	A E 02 09 0355	74S04				00024700
	EXECEN	1	A A 02 03 0491	CONN		S	A25 4	00024800

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
FCET	0	A D 04 04 0862	74H21				00024900
FCEI	0	A C 05 12 0972	74S00				00025000
FCEI	0	A E 06 06 1255	74S74		S		00025100
FCOMACK	0	A E 03 01 0650	7400				00025200
FCOMACK	0	A E 03 02 0651	7400				00025300
FCOMACK	0	A E 04 06 0855	74S74		S		00025400
FCOMACK	1	B B 01 04 0282	8T96				00025500
FCOMACK	1	A E 04 05 0854	74S74		S		00025600
FCOMACK	1	A F 04 02 0842	74S00				00025700
FCOMODE	0	A E 01 06 0255	74122		S		00025800
FCOMODE	0	A E 04 03 0852	74S74				00025900
FDEI	0	A D 05 11 0962	74S74				00026000
FDEI	0	A C 05 13 0971	74S00				00026100
FDEI	0	A E 06 08 1156	74S74		S		00026200
FDEI	1	A E 03 13 0551	7400				00026300
FDEI	1	A E 06 09 1155	74S74		S		00026400
FDEIACK	0	A D 04 05 0863	74H21				00026500
FDEIACK	0	A D 05 08 0965	74S74		S		00026600
FDEIACK	1	A E 05 09 0955	7408				00026700
FDEIACK	1	A D 05 09 0964	74S74		S		00026800
FDMAREQ	0	A E 04 08 0756	74S74		S		00026900
FDMAREQ	0	A D 05 03 1061	74S74				00027000
FDMAREQ	1	A E 04 09 0755	74S74		S		00027100
FDMAREQ	1	A E 07 10 1354	7438				00027200
FDMAREQ	1	A E 07 09 1355	7438				00027300
FDMC	0	B B 01 10 0185	8T96				00027400
FDMC	0	A D 03 06 0664	74S74		S		00027500
FDMC	1	A D 03 05 0663	74S74		S		00027600
FDMC	1	A D 05 02 1060	74S74				00027700
FDMC	1	A D 07 09 1364	74S11				00027800
FDMC	1	A D 07 03 1461	74S11				00027900
FDMC	1	B F 05 02 1042	74123				00027920
FDT	1	A D 05 05 1063	74S74		S		00028000
FDT	1	A C 05 02 1071	74S00				00028100

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
FDT	1	A C 01 02 0271	74S03				00028200
FTAKX	1	B B 01 12 0183	8T96				00028300
FTAKX	1	A D 03 09 0564	74S74		S		00028400
FTAKX	1	A E 03 04 0653	7400				00028500
FTAKX	1	A E 03 05 0654	7400				00028600
GACK	1	B B 02 12 0383	8T95				00028700
GACK	1	A E 05 08 0956	7408		S		00028800
GATN	1	A A 03 13 0590	CONN		S	A31 4	00028900
GATN	1	A D 04 02 0860	74H21				00029000
GATN	1	A D 05 13 0960	74S74				00029100
GBUSY	0	A F 04 06 0846	74S00		S		00029200
GBUSY	0	A F 04 10 0745	74S00				00029300
GCACK	0	A F 04 03 0843	74S00		S		00029400
GCACK	0	A F 04 09 0746	74S00				00029500
GCEINH	0	A E 03 08 0556	7400		S		00029600
GCEINH	0	A E 06 02 1251	74S74				00029700
GCEIR	0	A E 05 03 1052	7408		S		00029800
GCEIR	0	A E 06 01 1250	74S74				00029900
GCOMACK	1	A F 04 08 0747	74S00		S		00030000
GCOMACK	1	A E 07 04 1453	7438				00030100
GCOMACK	1	A E 07 05 1454	7438				00030200
GCOMAD	1	B F 01 10 0147	RC				00030300
GCOMAD	1	A E 02 13 0351	74S04				00030400
GCOMAD	1	A E 03 03 0652	7400		S		00030500
GCOMAR	0	A E 02 12 0352	74S04		S		00030600
GCOMAR	0	A E 04 01 0850	74S74				00030700
GDATIN	0	A C 05 03 1072	74S00		S		00030800
GDATIN	0	A C 06 03 1272	74S11				00030900
GDATOS	1	B B 01 06 0284	8T96				00031000
GDATOS	1	A C 04 06 0875	74S11		S		00031100
GDATSEN	1	A C 01 01 0270	74S03				00031200
GDATSEN	1	A C 06 08 1176	74S11		S		00031300

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
GDEACKR	0	A E 03 11 0553	7400		S		00031400
GDEACKR	0	A E 05 05 1054	7408				00031500
GDEI	1	A D 04 06 0964	74H21		S		00031600
GDEI	1	A E 06 11 1153	74S74				00031700
GDEIR	0	A E 05 06 1055	7408		S		00031800
GDEIR	0	A E 06 13 1151	74S74				00031900
GDMARR	0	A E 04 13 0751	74S74				00032000
GDMARR	0	A D 07 06 1464	74S11		S		00032100
GDMCR	0	A D 03 01 0659	74S74				00032200
GDMCR	0	A D 07 12 1361	74S11		S		00032300
GDRVS	1	A D 02 09 0364	74S86				00032400
GDRVS	1	A D 02 03 0461	74S86		S		00032500
GDRVS	1	A C 05 04 1073	74S00				00032600
GDRVSEN	0	B B 05 15 0980	S257				00032700
GDRVSEN	0	A C 05 06 1075	74S00		S		00032800
GDRVSEN	0	B B 06 15 1180	S257				00032900
GDRVSEN	0	A C 06 05 1274	74S11				00033000
GDRVSEN	0	B B 07 15 1390	S257				00033100
GDRVSEN	0	B F 08 15 1542	S257				00033200
GDTR	0	A D 05 01 1059	74S74				00033300
GDTR	0	A D 07 08 1365	74S11		S		00033400
GINTR	1	A C 05 11 0973	74S00		S		00033500
GINTR	1	A E 07 12 1352	7438				00033600
GMINA	1	B C 02 12 0374	74191		S		00033700
GMINA	1	A C 04 09 0775	74S11				00033800
GMINB	1	B C 03 12 0574	74191		S		00033900
GMINB	1	A C 04 11 0773	74S11				00034000
GND	0	A B 09 07 1885	RES		S		00034050
GND	0	A B 10 07 2085	RES		S		00035050
* GRIP	0	B C 02 13 0373	74191		S		00035100
GRIP	0	B C 03 04 0673	74191				00035200
GSRDEN6	1	A C 01 13 0171	74S03				00035300
GSRDEN9	1	A D 02 08 0365	74S86		S		00035400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
GSTAT	1	A C 01 10 0174	74503				00035500
GSTAT	1	A D 02 06 0464	74586		S		00035600
GSTAT	1	A D 02 10 0363	74586				00035700
GSTAT	1	A F 09 05 1845	7400				00035750
GSTCLK	0	B C 02 14 0372	74191				00035800
GSTCLK	0	B C 03 14 0572	74191				00035900
GSTCLK	0	A C 05 08 0976	74500		S		00036000
GTAKXR	0	B F 01 09 0148	RC				00036100
GTAKXR	0	A D 03 13 0560	74574				00036200
GTAKXR	0	A E 03 06 0655	7400		S		00036300
GTAKXR	0	A D 07 11 1362	74511				00036400
GTDBENB	0	A C 06 06 1275	74511		S		00036500
GTDBENB	0	B E 08 09 1557	8838				00036600
GTDBENB	0	B D 08 09 1566	8838				00036700
GTDBENB	0	B C 08 09 1577	8838				00036800
GTDBENB	0	B B 08 09 1586	8838				00036900
GTDBENB	0	B E 08 07 1656	8838				00037000
GTDBENB	0	B D 08 07 1665	8838				00037100
GTDBENB	0	B C 08 07 1676	8838				00037200
GTDBENB	0	B B 08 07 1685	8838				00037300
GWFO1	0	B F 01 04 0244	RC				00037400
GWFO1	0	B F 01 07 0247	RC		S		00037500
HEAD1	1	A A 05 09 0994	CONN		S	A48 4	00037600
HEAD1	1	B B 06 10 1185	S257				00037700
HEAD16	1	A A 06 10 1193	CONN		S	A57 4	00037800
HEAD16	1	B B 07 10 1385	S257				00037900
HEAD2	1	A A 05 12 0991	CONN		S	A50 4	00038000
HEAD2	1	B B 06 13 1182	S257				00038100
HEAD4	1	A A 06 03 1291	CONN		S	A62 4	00038200
HEAD4	1	B B 07 03 1481	S257				00038300
HEAD8	1	A A 06 08 1195	CONN		S	A56 4	00038400
HEAD8	1	B B 07 06 1484	S257				00038500
INTACK	0	A D 06 05 1263	74504				00038600
INTACK	0	A C 09 12 1772	RES				00038700
INTACK	0	A B 09 09 1784	RES				00038800
INTACK	0	A A 13 12 2591	CONN		S	B27 4	00038900

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
INTR	0	A E 07 11 1353	7438		S		00039000
INTR	0	A C 09 13 1771	RES				00039100
INTR	0	A B 09 13 1780	RES				00039200
INTR	0	A A 12 04 2492	CONN			B25 4	00039300
MAJSEL	0	A A 01 08 0195	CONN			A08 4	00039400
MAJSEL	0	A C 01 06 0275	74S03		S		00039500
MAJSTAT	0	A C 07 09 1375	74S04				00039600
MAJSTAT	0	A C 09 04 1873	RES				00039700
MAJSTAT	0	A B 09 04 1882	RES				00039800
MAJSTAT	0	A A 12 11 2392	CONN		S	B20 4	00039900
MCO	0	A A 02 13 0390	CONN		S	A21 4	00040000
MCO	0	A D 03 03 0661	74S74				00040100
MINSTAT	0	A C 07 11 1373	74S04				00040200
MINSTAT	0	A C 09 05 1874	RES				00040300
MINSTAT	0	A B 09 05 1883	RES				00040400
MINSTAT	0	A A 12 13 2390	CONN		S	B18 4	00040500
PURST	0	B F 01 13 0144	RC		S		00040600
PURST	0	B F 01 01 0241	RC		S		00040700
PURST	0	A E 02 03 0452	74S04				00040800
PURST	1	A D 01 04 0262	74S03				00040900
PURST	1	A D 01 05 0263	74S03				00041000
PURST	1	A E 02 04 0453	74S04		S		00041100
RCOMO	1	A E 01 03 0252	74122				00041200
RCOMO	1	A E 01 04 0253	74122				00041300
RCOMO	1	B B 01 02 0280	8T96				00041400
RCOMO	1	A D 06 02 1260	74S04		S		00041500
RCYLS	1	A D 02 01 0459	74S86				00041600
RCYLS	1	A C 07 04 1473	74S04		S		00041700
RDB00	1	B B 04 02 0880	8T95				00041800
RDB00	1	B B 08 13 1582	8838		S		00041900
RDB01	1	B B 04 04 0882	8T95				00042000
RDB01	1	B B 08 10 1585	9838		S		00042100
RDB02	1	B B 04 06 0884	8T95				00042200
RDB02	1	B B 08 03 1681	8838		S		00042300

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RDB03	1	B B 04 10 0785	8T95				00042400
RDB03	1	B B 08 06 1684	8838		S		00042500
RDB04	1	B B 04 12 0783	8T95				00042600
RDB04	1	B C 08 13 1573	8838		S		00042700
RDB05	1	B B 04 14 0781	8T95				00042800
RDB05	1	B C 08 10 1576	8838		S		00042900
RDB06	1	B B 03 02 0680	8T95				00043000
RDB06	1	B C 08 03 1672	8838		S		00043100
RDB07	1	B B 03 04 0682	8T95				00043200
RDB07	1	B C 08 06 1675	8838		S		00043300
RDB08	1	B B 03 06 0684	8T95				00043400
RDB08	1	B D 08 13 1562	8838		S		00043500
RDB09	1	B B 03 10 0585	8T95				00043600
RDB09	1	B D 08 10 1565	8838		S		00043700
RDB10	1	B B 03 12 0583	8T95				00043800
RDB10	1	B D 08 03 1661	8838		S		00043900
RDB11	1	B B 03 14 0581	8T95				00044000
RDB11	1	B D 08 06 1664	8838		S		00044100
RDB12	1	B B 02 02 0480	8T95				00044200
RDB12	1	B E 08 13 1553	8838		S		00044300
RDB13	1	B B 02 04 0482	8T95				00044400
RDB13	1	B E 08 10 1556	8838		S		00044500
RDB14	1	B B 02 06 0484	8T95				00044600
RDB14	1	B E 08 03 1652	8838		S		00044700
RDB15	1	B B 02 10 0385	8T95				00044800
RDB15	1	B E 08 06 1655	8838		S		00044900
RDMAST	0	A E 02 06 0455	74S04		S		00045000
RDMAST	0	A D 03 11 0562	74S74				00045100
RDMAST	1	A E 02 05 0454	74S04				00045200
RDMAST	1	A C 04 03 0872	74S11				00045300
RDMAST	1	A C 07 12 1372	74S04		S		00045400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RECSTAT 0	A	C 07 05 1474	74S04				00045500
RECSTAT 0	A	C 09 03 1872	RES				00045600
RECSTAT 0	A	B 09 03 1881	RES				00045700
RECSTAT 0	A	A 12 10 2393	CONN		S	B22 4	00045800
RINTACK 0	A	E 02 10 0354	74S04		S		00045900
RINTACK 0	A	D 04 01 0859	74H21				00046000
RINTACK 0	A	E 05 02 1051	7408				00046100
RINTACK 1	A	E 02 11 0353	74S04				00046200
RINTACK 1	A	E 03 12 0552	7400				00046300
RINTACK 1	A	E 05 10 0954	7408				00046400
RINTACK 1	A	D 06 06 1264	74S04		S		00046500
RMAJS 1	A	C 01 05 0274	74S03				00046600
RMAJS 1	A	D 02 04 0462	74S86				00046700
RMAJS 1	A	C 07 08 1376	74S04		S		00046800
RMINS 1	A	D 02 05 0463	74S86				00046900
RMINS 1	A	C 07 10 1374	74S04		S		00047000
RRECS 1	B	F 08 01 1641	S257				00047100
RRECS 1	A	D 02 02 0460	74S86				00047200
RRECS 1	B	B 05 01 1079	S257				00047300
RRECS 1	B	B 06 01 1279	S257				00047400
RRECS 1	A	C 07 06 1475	74S04		S		00047500
RRECS 1	B	B 07 01 1479	S257				00047600
RSYSRES 1	A	D 01 09 0164	74S03				00047650
RSYSRES 1	A	D 01 02 0260	74S03				00047700
RSYSRES 1	A	E 02 02 0451	74S04		S		00047800
SFC1 1	A	A 04 02 0890	CONN		S	A45 4	00047900
SEC1 1	B	B 05 03 1081	S257				00048000
SFC16 1	A	A 05 03 1091	CONN		S	A54 4	00048100
SEC16 1	B	B 06 03 1281	S257				00048200
SEC2 1	A	A 04 04 0892	CONN		S	A43 4	00048300
SEC2 1	B	B 05 06 1084	S257				00048400
SFC32 1	A	A 05 05 1093	CONN		S	A52 4	00048500
SEC32 1	B	B 06 06 1284	S257				00048600
SEC4 1	A	A 04 08 0795	CONN		S	A37 4	00048700
SFC4 1	B	B 05 10 0985	S257				00048800

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SECB 1	A	A 04 10 0793	CONN		S	A38	4 00048900
SECB 1	B	B 05 13 0982	S257				00049000
SOFLINE 0	A	C 01 12 0172	74S03				00049100
SOFLINE 0	A	C 01 09 0175	74S03				00049200
SOFLINE 0	A	D 01 01 0259	74S03				00049300
SOFLINE 0	A	D 01 10 0163	74S03				00049350
SOFLINE 0	A	C 01 04 0273	74S03				00049400
SOFLINE 0	A	F 04 12 0743	74S00				00049450
SOFLINE 0	A	C 05 05 1074	74S00				00049500
SOFLINE 0	A	C 06 10 1174	74S11				00049600
SOFLINE 0	A	E 07 13 1351	7438				00049700
SOFLINE 0	A	D 07 10 1363	74S11				00049800
SOFLINE 0	A	D 07 05 1463	74S11				00049900
SOFLINE 0	A	F 09 04 1844	7400				00049950
SOFLINE 0	A	E 10 10 1954	RES				00050000
SOFLINE 0	A	A 11 05 2293	CONN		S	B15	4 00050100
SOFLINE 1	B	B 01 15 0180	8T96				00050200
SOFLINE 1	A	E 01 01 0250	74122				00050300
SOFLINE 1	A	E 01 02 0251	74122				00050400
SOFLINE 1	B	B 01 01 0279	8T96				00050500
SOFLINE 1	B	B 02 15 0380	8T95				00050600
SOFLINE 1	A	C 10 10 1974	RES				00051200
SOFLINE 1	A	A 11 04 2292	CONN		S	B13	4 00051300
SPARE2 1	A	A 06 09 1194	CONN		S	A55	4 00051600
SPARE2 1	B	B 07 11 1384	S257				00051700
SPARE3 1	A	A 06 11 1192	CONN		S	A58	4 00051800
SPARE3 1	B	B 07 14 1381	S257				00051900
SPARE4 1	A	A 06 12 1191	CONN		S	A59	4 00052000
SPARE4 1	B	B 07 13 1382	S257				00052100
SRCHF IN 1	A	A 03 12 0591	CONN			A30	4 00052200
SRCHF IN 1	A	C 04 08 0776	74S11		S		00052300
SRES 0	A	D 01 08 0165	74S03		S		00052350
SRES 0	A	A 01 10 0193	CONN			A06	4 00052400
SRES 0	A	E 01 05 0254	74122				00052500
SRES 0	A	D 01 03 0261	74S03		S		00052600
SRES 0	A	D 01 06 0264	74S03		S		00052700
SRES 0	A	E 05 01 1050	7408				00052800
SRES 0	A	E 05 04 1053	7408				00052900

STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
STATRD	0	A A 11 13 2190	CONN			804	00053000
STATRD	0	A C 01 11 0173	7438		S		00053100
STATRD	0	B F 03 03 0643	RES				00053200
STATSEL	0	A C 01 08 0176	74S03		S		00053300
STATSEL	0	A A 01 09 0194	CONN			A05 4	00053400
SWBUSY	0	B F 02 16 0341	DIPSW		S		00053600
SWBUSY	0	A F 03 01 0641	RES				00053700
SWBUSY	0	A E 04 02 0851	74S74				00053800
SWCACK	0	A F 04 04 0844	74S00				00053900
SWCACK	0	A D 06 10 1163	74S04		S		00054000
SWCACK	1	B F 02 09 0348	DIPSW		S		00054100
SWCACK	1	A F 03 02 0642	RES				00054200
SWCACK	1	A F 04 01 0841	74S00				00054300
SWCACK	1	A D 06 11 1162	74S04				00054400
SYSRES	0	A E 02 01 0450	74S04				00054500
SYSRES	0	A C 09 06 1875	RES				00054600
SYSRES	0	A B 09 06 1884	RES				00054700
SYSRES	0	A A 13 04 2692	CONN		S	B34 4	00054800
TAKX	0	B B 01 11 0184	8T96		S		00054900
TAKX	0	A A 01 05 0293	CONN			A12 4	00055000
TERM	0	A D 06 03 1261	74S04				00055100
TERM	0	A A 06 01 1289	CONN		S	A64	00055150
TERM	1A	A E 06 03 1252	74S74				00055200
TERM	1A	A D 06 04 1262	74S04		S		00055300
TID4	1	A E 03 09 0555	7400				00055400
TID4	1	A A 11 06 2294	CONN		S	B16 4	00055500
TRQX	0	A A 05 13 0990	CONN		S	A51	00055510
TRQX	0	A F 09 02 1842	7400				00055520
TRQX	0	A F 09 01 1841	7400				00055530
TRQX	1	A F 09 03 1843	7400		S		00055550
TRQX	1	A E 04 11 0753	74S74				00055600
TRQX	1	A C 04 04 0873	74S11				00055700
TRQX	1	A C 06 11 1173	74S11				00055900
WGC02	0	B C 02 04 0473	74191				00056000

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
WGC02	U	B C 02 08 0477	74191		S		00056100
WGF08	0	B F 08 02 1642	S257				00056200
WGF08	0	B F 08 03 1643	S257				00056300
WGF08	0	B F 08 05 1645	S257				00056400
WGF08	0	B F 08 06 1646	S257				00056500
WGF08	0	B F 08 08 1648	S257		S		00056600
WGF08	0	B F 08 10 1547	S257				00056700
WGF08	0	B F 08 11 1546	S257				00056800
WGF08	0	B F 08 13 1544	S257				00056900
WGF08	0	B F 08 14 1543	S257				00057000
WVE01	1	A E 01 14 0150	74122		S		00057100
WVE01	1	A E 01 09 0155	74122				00057200

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A A 01 01 0289	COMLD	0	CONN			A17 4	00002300
A A 01 02 0290	COMST	0	CONN			A16 4	00002900
A A 01 03 0291	DATOUTS	0	CONN			A15 4	00010200
A A 01 04 0292	DMC	1	CONN			A11 4	00018200
A A 01 05 0293	TAKX	0	CONN			A12 4	00055000
A A 01 07 0295	DATAI15	1	CONN			A13 4	00009200
A A 01 08 0195	MAJSEL	0	CONN			A08 4	00039400
A A 01 09 0194	STATSEL	0	CONN			A05 4	00053400
A A 01 10 0193	SRES	0	CONN			A06 4	00052400
A A 01 11 0192	DATAI12	1	CONN			A07 4	00008600
A A 01 12 0191	DATAI13	1	CONN			A10 4	00008800
A A 01 13 0190	DATAI14	1	CONN			A09 4	00009000
A A 02 01 0489	ACK	1	CONN			A27 4	00000300
A A 02 02 0490	BUFWCTC	0	CONN		S	A26 4	00000500
A A 02 03 0491	EXECEN	1	CONN		S	A25 4	00024800
A A 02 04 0492	DATAI06	1	CONN			A24 4	00007200
A A 02 05 0493	DATAI07	1	CONN			A23 4	00007500
A A 02 06 0494	DATAI08	1	CONN			A22 4	00007800
A A 02 10 0393	DATAI09	1	CONN			A18 4	00008000
A A 02 11 0392	DATAI10	1	CONN			A19 4	00008200
A A 02 12 0391	DATAI11	1	CONN			A20 4	00008400
A A 02 13 0390	MCO	0	CONN		S	A21 4	00040000
A A 02 14 0389	DATSEL	0	CONN			A14 4	00010400
A A 03 01 0689	DATAI00	1	CONN			A35 4	00005600
A A 03 02 0690	DATAI01	1	CONN			A34 4	00005800
A A 03 03 0691	DATAI02	1	CONN			A33 4	00006100
A A 03 04 0692	DATAI03	1	CONN			A32 4	00006400
A A 03 10 0593	DATAI04	1	CONN			A28 4	00006700
A A 03 11 0592	DATAI05	1	CONN			A29 4	00006900
A A 03 12 0591	SRCHFIN	1	CONN			A30 4	00052200
A A 03 13 0590	GATN	1	CONN		S	A31 4	00028900
A A 04 01 0889	CYL1	1	CONN		S	A46 4	00003000
A A 04 02 0890	SEC1	1	CONN		S	A45 4	00047900
A A 04 03 0891	CYL2	1	CONN		S	A44 4	00003600
A A 04 04 0892	SEC2	1	CONN		S	A43 4	00048300
A A 04 05 0893	CYL4	1	CONN		S	A42 4	00004200
A A 04 08 0795	SEC4	1	CONN		S	A37 4	00048700
A A 04 09 0794	CYL8	1	CONN		S	A36 4	00004800
A A 04 10 0793	SEC8	1	CONN		S	A38 4	00048900
A A 04 11 0792	EXEC	1	CONN		S	A39 4	00024300

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A A	04 12	0791 ENDRK	0	CONN	S	A40	00023500
A A	04 13	0790 CYL16	1	CONN	S	A41 4	00003400
A A	05 03	1091 SEC16	1	CONN	S	A54 4	00048100
A A	05 04	1092 CYL32	1	CONN	S	A53 4	00004000
A A	05 05	1093 SEC32	1	CONN	S	A52 4	00048500
A A	05 08	0995 CYL64	1	CONN	S	A47 4	00004600
A A	05 09	0994 HEAD1	1	CONN	S	A48 4	00037600
A A	05 11	0992 CYL128	1	CONN	S	A49 4	00003200
A A	05 12	0991 HEAD2	1	CONN	S	A50 4	00038000
A A	05 13	0990 TRQX	0	CONN	S	A51	00055510
A A	06 01	1289 TERM	0	CONN	S	A64	00055150
A A	06 02	1290 CYL256	1	CONN	S	A63 4	00003800
A A	06 03	1291 HEAD4	1	CONN	S	A62 4	00038200
A A	06 04	1292 CYL512	1	CONN	S	A61	00004400
A A	06 08	1195 HEAD8	1	CONN	S	A56 4	00038400
A A	06 09	1194 SPARE2	1	CONN	S	A55 4	00051600
A A	06 10	1193 HEAD16	1	CONN	S	A57 4	00037800
A A	06 11	1192 SPARE3	1	CONN	S	A58 4	00051800
A A	06 12	1191 SPARE4	1	CONN	S	A59 4	00052000
A A	06 13	1190 DATAOUT	1	CONN	S	A60 4	00009700
A A	07 01	1489 BUSY	1	CONN	S	A78 4	00001300
A A	07 02	1490 DSTAT00	1	CONN	S	A77 4	00018800
A A	07 03	1491 DSTAT01	1	CONN	S	A76 4	00019100
A A	07 04	1492 DSTAT02	1	CONN	S	A75 4	00019400
A A	07 05	1493 DSTAT03	1	CONN	S	A74 4	00019700
A A	07 06	1494 DSTAT04	1	CONN	S	A73 4	00020000
A A	07 07	1495 DSTAT05	1	CONN	S	A71 4	00020300
A A	07 08	1395 DSTAT06	1	CONN	S	A66 4	00020600
A A	07 09	1394 DSTAT07	1	CONN	S	A65 4	00020900
A A	07 10	1393 DSTAT08	1	CONN	S	A67 4	00021100
A A	07 11	1392 DSTAT09	1	CONN	S	A68 4	00021400
A A	07 12	1391 DSTAT10	1	CONN	S	A69 4	00021800
A A	07 13	1390 DSTAT11	1	CONN	S	A70 4	00022100
A A	07 14	1389 DSTAT12	1	CONN	S	A72 4	00022300
A A	11 01	2289 DSTAT13	1	CONN	S	B10 4	00022800
A A	11 02	2290 DSTAT14	1	CONN	S	B09 4	00023100
A A	11 03	2291 DSTAT15	1	CONN	S	B14 4	00023400
A A	11 04	2292 SOFLINE	1	CONN	S	B13 4	00051300
A A	11 05	2293 SOFLINE	0	CONN	S	B15 4	00050100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.	
A A	11 06	2294 TID4	1	CONN	S	B16	4	00055500
A A	11 13	2190 STATRD	0	CONN		304		00053000
A A	12 01	2489 DOUT	0	CONN		B21	4	00018600
A A	12 02	2490 COMACK	0	CONN		B24	4	00002100
A A	12 03	2491 DMAREQ	0	CONN		B23	4	00017600
A A	12 04	2492 INTR	0	CONN		B25	4	00039300
A A	12 08	2395 CYLSTAT	0	CONN	S	B19	4	00005300
A A	12 10	2393 RECSTAT	0	CONN	S	B22	4	00045800
A A	12 11	2392 MAJSTAT	0	CONN	S	B20	4	00039900
A A	12 13	2390 MINSTAT	0	CONN	S	B18	4	00040500
A A	13 03	2691 COMO	0	CONN	S	B31	4	00002700
A A	13 04	2692 SYSRES	0	CONN	S	B34	4	00054800
A A	13 06	2694 DMAACK	0	CONN	S	B33	4	00017200
A A	13 08	2595 DMASTRB	0	CONN	S	B30	4	00018000
A A	13 10	2593 EOXFR	0	CONN	S	B29	4	00024200
A A	13 12	2591 INTACK	0	CONN	S	B27	4	00038900
A A	13 13	2590 DB00	0	CONN		B28	4	00010800
A A	14 01	2889 DB01	0	CONN		B41	4	00011200
A A	14 03	2891 DB02	0	CONN		B48	4	00011600
A A	14 04	2892 DB03	0	CONN		B45	4	00012000
A A	14 05	2893 DB04	0	CONN		B46	4	00012400
A A	14 08	2795 DB05	0	CONN		B40	4	00012800
A A	14 09	2794 DB06	0	CONN		B39	4	00013200
A A	14 10	2793 DB07	0	CONN		B42	4	00013600
A A	14 12	2791 DB08	0	CONN		B38	4	00014000
A A	14 13	2790 DB09	0	CONN		B35	4	00014400
A A	15 03	3091 DB10	0	CONN		B58	4	00014800
A A	15 05	3093 DB11	0	CONN		B56	4	00015200
A A	15 06	3094 DB12	0	CONN		B53	4	00015600
A A	15 08	2995 DB13	0	CONN		B50	4	00016000
A A	15 10	2993 DB14	0	CONN		B49	4	00016500
A A	15 11	2992 DB15	0	CONN		B52	4	00016800
A R	09 01	1879 DOUT	0	RES				00018500
A R	09 02	1980 CYLSTAT	0	RES				00005200
A R	09 03	1881 RECSTAT	0	RES				00045700
A R	09 04	1882 MAJSTAT	0	RES				00039800
A R	09 05	1883 MINSTAT	0	RES				00040400
A R	09 06	1884 SYSRES	0	RES				00054700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	B 09 07	1985 GND	0	RES		S	00034050
A	B 09 08	1785 COMACK	0	RES			00002000
A	B 09 09	1784 INTACK	0	RES			00038800
A	B 09 10	1783 DMASTRB	0	RES			00017900
A	B 09 11	1782 EOXFR	0	RES			00024100
A	B 09 12	1781 DMAREQ	0	RES			00017500
A	B 09 13	1780 INTR	0	RES			00039200
A	B 09 14	1779 COMO	0	RES			00002500
A	B 10 01	2079 DB00	0	RES			00010700
A	B 10 02	2080 DB01	0	RES			00011100
A	B 10 03	2081 DB02	0	RES			00011500
A	B 10 04	2082 DB03	0	RES			00011900
A	B 10 05	2083 DB04	0	RES			00012300
A	B 10 06	2084 DB05	0	RES			00012700
A	B 10 07	2085 GND	0	RES		S	00035050
A	B 10 08	1985 DB06	0	RES			00013100
A	B 10 09	1984 DB07	0	RES			00013500
A	C 01 01	0270 GDATSEN	1	74S03			00031200
A	C 01 02	0271 FDT	1	74S03			00028200
A	C 01 03	0272 DATSEL	0	74S03		S	00010300
A	C 01 04	0273 SOFLINE	0	74S03			00049400
A	C 01 05	0274 RMAJS	1	74S03			00046600
A	C 01 06	0275 MAJSEL	0	74S03		S	00039500
A	C 01 08	0176 STATSEL	0	74S03		S	00053300
A	C 01 09	0175 SOFLINE	0	74S03			00049200
A	C 01 10	0174 GSTAY	1	74S03			00035500
A	C 01 11	0173 STATRD	0	7438		S	00053100
A	C 01 12	0172 SOFLINE	0	74S03			00049100
A	C 01 13	0171 GSRDENB	1	74S03			00035300
A	C 04 03	0872 RDMAST	1	74S11			00045300
A	C 04 04	0873 TRQX	1	74S11			00055700
A	C 04 05	0874 DATAOUT	1A	74S11			00010030
A	C 04 06	0875 GOATOS	1	74S11		S	00031100
A	C 04 08	0776 SRCHFIN	1	74S11		S	00052300
A	C 04 09	0775 GMINA	1	74S11			00033800
A	C 04 10	0774 ENDTRK	1A	74S11			00023800
A	C 04 11	0773 GMINB	1	74S11			00034000
A	C 05 01	1070 DATAOUT	0	74S00			00009400
A	C 05 02	1071 FDT	1	74S00			00028100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.	
A	C 05 03	1072	GDATIN	0		74S00	S	00030800
A	C 05 04	1073	GDRVS	1		74S00		00032600
A	C 05 05	1074	SOFLINE	0		74S00		00049500
A	C 05 06	1075	GDRVSEN	0		74S00	S	00032800
A	C 05 08	0976	GSTCLK	0		74S00	S	00036000
A	C 05 09	0975	EXEC	1		74S00		00024400
A	C 05 10	0974	ENDTRK	1A		74S00		00023850
A	C 05 11	0973	GINTR	1		74S00	S	00033500
A	C 05 12	0972	FCEI	0		74S00		00025000
A	C 05 13	0971	FDEI	0		74S00		00026100
A	C 06 03	1272	GDATIN	0		74S11		00030900
A	C 06 04	1273	CPUSTAT	0		74S11		00002950
A	C 06 05	1274	GDRVSEN	0		74S11		00033000
A	C 06 06	1275	GTOBENB	0		74S11	S	00036500
A	C 06 08	1176	GDATSEN	1		74S11	S	00031300
A	C 06 09	1175	DATAOUT	0		74S11		00009350
A	C 06 10	1174	SOFLINE	0		74S11		00049600
A	C 06 11	1173	TRQX	1		74S11		00055900
A	C 07 01	1470	DATAOUT	1		74S04		00010000
A	C 07 02	1471	DATAOUT	0		74S04	S	00009500
A	C 07 03	1472	CYLSTAT	0		74S04		00005000
A	C 07 04	1473	RCYLS	1		74S04	S	00041700
A	C 07 05	1474	RECSTAT	0		74S04		00045500
A	C 07 06	1475	RRECS	1		74S04	S	00047500
A	C 07 08	1376	RMAJS	1		74S04	S	00046800
A	C 07 09	1375	MAJSTAT	0		74S04		00039600
A	C 07 10	1374	RMINS	1		74S04	S	00047000
A	C 07 11	1373	MINSTAT	0		74S04		00040200
A	C 07 12	1372	RDMAST	1		74S04	S	00045400
A	C 07 13	1371	DMASTRB	0		74S04		00017700
A	C 09 01	1870	DOUT	0		RES		00018400
A	C 09 02	1871	CYLSTAT	0		RES		00005100
A	C 09 03	1872	RECSTAT	0		RES		00045600
A	C 09 04	1873	MAJSTAT	0		RES		00039700
A	C 09 05	1874	MINSTAT	0		RES		00040300
A	C 09 06	1875	SYPES	0		RES		00054600
A	C 09 07	1876	COMO	0		RES		00002600
A	C 09 08	1776	COMACK	0		RES		00001900
A	C 09 09	1775	DMAREQ	0		RES		00017400
A	C 09 10	1774	EQXFR	0		RES		00024000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	C	09 11 1773	DMASTRB	0		RES	00017800
A	C	09 12 1772	INTACK	0		RES	00038700
A	C	09 13 1771	INTR	0		RES	00039100
A	C	10 01 2070	DB00	0		RES	00010600
A	C	10 02 2071	DB01	0		RES	00011000
A	C	10 03 2072	DB02	0		RES	00011400
A	C	10 04 2073	DB03	0		RES	00011800
A	C	10 05 2074	DB04	0		RES	00012200
A	C	10 06 2075	DB05	0		RES	00012600
A	C	10 08 1976	DB06	0		RES	00013000
A	C	10 09 1975	DB07	0		RES	00013400
A	C	10 10 1974	SOFLINE	1		RES	00051200
A	D	01 01 0259	SOFLINE	0		74S03	00049300
A	D	01 02 0260	RSYSRES	1		74S03	00047700
A	D	01 03 0261	SRES	0	S	74S03	00052600
A	D	01 04 0262	PURST	1		74S03	00040900
A	D	01 05 0263	PURST	1		74S03	00041000
A	D	01 06 0264	SRES	0	S	74S03	00052700
A	D	01 08 0165	SRES	0	S	74S03	00052350
A	D	01 09 0164	RSYSRES	1		74S03	00047650
A	D	01 10 0163	SOFLINE	0		74S03	00049350
A	D	01 11 0162	DOUTBSY	1	S	74S03	00018620
A	D	01 12 0161	DATAOUT	0		74S03	00009560
A	D	01 13 0160	BUSY	1		74S03	00000850
A	D	02 01 0459	RCYLS	1		74S86	00041600
A	D	02 02 0460	RRECS	1		74S86	00047200
A	D	02 03 0461	GDRVS	1	S	74S86	00032500
A	D	02 04 0462	RMAJS	1		74S86	00046700
A	D	02 05 0463	RMINs	1		74S86	00046900
A	D	02 06 0464	GSTAT	1	S	74S86	00035600
A	D	02 08 0365	GSRDENB	1	S	74S86	00035400
A	D	02 09 0364	GDRVS	1		74S86	00032400
A	D	02 10 0363	GSTAT	1		74S86	00035700
A	D	02 11 0362	DATAOUT	1A	S	74S86	00010020
A	D	02 12 0361	DATAOUT	0		74S86	00009550
A	D	03 01 0659	GDMCR	0		74S74	00032200
A	D	03 03 0661	MCO	0		74S74	00040100
A	D	03 05 0663	FDMC	1	S	74S74	00027600
A	D	03 06 0664	FDMC	0	S	74S74	00027500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A D 03 09 0564	FTAKX	I	74S74		S		00028400
A D 03 11 0562	RDMAST	0	74S74				00045100
A D 03 13 0560	GTAKXR	0	74S74				00036200
A D 04 01 0859	RINTACK	0	74421				00046000
A D 04 02 0860	GATN	1	74421				00029000
A D 04 04 0862	FCEI	0	74421				00024900
A D 04 05 0863	FDEIACK	0	74421				00026500
A D 04 06 0864	GDEI	1	74421		S		00031600
A D 05 01 1059	GDTR	0	74S74				00033300
A D 05 02 1060	FDMC	1	74S74				00027700
A D 05 03 1061	FDMAREQ	U	74S74				00027000
A D 05 05 1063	FDT	1	74S74		S		00028000
A D 05 08 0965	FDEIACK	0	74S74		S		00026600
A D 05 09 0964	FDEIACK	1	74S74		S		00026800
A D 05 11 0962	FDEI	0	74S74				00026000
A D 05 13 0960	GATN	1	74S74				00029100
A D 06 01 1259	COMO	0	74S04				00002400
A D 06 02 1260	RCOMO	1	74S04		S		00041500
A D 06 03 1261	TERM	0	74S04				00055100
A D 06 04 1262	TERM	1A	74S04		S		00055300
A D 06 05 1263	INTACK	0	74S04				00038600
A D 06 06 1264	RINTACK	1	74S04		S		00046500
A D 06 08 1165	ENDTRK	1A	74S04		S		00023700
A D 06 09 1164	ENDTRK	0	74S04				00023600
A D 06 10 1163	SWCACK	0	74S04		S		00054000
A D 06 11 1162	SWCACK	1	74S04				00054400
A D 06 12 1161	BUSY	0A	74S04		S		00000800
A D 06 13 1160	BUSY	1	74S04				00001000
A D 07 01 1459	BUSY	1	74S11				00001200
A D 07 02 1460	EQXFRA	0	74S11				00024220
A D 07 03 1461	FDMC	1	74S11				00027900
A D 07 04 1462	DMAACK	0	74S11				00016900
A D 07 05 1463	SOFLINE	0	74S11				00049900
A D 07 06 1464	GMARR	0	74S11		S		00032100
A D 07 08 1365	GDTR	0	74S11		S		00033400
A D 07 09 1364	FDMC	1	74S11				00027800
A D 07 10 1363	SOFLINE	0	74S11				00049800
A D 07 11 1362	GTAKXR	0	74S11				00036400
A D 07 12 1361	GD4CR	0	74S11		S		00032300

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A D	07 13	1360 BUSY	1	74S11			00001100
A D	09 01	1859 DMAACK	0	RES			00017100
A D	09 08	1765 DMAACK	0	RES			00017000
A D	10 01	2059 DB08	0	RES			00013900
A D	10 02	2060 DB09	0	RES			00014300
A D	10 03	2061 DB10	0	RES			00014700
A D	10 04	2062 DB11	0	RES			00015100
A D	10 05	2063 DB12	0	RES			00015500
A D	10 06	2064 DB13	0	RES			00015900
A D	10 08	1965 DB14	0	RES			00016400
A D	10 09	1964 DB15	0	RES			00016820
A E	01 01	0250 SOFLINE	1	74122			00050300
A E	01 02	0251 SOFLINE	1	74122			00050400
A E	01 03	0252 RCOMO	1	74122			00041200
A E	01 04	0253 RCOMO	1	74122			00041300
A E	01 05	0254 SRES	0	74122			00052500
A E	01 06	0255 FCOMODE	0	74122	S		00025800
A E	01 09	0155 WVE01	1	74122			00057200
A E	01 11	0153 CAPA	1	74122	S		00001400
A E	01 13	0151 CAPB	1	74122	S		00001700
A E	01 14	0150 WVE01	1	74122	S		00057100
A E	02 01	0450 SYSRES	0	74S04			00054500
A E	02 02	0451 RSYSRES	1	74S04	S		00047800
A E	02 03	0452 PURST	0	74S04			00040800
A E	02 04	0453 PURST	1	74S04	S		00041100
A E	02 05	0454 RDMAST	1	74S04			00045200
A E	02 06	0455 RDMAST	0	74S04	S		00045000
A E	02 08	0356 EXECEN	0A	74S04	S		00024500
A E	02 09	0355 EXECEN	1	74S04			00024700
A E	02 10	0354 RINTACK	0	74S04	S		00045900
A E	02 11	0353 RINTACK	1	74S04			00046200
A E	02 12	0352 GCOMAR	0	74S04	S		00030600
A E	02 13	0351 GCOMAD	1	74S04			00030400
A E	03 01	0650 FCOMACK	0	7400			00025200
A E	03 02	0651 FCOMACK	0	7400			00025300
A E	03 03	0652 GCOMAD	1	7400	S		00030500
A E	03 04	0653 FTAKX	1	7400			00028500
A E	03 05	0654 FTAKX	1	7400			00028600

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	E 03 06	0655 GTAKXR	0	7400	S		00036300
A	E 03 08	0556 GCEINH	0	7400	S		00029600
A	E 03 09	0555 TID4	1	7400			00055400
A	E 03 10	0554 EXECEN	0A	7400			00024600
A	E 03 11	0553 GDEACKR	0	7400	S		00031400
A	E 03 12	0552 RINTACK	1	7400			00046300
A	E 03 13	0551 FDEI	1	7400			00026300
A	E 04 01	0850 GCOMAR	0	74S74			00030700
A	E 04 02	0851 SWBUSY	0	74S74			00053800
A	E 04 03	0852 FCOMODE	0	74S74			00025900
A	E 04 05	0854 FCOMACK	1	74S74	S		00025600
A	E 04 06	0855 FCOMACK	0	74S74	S		00025400
A	E 04 08	0756 FDMAREQ	0	74S74	S		00026900
A	E 04 09	0755 FDMAREQ	1	74S74	S		00027100
A	E 04 11	0753 TRQX	1	74S74			00055600
A	E 04 13	0751 GDMARR	0	74S74			00032000
A	E 05 01	1050 SRES	0	7408			00052800
A	E 05 02	1051 RINTACK	0	7408			00046100
A	E 05 03	1052 GCEIR	0	7408	S		00029800
A	E 05 04	1053 SRES	0	7408			00052900
A	E 05 05	1054 GDEACKR	0	7408			00031500
A	E 05 06	1055 GDEIR	0	7408	S		00031800
A	E 05 08	0956 GACK	1	7408	S		00028800
A	E 05 09	0955 FDEIACK	1	7408			00026700
A	E 05 10	0954 RINTACK	1	7408			00046400
A	E 06 01	1250 GCEIR	0	74S74			00029900
A	E 06 02	1251 GCEINH	0	74S74			00029700
A	E 06 03	1252 TERM	1A	74S74			00055200
A	E 06 06	1255 FCEI	0	74S74	S		00025100
A	E 06 08	1156 FDEI	0	74S74	S		00026200
A	E 06 09	1155 FDEI	1	74S74	S		00026400
A	E 06 11	1153 GDEI	1	74S74			00031700
A	E 06 13	1151 GDEIR	0	74S74			00031900
A	E 07 01	1450 DATAOUT	1A	7438			00010040
A	E 07 02	1451 DATAOUT	1A	7438			00010050
A	E 07 03	1452 DDUT	0	7438	S		00018300
A	E 07 04	1453 GCOMACK	1	7438			00030100
A	E 07 05	1454 GCOMACK	1	7438			00030200
A	E 07 06	1455 COMACK	0	7438	S		00001800

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	E 07 08	1356 DMAREQ	0	7438			00017300
A	E 07 09	1355 FDMAREQ	1	7438		S	00027300
A	E 07 10	1354 FDMAREQ	1	7438			00027200
A	E 07 11	1353 INTR	0	7438		S	00039000
A	E 07 12	1352 GINTR	1	7438			00033600
A	E 07 13	1351 SOFLINE	0	7438			00049700
A	E 10 01	2050 DB08	0	RES			00013800
A	E 10 02	2051 DB09	0	RES			00014200
A	E 10 03	2052 DB10	0	RES			00014600
A	E 10 04	2053 DB11	0	RES			00015000
A	E 10 05	2054 DB12	0	RES			00015400
A	E 10 06	2055 DB13	0	RES			00015800
A	E 10 08	1956 DB14	0	RES			00016200
A	E 10 09	1955 DB15	0	RES			00016700
A	E 10 10	1954 SOFLINE	0	RES			00050000
A	F 03 01	0641 SWBUSY	0	RES			00053700
A	F 03 02	0642 SWCACK	1	RES			00054200
A	F 03 04	0644 DOUTBSY	1	1KRES			00018630
A	F 04 01	0841 SWCACK	1	74500			00054300
A	F 04 02	0842 FCOMACK	1	74500			00025700
A	F 04 03	0843 GCACK	0	74500		S	00029400
A	F 04 04	0844 SWCACK	0	74500			00053900
A	F 04 05	0845 BUSY	1	74500			00000900
A	F 04 06	0846 GBUSY	0	74500		S	00029200
A	F 04 08	0747 GCOMACK	1	74500		S	00030000
A	F 04 09	0746 GCACK	0	74500			00029500
A	F 04 10	0745 GBUSY	0	74500			00029300
A	F 04 11	0744 DATINH	1	74500		S	00010085
A	F 04 12	0743 SOFLINE	0	74500			00049450
A	F 04 13	0742 DOUTBSY	1	74500			00018640
A	F 06 01	1241 EOXRC	1	RC			00024260
A	F 06 02	1242 EOXRC	1	RC			00024265
A	F 06 13	1142 EOXC	1	RC			00023860
A	F 07 01	1441 BUSY	1	7474			00000840
A	F 07 03	1443 EOXOS	0	7474			00024250
A	F 07 06	1446 EOXFRB	0	7474		S	00024235
A	F 09 01	1341 TRQX	0	7400			00055530

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	F 09 02	1842 TRQX	0	7400			00055520
A	F 09 03	1843 TRQX	1	7400	S		00055550
A	F 09 04	1844 SOFLINE	0	7400			00049950
A	F 09 05	1845 GSTAT	1	7400			00035750
A	F 09 06	1846 CPUSTAT	0	7400	S		00002960
B	B 01 01	0279 SOFLINE	1	8T96			00050500
B	B 01 02	0280 RCOMD	1	8T96			00041400
B	B 01 03	0281 COMLD	0	8T96	S		00002200
B	B 01 04	0282 FCOMACK	1	8T96			00025500
B	B 01 05	0283 COMST	0	8T96	S		00002800
B	B 01 06	0284 GOATOS	1	8T96			00031000
B	B 01 07	0285 DATOUTS	0	8T96	S		00010100
B	B 01 09	0186 DMC	1	8T96	S		00018100
B	B 01 10	0185 FDMC	0	8T96			00027400
B	B 01 11	0184 TAKX	0	8T96	S		00054900
B	B 01 12	0193 FTAKX	1	8T96			00028300
B	B 01 15	0180 SOFLINE	1	8T96			00050200
B	B 02 01	0479 DATIINH	1	8T95			00010060
B	B 02 02	0480 RDB12	1	8T95			00044200
B	B 02 03	0481 DATAI12	1	8T95	S		00008700
B	B 02 04	0482 RDB13	1	8T95			00044400
B	B 02 05	0433 DATAI13	1	8T95	S		00008900
B	B 02 06	0484 RDB14	1	8T95			00044600
B	B 02 07	0485 DATAI14	1	8T95	S		00009100
B	B 02 09	0386 DATAI15	1	8T95	S		00009300
B	B 02 10	0385 RDB15	1	8T95			00044800
B	B 02 11	0384 ACK	1	8T95	S		00000200
B	B 02 12	0383 GACK	1	8T95			00028700
B	B 02 15	0380 SOFLINE	1	8T95			00050600
B	B 03 01	0679 DATIINH	1	8T95			00010070
B	B 03 02	0680 RDB06	1	8T95			00043000
B	B 03 03	0681 DATAI06	1	8T95	S		00007400
B	B 03 04	0682 RDB07	1	8T95			00043200
B	B 03 05	0683 DATAI07	1	8T95	S		00007700
B	B 03 06	0684 RDB08	1	8T95			00043400
B	B 03 07	0685 DATAI08	1	8T95	S		00007900
B	B 03 09	0586 DATAI09	1	8T95	S		00008100
B	B 03 10	0585 RDB09	1	8T95			00043600
B	B 03 11	0584 DATAI10	1	8T95	S		00008300
B	B 03 12	0583 RDB10	1	8T95			00043800

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B B	03 13	0582 DATA11	1	8T95	S		00008500
B B	03 14	0581 RDB11	1	8T95			00044000
B B	03 15	0580 DATAINH	1	8T95			00018065
B B	04 01	0879 DATAINH	1	8T95			00010080
B B	04 02	0880 RDB00	1	8T95			00041800
B B	04 03	0881 DATAI00	1	8T95	S		00005700
B B	04 04	0882 RDB01	1	8T95			00042000
B B	04 05	0883 DATAI01	1	8T95	S		00005900
B B	04 06	0884 RDB02	1	8T95			00042200
B B	04 07	0885 DATAI02	1	8T95	S		00004200
B B	04 09	0786 DATAI03	1	8T95	S		00006500
B B	04 10	0785 RDB03	1	8T95			00042400
B B	04 11	0784 DATAI04	1	8T95	S		00006800
B B	04 12	0783 RDB04	1	8T95			00042600
B B	04 13	0782 DATAI05	1	8T95	S		00007100
B B	04 14	0781 RDB05	1	8T95			00042800
B B	04 15	0780 DATAINH	1	8T95			00010075
B B	05 01	1079 RRECS	1	S257			00047300
B B	05 02	1080 CYL1	1	S257			00003100
B B	05 03	1081 SEC1	1	S257			00048000
B B	05 04	1082 DSTAT00	1	S257	S		00018700
B B	05 05	1083 CYL2	1	S257			00003700
B B	05 06	1084 SEC2	1	S257			00048400
B B	05 07	1085 DSTAT01	1	S257	S		00019000
B B	05 09	0986 DSTAT02	1	S257	S		00019300
B B	05 10	0985 SEC4	1	S257			00048800
B B	05 11	0984 CYL4	1	S257			00004300
B B	05 12	0983 DSTAT03	1	S257	S		00019600
B B	05 13	0982 SEC8	1	S257			00049000
B B	05 14	0981 CYL8	1	S257			00004900
B B	05 15	0980 GDRVSEM	0	S257			00032700
B B	06 01	1279 RRECS	1	S257			00047400
B B	06 02	1280 CYL16	1	S257			00003500
B B	06 03	1281 SEC16	1	S257			00048200
B B	06 04	1282 DSTAT04	1	S257	S		00019900
B B	06 05	1283 CYL32	1	S257			00004100
B B	06 06	1284 SEC32	1	S257			00048600
B B	06 07	1285 DSTAT05	1	S257	S		00020200
B B	06 09	1186 DSTAT06	1	S257	S		00020500
B B	06 10	1185 HEAD1	1	S257			00037700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B B	06 11	1184 CYL64	1	S257			00004700
B 3	06 12	1183 DSTAT07	1	S257	S		00020800
B B	06 13	1182 HEAD2	1	S257			00038100
B B	06 14	1181 CYL128	1	S257			00003300
B B	06 15	1180 GDRVSEN	0	S257			00032900
B B	07 01	1479 RRECS	1	S257			00047600
B B	07 02	1480 CYL256	1	S257			00003900
B B	07 03	1481 HEAD4	1	S257			00038300
B B	07 04	1482 DSTAT08	1	S257	S		00021200
B B	07 05	1483 CYL512	1	S257			00004500
B B	07 06	1484 HEAD8	1	S257			00038500
B B	07 07	1485 DSTAT09	1	S257	S		00021500
B B	07 09	1386 DSTAT10	1	S257	S		00021700
B B	07 10	1385 HEAD16	1	S257			00037900
B B	07 11	1384 SPARE2	1	S257			00051700
B B	07 12	1383 DSTAT11	1	S257	S		00022000
B B	07 13	1382 SPARE4	1	S257			00052100
B B	07 14	1381 SPARE3	1	S257			00051900
B B	07 15	1380 GDRVSEN	0	S257			00033100
B B	08 01	1679 DB02	0	8838	S		00011300
B B	08 02	1680 DSTAT02	1	8838			00019500
B B	08 03	1681 RDB02	1	8838	S		00042300
B B	08 04	1682 DB03	0	8838	S		00011700
B B	08 05	1683 DSTAT03	1	8838			00019800
B B	08 06	1684 RDB03	1	8838	S		00042500
B B	08 07	1685 GTDBENB	0	8838			00037300
B B	08 09	1586 GTDBENB	0	8838			00036900
B B	08 10	1585 RDB01	1	8838	S		00042100
B B	08 11	1584 DSTAT01	1	8838			00019200
B B	08 12	1583 DB01	0	8838	S		00010900
B B	08 13	1582 RDB00	1	8838	S		00041900
B B	08 14	1581 DSTAT00	1	8838			00018900
B B	03 15	1580 DB00	0	8838	S		00010500
B C	02 01	0470 DATA01	1	74191			00005750
B C	02 04	0473 WGC02	0	74191			00056000
B C	02 08	0477 WGC02	0	74191	S		00056100
B C	02 09	0377 DATAI03	1	74191			00006300
B C	02 10	0376 DATAI02	1	74191			00006000
B C	02 11	0375 BUFWCTC	0	74191			00000400
B C	02 12	0374 GMINA	1	74191	S		00033700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B C	02 13	0373 GRIP 0	74191		S		00035100
B C	02 14	0372 GSTCLK 0	74191				00035800
B C	02 15	0371 DATA100 1	74191				00005400
B C	03 01	0670 DATA105 1	74191				00007000
B C	03 04	0673 GRIP 0	74191				00035200
B C	03 09	0577 DATA107 1	74191				00007600
B C	03 10	0576 DATA106 1	74191				00007300
B C	03 11	0575 BUFWCTC 0	74191				00000600
B C	03 12	0574 GMINB 1	74191		S		00033900
B C	03 14	0572 GSTCLK 0	74191				00035900
B C	03 15	0571 DATA104 1	74191				00006600
B C	08 01	1670 DB06 0	8838		S		00012900
B C	08 02	1671 DSTAT06 1	8838				00020700
B C	08 03	1672 RDB06 1	8838		S		00043100
B C	08 04	1673 DB07 0	8838		S		00013300
B C	08 05	1674 DSTAT07 1	8838				00021000
B C	08 06	1675 RDB07 1	8838		S		00043300
B C	08 07	1676 GTDBENB 0	8838				00037200
B C	08 09	1577 GTDBENB 0	8838				00036800
B C	08 10	1576 RDB05 1	8838		S		00042900
B C	08 11	1575 DSTAT05 1	8838				00020400
B C	08 12	1574 DB05 0	8838		S		00012500
B C	08 13	1573 RDB04 1	8838		S		00042700
B C	08 14	1572 DSTAT04 1	8838				00020100
B C	08 15	1571 DB04 0	8838		S		00012100
B D	08 01	1659 DB10 0	8838		S		00014500
B D	08 02	1660 DSTAT10 1	8838				00021900
B D	08 03	1661 RDB10 1	8838		S		00043900
B D	08 04	1662 DB11 0	8838		S		00014900
B D	08 05	1663 DSTAT11 1	8838				00022200
B D	08 06	1664 RDB11 1	8838		S		00044100
B D	08 07	1665 GTDBENB 0	8838				00037100
B D	08 09	1566 GTDBENB 0	8838				00036700
B D	08 10	1565 RDB09 1	8838		S		00043700
B D	08 11	1564 DSTAT09 1	8838				00021600
B D	08 12	1563 DB09 0	8838		S		00014100
B D	08 13	1562 RDB08 1	8838		S		00043500
B D	08 14	1561 DSTAT08 1	8838				00021300
B D	08 15	1560 DB08 0	8838		S		00013700
B E	08 01	1650 DB14 0	8838		S		00016100

P	LOCATTON	SIGNAL	TYPE	SH	S	COMMENTS	I-D.
R	F 08 02	1651 DSTAT14	1	8838			00023000
B	E 08 03	1652 RDR14	1	8838	S		00044700
B	E 08 04	1653 DB15	0	8838	S		00016600
B	E 08 05	1654 DSTAT15	1	8838			00023300
B	E 08 06	1655 RD915	1	8838	S		00044900
B	E 08 07	1656 GTDBENR	0	8838			00037000
B	E 08 09	1557 GTDBENB	0	8838			00036600
B	E 08 10	1556 RDB13	1	8838	S		00044500
B	E 08 11	1555 DSTAT13	1	8838			00022700
B	E 08 12	1554 DB13	0	8838	S		00015700
B	E 08 13	1553 RDB12	1	8838	S		00044300
B	E 08 14	1552 DSTAT12	1	8838			00022400
B	E 08 15	1551 DB12	0	8838	S		00015300
B	F 01 01	0241 PURST	0	RC	S		00040700
B	F 01 04	0244 GWF01	0	RC			00037400
B	F 01 06	0246 CAPA	1	RC			00001500
B	F 01 07	0247 GWF01	0	RC	S		00037500
B	F 01 09	0148 GTAKXR	0	RC			00036100
B	F 01 10	0147 GCOMAD	1	RC			00030300
B	F 01 11	0146 CAPB	1	RC			00001600
B	F 01 13	0144 PURST	0	RC	S		00040600
B	F 02 01	0441 BUSY	0A	DIPSW			00000700
B	F 02 02	0442 EOXFR	0	DIPSW			00023890
B	F 02 03	0443 EOXFRB	0	DIPSW			00024230
B	F 02 09	0348 SWCACK	1	DIPSW	S		00054100
B	F 02 14	0343 EOXFRA	0	DIPSW			00024210
B	F 02 15	0342 EOXFRA	0	DIPSW	S		00024215
B	F 02 16	0341 SWBUSY	0	DIPSW	S		00053600
B	F 03 03	0643 STATRD	0	RES			00053200
B	F 05 01	1041 EOXFR	0	74123			00023900
B	F 05 02	1042 FDMC	1	74123			00027920
B	F 05 04	1044 EOXOS	0	74123	S		00024240
B	F 05 14	0943 EOXC	1	74123	S		00023870
B	F 05 15	0942 EOXC	1	74123	S		00024270
B	F 08 01	1641 RRECS	1	S257			00047100
B	F 08 02	1642 WGF08	0	S257			00056200
B	F 08 03	1643 WGF08	0	S257			00056300
B	F 08 04	1644 DSTAT12	1	S257	S		00022500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
B	F 08 05	1645 WGF08	0	S257			00056400
B	F 08 06	1646 WGF08	0	S257			00056500
B	F 08 07	1647 DSTAY13	1	S257	S		00022600
B	F 08 08	1648 WGF08	0	S257	S		00056600
B	F 08 09	1548 DSTAY14	1	S257	S		00022900
B	F 08 10	1547 WGF08	0	S257			00056700
B	F 08 11	1546 WGF08	0	S257			00056800
B	F 08 12	1545 DSTAY15	1	S257	S		00023200
B	F 08 13	1544 WGF08	0	S257			00056900
B	F 08 14	1543 WGF08	0	S257			00057000
B	F 08 15	1542 GDRVSEN	0	S257			00033200

INTERNAL DRIVE DATA CABLE HARNESS WIRING (201809 WL2)

DRIVE 0 WIRING		
FROM	TO	TERM
PY-A1	J02-BB	USO-0
PY-B1	J02-DD	USO-1
PY-A2	J02-AA	SKENDO-0
PY-B2	J02-BB	SKENDO-1
PY-A3	J02-M	SERVCK0-0
PY-B3	J02-N	SERVCK0-1
PY-A4	J02-W	RDCK0-0
PY-B4	J02-X	RDCK0-1
PY-A5	J02-U	READD0-0
PY-B5	J02-V	READD0-1
PY-A6	J02-A	RWDATA0-0
PY-B6	J02-B	RWDATA0-1
PY-A7	J02-H	WRCLK0-0
PY-B7	J02-J	WRCLK0-1

DRIVE 1 WIRING		
FROM	TO	TERM
PY-A8	J03-BB	US1-0
PY-B8	J03-DD	US1-1
PY-A9	J03-AA	SKEND1-0
PY-B9	J03-BB	SKEND1-1
PY-A10	J03-M	SERVCK1-0
PY-B10	J03-N	SERVCK1-1
PY-A11	J03-W	RDCK1-0
PY-B11	J03-X	RDCK1-1
PY-A12	J03-U	READD1-0
PY-B12	J03-V	READD1-1
PY-A13	J03-A	RWDATA1-0
PY-B13	J03-B	RWDATA1-1
PY-A14	J03-H	WRCLK1-0
PY-B14	J03-J	WRCLK1-1

DRIVE 2 WIRING		
FROM	TO	TERM
PY-A15	J04-BB	US2-0
PY-B15	J04-DD	US2-1
PY-A16	J04-AA	SKEND2-0
PY-B16	J04-CC	SKEND1-1
PY-A17	J04-M	SERVCK2-0
PY-B17	J04-N	SERVCK2-1
PY-A18	J04-W	RDCK2-0
PY-B18	J04-X	RDCK2-1
PY-A19	J04-U	READD2-0
PY-B19	J04-V	READD2-1
PY-A20	J04-A	RWDATA2-0
PY-B20	J04-B	RWDATA2-1
PY-A21	J04-H	WRCLK2-0
PY-B21	J04-J	WRCLK2-1

DRIVE 3 WIRING		
FROM	TO	TERM
PY-A22	J05-BB	US3-0
PY-B22	J05-DD	US3-1
PY-A23	J05-AA	SKEND3-0
PY-B23	J05-CC	SKEND3-1
PY-A24	J05-M	SERVCK3-0
PY-B24	J05-N	SERVCK3-1
PY-A25	J05-W	RDCK3-0
PY-B25	J05-X	RDCK3-1
PY-A26	J05-U	READD3-0
PY-B26	J05-V	READD3-1
PY-A27	J05-A	RWDATA3-0
PY-B27	J05-B	RWDATA3-1
PY-A28	J05-H	WRCLK3-0
PY-B28	J05-J	WRCLK3-1

INTERNAL DRIVE INTERFACE SIGNAL CABLE HARNESS WIRING (201809 WL1)

FROM	TO	TERM
PX-A1	J01-10	INDEX-0
PX-B1	J01-13	INDEX-1
PX-A2	J01-74	SECTOR-0
PX-B2	J01-77	SECTOR-1
PX-A3	J01-52	TAG3-0
PX-B3	J01-55	TAG3-1
PX-A4	J01-48	TAG2-0
PX-B4	J01-51	TAG2-1
PX-A5	J01-46	TAG1-0
PX-B5	J01-49	TAG1-1
PX-A6	J01-41	SPARE
PX-B6	J01-44	SPARE
PX-A7	J01-42	AMFND-0
PX-B7	J01-45	AMFND-1
PX-A8	J01-11	FAULT-0
PX-B8	J01-14	FAULT-1
PX-A9	J01-75	SKERR-1
PX-B9	J01-78	SKERR-0
PX-A10	J01-15	ONCYL-0
PX-B10	J01-18	ONCYL-1
PX-A11	J01-21	UNTRDY-0
PX-B11	J01-17	UNTRDY-1
PX-A12	J01-20	OPNCBL-1
PX-B12	J01-16	OPNCBL-0
PX-B13	J01-25	USELTAG-1
PX-B13	J01-22	USELTAG-0

FROM	TO	TERM
PX-A14	J01-01	USEL1-0
PX-B14	J01-04	USEL1-1
PX-A15	J01-02	USEL2-0
PX-B15	J01-05	USEL2-1
PX-A16	J01-03	USEL4-0
PX-B16	J01-07	USEL4-1
PX-A17	J01-08	USEL8-0
PX-B17	J01-12	USEL8-1
PX-A18	J01-23	BIT0-0
PX-B18	J01-26	BIT0-1
PX-A19	J01-24	BIT1-0
PX-B19	J01-27	BIT1-1
PX-A20	J01-28	BIT2-0
PX-B20	J01-31	BIT2-1
PX-A21	J01-29	BIT3-0
PX-B21	J01-32	BIT3-1
PX-A22	J01-30	BIT4-0
PX-B22	J01-33	BIT4-1
PX-A23	J01-34	BIT5-0
PX-B23	J01-37	BIT5-1
PX-A24	J01-35	BIT6-0
PX-B24	J01-38	BIT6-1
PX-A25	J01-36	BIT7-0
PX-B25	J01-39	BIT7-1
PX-A26	J01-40	BIT8-0
PX-B26	J01-43	BIT8-1

Table 1. HP 3000 Diagnostic Initializing Sequence

ALL NUMBERS OCTAL UNLESS PRECEDED WITH PERIOD ()
CARRIAGE RETURN IMPLIES DEFAULT VALUE IF SHOWN

CONTROL-A TERMINATES CURRENT TEST AND STARTS OVER

TELEFILE DISK ORT #: 15

DRIVE TYPE CODES ARE:

Ø=T25, 1=T5Ø, 2=94Ø, 3=98Ø

4=92ØØ/T677, 5=93ØØ/T3ØØ, 6=OTHER

ENTER CODE: 5

STANDARD 93ØØ DRIVE WITH: 1456 CYLINDERS, 23 HEADS, 7Ø,2ØØ WORD SECTORS
CORRECT? (Y)

ENTER PRIMARY UNIT #: (Ø)

SECONDARY UNIT? (N)

MOUNT SCRATCH PACK ON UNIT Ø
READY? (Y)

RESET WRITE PROTECT ON UNIT Ø
READY? (Y)

SET WRITE PROTECT ON OTHERS
READY? (Y)

BEGIN TEST S
ENTER DATA PATTERN CODE: (Ø) 1Ø
END S

PACK FORMATTED? (Y)

SET SYSTEM SWITCH REGISTER IF DESIRED
READY? (Y)

ENTER TEST(S):

SECTION V

MAINTENANCE

5.1 GENERAL

The DC-16-C controller requires no routine maintenance as there are no air filters to be cleaned, replaced, or no mechanical adjustments to be made. However, the following preventative maintenance procedures should be accomplished during the regular PM scheduled by the data center.

5.2 PREVENTIVE MAINTENANCE

Preventive maintenance of the DC-16-C consists of visual inspection, cleaning and running diagnostic programs.

5.2.1 VISUAL INSPECTION

The interior of the controller must be free of wire cuttings, dust and other foreign matter. No clip leads or push-on jumpers should be connected to any backplane pins. After inspection all hardware should be put back in place.

5.2.2 CLEANING

The external surfaces of the controller should be kept clean and free of dust. A space must be maintained around the sides of the chassis (if mounted on a table top) so that fan assemblies are able to expel the air for proper cooling.

5.2.3 DIAGNOSTIC TESTING

The diagnostic program which applies directly to the controller is listed in Section II. Consult the appropriate manual for operating procedures.

5.3 CORRECTIVE MAINTENANCE

The theory of operation, logic diagrams, timing diagrams and wire lists provided for the power supply, and the four DC-16-C modules is believed sufficient to isolate a fault to a defective module. To facilitate troubleshooting procedures, an optional maintenance module is available from Telefile which permits offline verification of all major DC-16-C functions by simulating CPU input signals.

APPENDIX A

DISK INTERFACE MODULE

DISK INTERFACE MODULE (DIM)

DUAL PORT DRIVE

TECHNICAL MANUAL

THIS DOCUMENT INCLUDES DATA AND INFORMATION WHICH IS CONSIDERED PROPRIETARY TO TELEFILE COMPUTER PRODUCTS, INC. REPRODUCTION, DUPLICATION, DISCLOSURE OR DISSEMINATION, IN WHOLE OR IN PART, TO OTHERS THAN REPRESENTATIVES OF THE UNITED STATES GOVERNMENT SHALL NOT BE MADE WITHOUT PRIOR WRITTEN AUTHORIZATION OF TELEFILE COMPUTER PRODUCTS, INC. NOTWITHSTANDING THE FOREGOING, USE OF THE DATA OR INFORMATION IN WHOLE OR IN PART FOR DESIGN, PROCUREMENT OR MANUFACTURE IS STRICTLY FORBIDDEN.

January 3, 1978
TM-610-0001-2A

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Telefile

ENGINEERING ORDER

E.O. NO. 265PRODUCT LINE AFFECTED DC 16C
DUAL DRIVE Yo 201803A4

REVISION (DOCUMENTATION CHANGE ONLY)

ORIGINATING R.E.O. _____ SERIES E.O. NO YES PREVIOUS E.O. _____

DISTRIBUTION:

<input checked="" type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> OPERATIONS	<input checked="" type="checkbox"/> MARKETING
<input checked="" type="checkbox"/> HARDWARE	<input checked="" type="checkbox"/> MANUFACTURING	<input checked="" type="checkbox"/> PUBLICATIONS
<input type="checkbox"/> SOFTWARE	<input checked="" type="checkbox"/> SYSTEM TEST	<input checked="" type="checkbox"/> SUPPORT OPERATIONS
<input checked="" type="checkbox"/> DRAFTING	<input checked="" type="checkbox"/> INSPECTION (QC)	

REASON FOR CHANGE

- 1 CORRECT ERROR IN WIRE LIST
- 2 TO PROVIDE ACCESS TO ADJUSTING SCREW ON POTENTIOMETERS

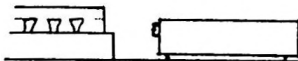
SUMMARY OF CHANGE

- 1 CORRECT WIRELIST AS FOLLOWS:

WAS	J07-05 TO K03-03 TO J01-02 TO K08-05	SEEKERR-1
WAS	J06-06 TO J07-06 TO J01-06 TO K03-02	SEEKERR-0
IS	J06-06 TO J07-05 TO J01-02 TO K03-02	SEEKERR-0
IS	J07-06 TO K03-03 TO J01-06 TO K08-05	SEEKERR-1

- 2 MOUNT POTENTIOMETERS AT F16 + F17 AS SHOWN

WAS



IS



ESTIMATED TIME TO INSTALL CHANGE

10 MINUTES

AFTER INSTALLATION

MARK BOARD 201803A4 R2

SERIAL NO'S AFFECTED

ALL UNITS

ORIGINATOR SID ELLEGARDDATE 2 10 78APPROVAL [Signature]DATE 2/10/78FINAL APPR [Signature]DATE 2/10/78SHEET 1 OF 1

ASSEMBLY REVISION LEVEL

P/N	ASM	W/L REV	1	2	3	4	5	6	7	8	9	10	11	12	13
201800	A1	--	203	203											
201801	A2	WL2R3	165	181	195	206	217								
201801	A3	--	204												
201801	A4	--	231A												
201802	A2	WL2R2	166	200	207A	233A									
201802	A3	--	200	212											
201803	A1	WL1R7	167	185	197	208									191*
201803	A2	WL2R1	167	185	197	208									191*
201803	A3	WL2R2	167	185	197	198	208								191*
201803	A4	WL4R2	236	265											191*
201803	A5	--													191*
201805	A1	WL1R0													
201806	A1	WL1R6	189	210A											
201806	A2	WL2R2													
201823	A1	WL1R5	209A												
201848	A1	WL1R2													
201848	A2	--	205	210											
201865	A1	WL1R7	179	187	196	211	234A	235A	241						
201908	A1	WL1R2	190												
201982	A1	WL1R2													
202006	A1	WL1R3	189	210A											
201006	A2		189												
202013	A1	--													
202015	A1	WL1R1	232	251											
202038	A2	--	264												
202098	A1	--													
202098	A2	--													
202100	A1	WL1R3													

* EØ 191 is not to be installed except as noted on EØ 191.

Figure 1. DC-16-C ASM Revision Level Chart

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1.0	INTRODUCTION
1.1	REFERENCES
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2.2	RELEASE COMMAND
2.3	PRIORITY SELECT COMMAND
3.0	STATUS RESPONSE

1.0 INTRODUCTION

This specification defines the functional characteristics of the DC-16-C Dual Port Drive Interface. The Dual Port Drive Interface (DPDI) will allow two processors via two DC-16-C Disk Controllers to access a common disk data base.

1.1 REFERENCES

- 1.1.1 TM-600-0034-1B DC-16-C Disk Controller Technical Manual.
- 1.1.2 CDC SPEC 64709300 Product Specification for Flat Cable Interface, Storage Module Drive family.

1.2 DUAL PORT DRIVE INTERFACE (DPI) DESCRIPTION

The DPDI allows access to up to four disk spindles which have incorporated within them the standard CDC Dual Port Interface function. This dual access feature in the drive allows access to a given drive by two DC-16-C Controllers. (See figure 1 for typical configuration.) The dual port feature in the drive functions as a dynamic switch which routes the necessary control and data signals to and from the drive to the correct control unit. Once selection has been made, the DPDI is transparent to the basic system.

1.2.1 The dual port drive interface provides the following functions:

- a) Allows reservation of a logical drive via normal select drive command.
- b) Implements a release command to release a logical drive previously reserved.
- c) Provides a selected Drive Reserved status response to a select drive command in the event the other port has reserved that logical drive.
- d) Implements a priority select command to 1) force the release of the other port's reservation in cases of urgency or suspected failure, and 2) prohibit the other port from gaining access to the selected logical drive until a release is issued.

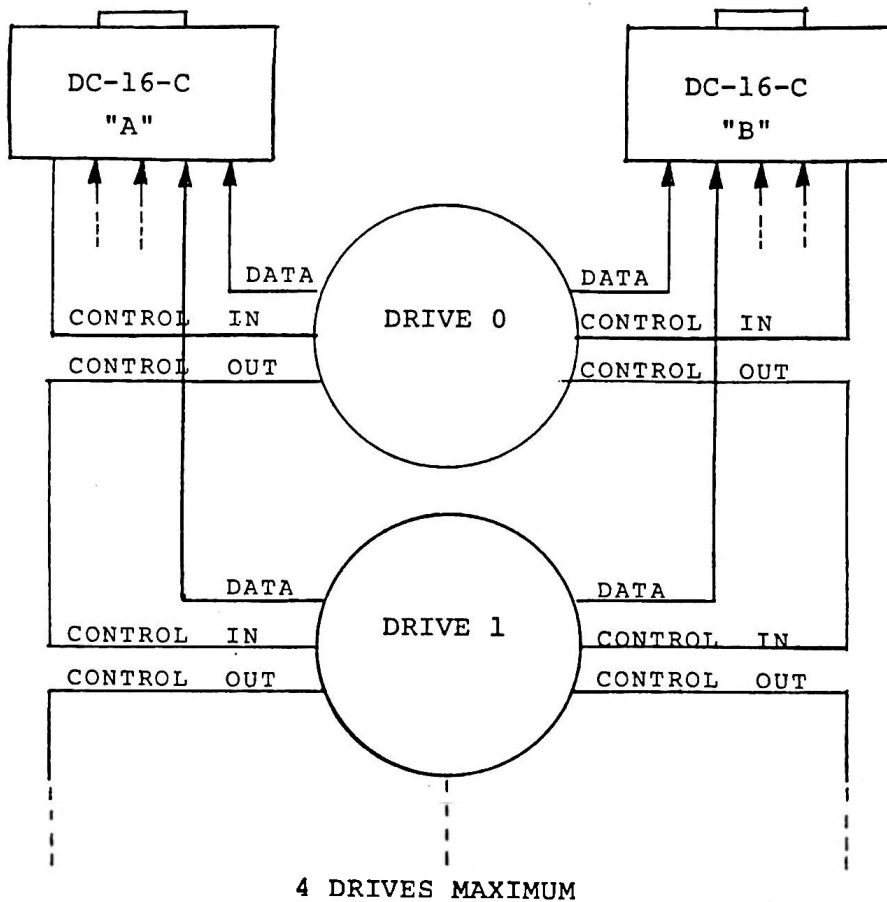
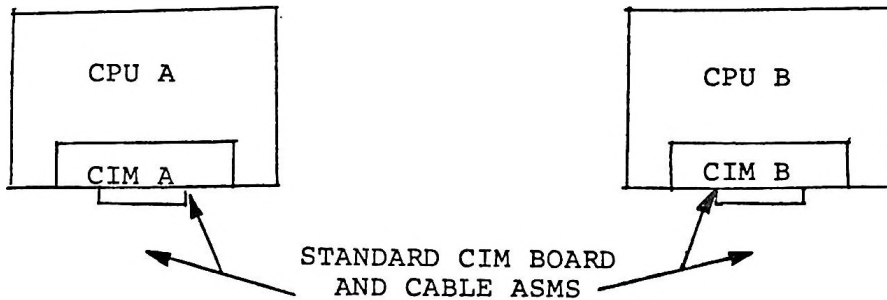


FIGURE 1

1.2.2 The dual port drive option in the drive itself will support the above features plus provide the following:

- a) A three position switch to manually reserve Port A, or Port B, or if in the neutral position allows normal drive selection operations to select, reserve, etc.
- b) A Reserve timer which will clear the reserved status 500 msec following the last selection. The timer may be extended to 10 seconds and also can be disabled totally via a PCB switch.

2.0 COMMAND SET

Reference the DC-16-C Technical Manual for a description of the standard DC-16-C instruction set.

Two new commands are implemented into the system:

- a) RELEASE DRIVE COMMAND
- b) PRIORITY SELECT COMMAND

These new commands are fully described in the following paragraphs. Figure 2 shows the full DC-16-C command set with all new options.

2.1 DRIVE SELECTION/RESERVATION

Drive selection is accomplished with the standard UNIT SELECT command and associated unit number. If the selected unit has a dual port option installed, the UNIT SELECT command will reserve that drive to the controller which issued the command. The software must at this point input major status and check bit 4 (see additional discussion on status response in paragraph 3.0). Bit 4 true, Selected Drive Reserved, will indicate the OTHER port has that logical unit reserved at this time. Bit 4 false and all other status normal will allow normal operations to continue.

Upon selection/reservation, the unit will remain reserved until one of the following events occurs.

- a) A Release Command is issued (see paragraph 2.2)
- b) A Priority Select is issued by the other port (see paragraph 2.3)
- c) The reserve timer in the drive times out. This timer is nominally set to 500 milliseconds but can be altered by changing the RC time constant to obtain delays up to 10 seconds. A PCB mounted switch in the drive allows this timer to be disabled if its use is not wanted.

MSB

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0	0	0	0	CCB _i	ϕ_+	ϕ_-	S _E	S _L	TKS						UNIT	UNIT SELECT
0	0	0	1													SPECIAL
0	0	1	0	I _{CE}	I _{SE}											RESTORE
0	0	1	1						NUMBER OF TRACKS TO SEARCH*					BUFFER WRITE		
0	1	0	0	I _{CE}	I _{SE}	CYLINDER NUMBER										SEEK
0	1	0	1													BUFFER READ
0	1	1	0						CYLINDER NUMBER					LINKED SEEK		
0	1	1	1		HEAD NUMBER					SECTOR NUMBER					READ SPECIAL	
1	0	0	0		HEAD NUMBER					SECTOR NUMBER					READ	
1	0	0	1	I _{CC} ^R	HEAD NUMBER					SECTOR NUMBER					READ HEADERS	
1	0	1	0		HEAD NUMBER					SECTOR NUMBER					WRITE CHECK	
1	0	1	1		HEAD NUMBER					SECTOR NUMBER					SEARCH AND READ	
1	1	0	0		HEAD NUMBER					SECTOR NUMBER					WRITE	
1	1	0	1	I _{CC} ^R	HEAD NUMBER					SECTOR NUMBER					READ WITHOUT HEADER CHECK	
1	1	1	0		HEAD NUMBER										FORMAT TRACK	
1	1	1	1		HEAD NUMBER					SECTOR NUMBER					WRITE SINGLE HEADER	

*RELEVANT ONLY TO SEARCH AND READ.

NOTES

CCB, 1 = CLEAR CONDITION BIT REGISTER
 ϕ_+ , 1 = OFFSET TOWARD SPINDLE
 ϕ_- , 1 = OFFSET AWAY FROM SPINDLE
SE, 1 = DATA STROBE EARLY
SL, 1 = DATA STROBE LATE
ICE, 1 = INHIBIT CONTROLLER END INTERRUPT
ISE, 1 = INHIBIT SEEK END INTERRUPT

ICRC, 1 = INHIBIT CRC ERROR TERMINATION
TKS = TRACK STATUS BITS:
6 5
0 0 GOOD TRACK
0 1 DEFECTIVE TRACK
1 0 ALTERNATE TRACK
1 1 DEFECTIVE ALTERNATE TRACK

Figure 2. DC-16-C Command Set

I/O Bus Bit	Major Status Word	Minor Status Word
15	Controller Busy	Invalid Address
14	Controller Alert	(not used)
13	Selected Drive Busy	Header Error
12	Selected Drive Alert	Data Error
11	Gated Attention	Transfer Timing Error
10	Drive Selection (Bit 4)	End of Pack
9	Drive Selection (Bit 2)	Defective Track
8	Drive Selection (Bit 1)	Write Protect Error
7	Select Error	No Compare
6	Not Available (Note 1)	Selected Drive Unsafe
5	Reserved (Note 1)	Selected Drive Seek Incomplete
4	Selected Drive (Note 2) Reserved	Selected Drive Offline
3	Drive 3 Attention	Selected Drive Write Protected
2	Drive 2 Attention	(not used) Reserved
1	Drive 1 Attention	(not used) for
0	Drive 0 Attention	(not used) CIM Use

Note 1: Dual Host Interface only

Note 2: Dual Port Drive only

Figure 3. Major/Minor Status Words

4.0 INTERRUPTS

All drive related interrupts to the system will remain as they were with the following exceptions.

- a) If neither port is selected or reserved, the first seek or restore interrupt on power up is passed on to both attached DC-16-C's.
- b) If a drive is reserved by one DC-16-C, and the other DC-16-C attempts to select that unit, then the second DC-16-C will receive an interrupt when the first DC-16-C issues a release command. (This will alert the waiting DC-16-C of that drive's availability.)
- c) If, while the drive is reserved to one DC-16-C, the disk pack is changed, an interrupt will be sent to the second DC-16-C upon reservation release by the first DC-16-C.

5.0 MECHANICAL CONSTRAINTS

At the date of this specification, the dual port drive Interface is available only with a ribbon cable control and data cable interface. While the drive interface PCB P/N 201803 A3 may be upgraded to include the DPDI logic (with an extensive E.O.) the DC-16-C chassis must be recycled through the factory for upgrade from the present AMP connectors.

DISK INTERFACE MODULE (DIM)

Ampex, CDC, Memorex

LOGIC DIAGRAM AND ASSEMBLY DRAWINGS

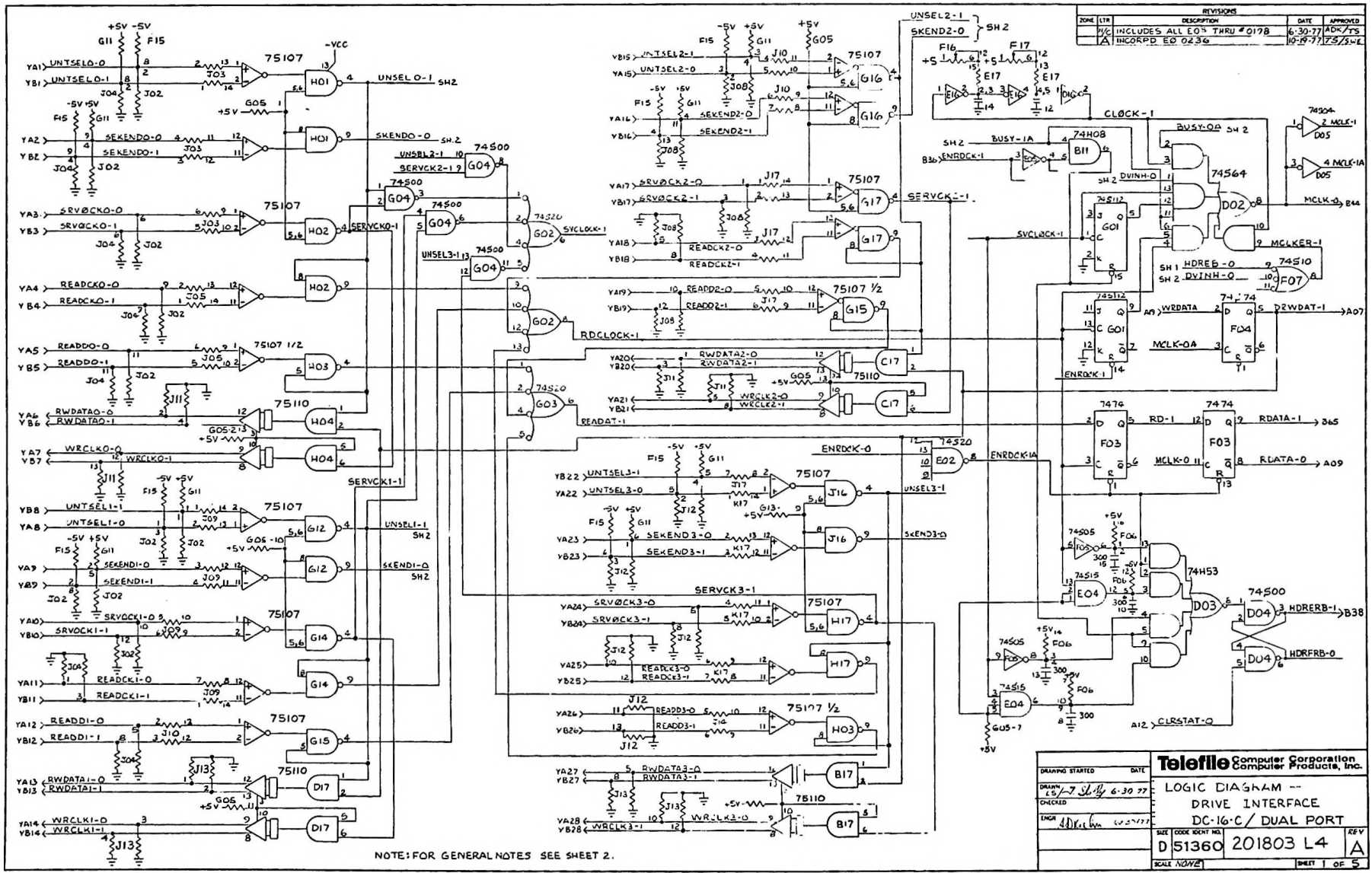
Disk Interface Module Logic Diagram (201803 L4).

Disk Interface Module Assembly Drawing (201803 A4).

DC-16-C to Disk Drive Signal Cable (201809 WL1).

DC-16-C to Disk Drive Data Cable (201809 WL2).

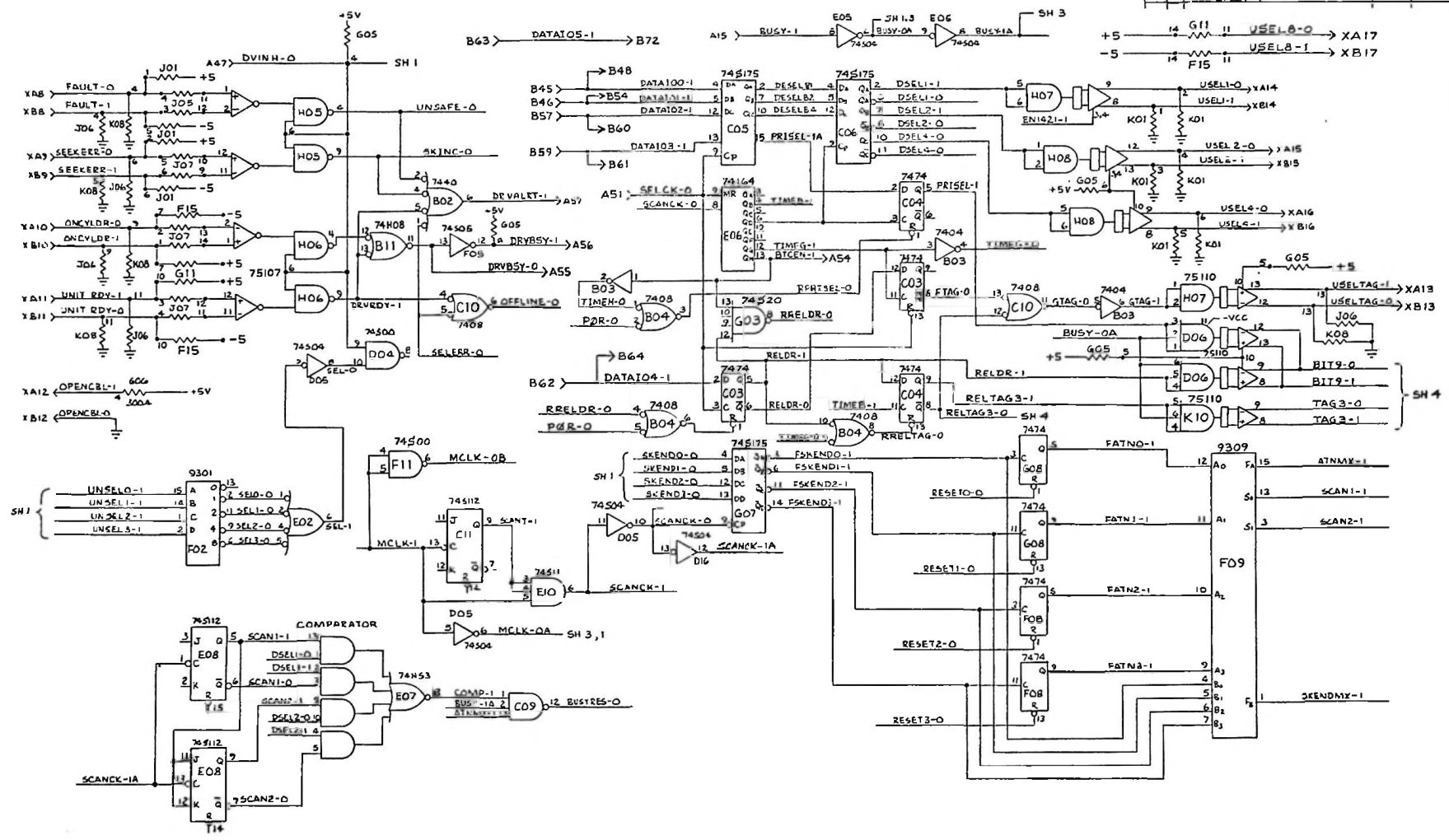
DC-16-C DIM Term List and Pin Sort (201803 WL4R1).



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
M/C		INCLUDES ALL EOs THRU #017B	6-30-77	ADK/TS
A		INCORPORATED EOs 02, 36	10-19-77	TS/S-W-L

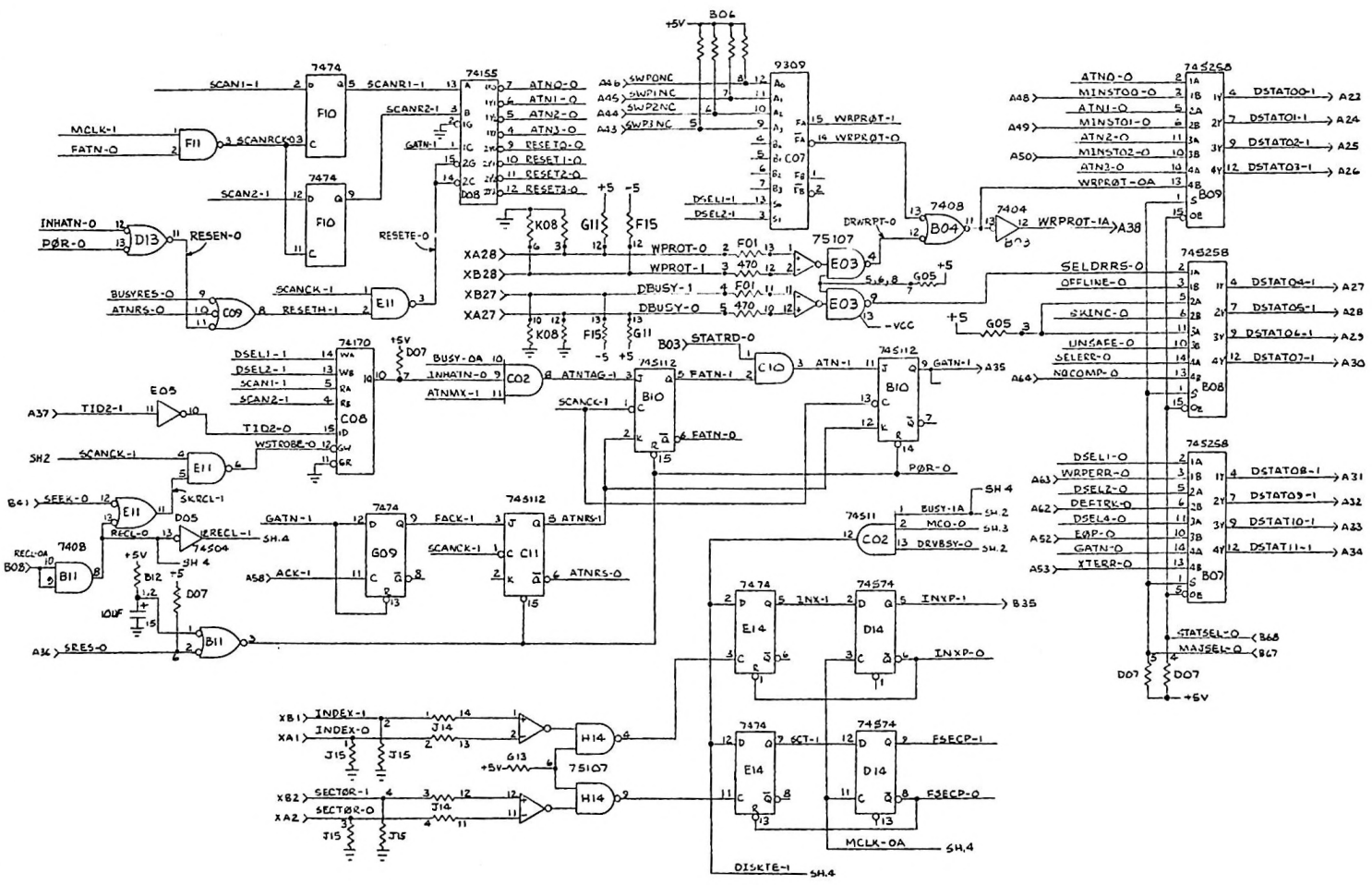
NOTE: FOR GENERAL NOTES SEE SHEET 2.

DRAWING STARTED	DATE	Telefile Computer Corporation Computer Products, Inc.
DRAWN	6-5-77	
CHECKED	6-30-77	
ENGR	ADK/TS	
LOGIC DIAGRAM -- DRIVE INTERFACE DC-16C / DUAL PORT		REV
SHEET	51360	201803 L4
SCALE	NONE	SHEET 1 OF 5



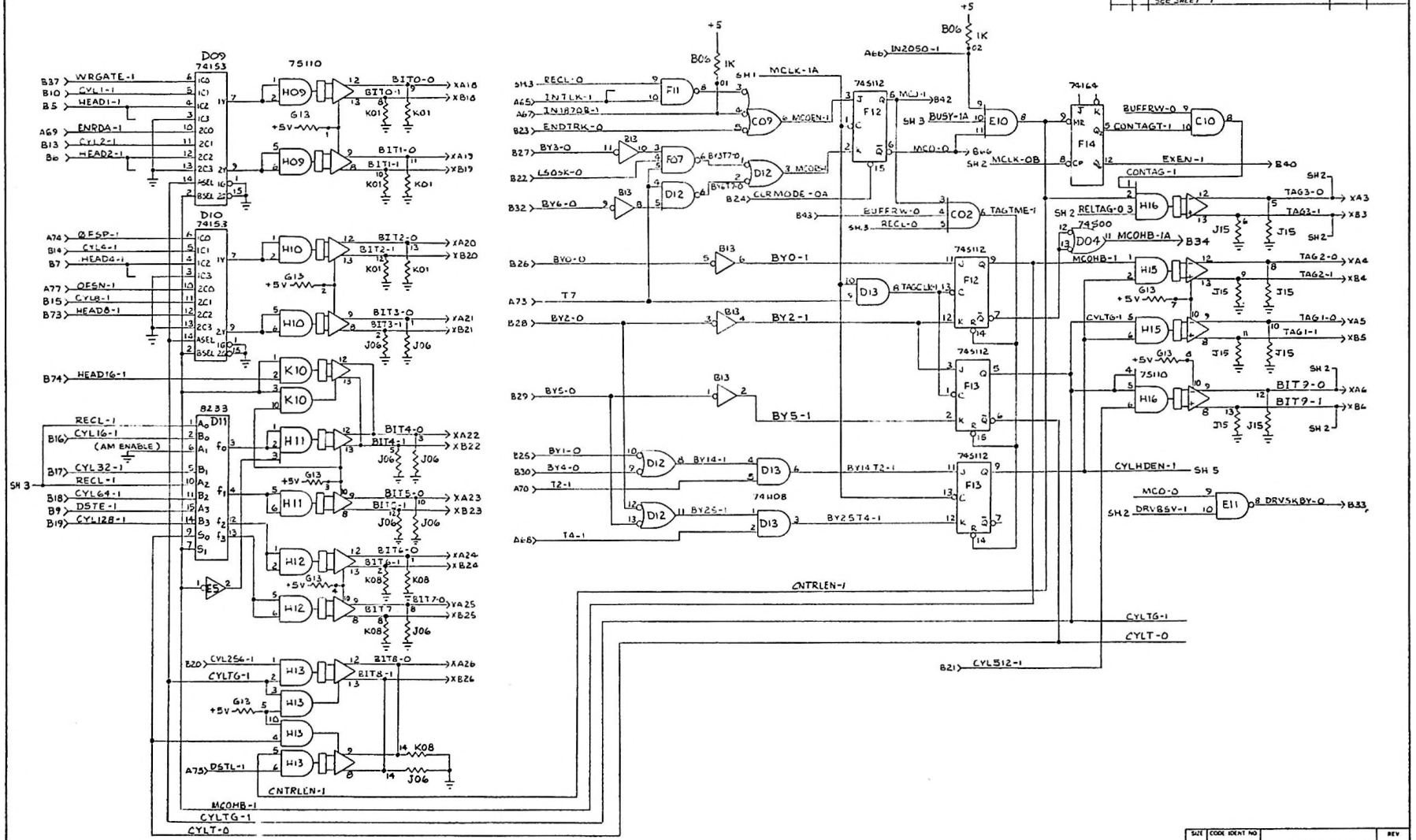
4 FOR MATERIAL LIST REFER TO 201803 ML3
 1 FOR ASSEMBLY DWG. REFER TO 201803 A3
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 1. ALL RESISTOR VALUES ARE IN OHMS ± 5%
 NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS			
DATE	DESCRIPTION	DATE	APPROVED
SEE SHEET 1			



SIZE	CODE IDENT NO	REV.
D	51360	A
SCALE	201803 L4	SHEET 3 OF 5

ZONE	REV	DATE	APPROVED
112	REV. 5/015		
SEE SHEET 1			



SIZE	CODE IDENT NO	REV
D	51360	201803 L4
SCALE		SHEET 4 OF 5

INTERFACE CONNECTIONS

FROM IC-PIN	TO								
A01-01	A17	A07-06	A73	A15-08	B50	K06-01	XB25	K15-11	YB21
-02	A16	-07	A71	-09	B47	-02	XA24	-12	YA21
-03	A15	-08	A66	-10	B49	-03	XB24	-13	YB 22
-04	A11	-09	A65	-11	B52	-04	XA23		
-05	A12	-10	A67	-12	B51	-05	XB23	K16-01	YA29
-06	A04	-11	A68	-13	B54	-09	XA22	-02	YB29
-07	A13	-12	A69			-10	XA20	-03	YA28
-08	A08	-13	A70	A16-04	B63	-11	XB21	-04	YB28
-09	A05	-14	A72	-05	B64	-12	XA21	-05	YB30
-10	A06			-08	B57	-13	XB22	-06	YA30
-11	A07	+ 5 VOLTS	A79	-09	B60			-09	YA27
-12	A10	(Vcc)	A80	-10	B59	K07-01	XA29	-10	YA25
-13	A09		B01	-11	B62	-02	XB29	-11	YB26
-14	A03		B02	-12	B61	-03	XA28	-12	YA26
						-04	XA27	-13	YB27
						-05	XB30		
A02-01	A27	GND	A01	A17-01	B73	-06	XA30		
-02	A26	(COMMON)	A02	-02	B78	-09	XB28		
-03	A25		B79	-03	B72	-10	XB26		
-04	A24		B80	-04	B76	-11	XA25		
-05	A23			-05	B75	-12	XA26		
-06	A22			-06	B71	-13	XB27		
-10	A18	A11-01	B10	-07	B77				
-11	A19	-02	B09	-08	B68	K11-01	YB05		
-12	A20	-03	B14	-09	B67	-02	YB04		
-13	A21	-04	B13	-10	B70	-03	YA04		
-14	A14	-05	B15	-11	B69	-04	YB03		
		-06	B16	-12	B65	-05	YB02		
A03-01	A35	-07	B12	-13	B66	-10	YA01		
-02	A34	-08	B07	-14	B74	-11	YB01		
-03	A33	-09	B08			-12	YA02		
-04	A32	-10	B05	K02-01	XB04	-13	YA03		
-10	A28	-11	B06	-02	XA05				
-11	A29	-12	B03	-03	XA04				
-12	A30	-13	B04	-04	XB03	K12-01	YA10		
-13	A31	-14	B11	-05	XB02	-02	YB09		
				-10	XA01	-03	YA09		
A04-01	A46	A12-01	B21	-11	XB01	-04	YB08		
-02	A45	-02	B24	-12	XA02	-05	YA08		
-03	A44	-03	B23	-13	XA03	-09	YA07		
-04	A43	-04	B25			-10	YA05		
-05	A42	-05	B26			-11	YA06		
-08	A37	-08	B19	K03-01	XB10	-12	YB06		
-09	A36	-10	B22	-02	XA09	-13	YB07		
-10	A38	-11	B20	-03	XB09				
-11	A39	-12	B17	-04	XB08				
-12	A40	-13	B18	-05	XA08	K13-01	YB15		
-13	A41			-09	XA07	-02	YB14		
				-10	XB05	-03	YA14		
A05-03	A54	A13-03	B31	-11	XA06	-04	YA13		
-04	A53	-04	B34	-12	XB06	-05	YB13		
-05	A52	-05	B36	-13	XB07	-09	YB12		
-08	A47	-08	B30			-10	YB10		
-09	A48	-10	B29	K04-01	XB15	-11	YA11		
-11	A49	-11	B32	-02	XA14	-12	YB11		
-12	A50	-12	B27	-03	XB14	-13	YA12		
-13	A51	-13	B28	-04	XA13				
				-05	XB13	K14-01	YB20		
A06-01	A64	A14-01	B41	-09	XA12	-02	YA19		
-02	A63	-02	B44	-10	XA10	-03	YB19		
-03	A62	-03	B48	-11	XB11	-04	YA18		
-04	A61	-04	B45	-12	XA11	-05	YB18		
-08	A56	-05	B46	-13	XB12	-09	YA17		
-09	A55	-06	B43			-10	YA15		
-10	A57	-08	B40	K05-01	XB20	-11	YB16		
-11	A58	-09	B39	-02	XA19	-12	YA16		
-12	A59	-10	B42	-03	XB19	-13	YB17		
-13	A60	-11	B37	-04	XA18				
		-12	B38	-05	XB18				
		-13	B35	-09	XA17				
				-10	XA15	K15-01	YB25		
A07-01	A78	A15-03	B58	-11	XB16	-02	YA24		
-02	A77	-04	B55	-12	XA16	-03	YB24		
-03	A76	-05	B56	-13	XB17	-04	YA23		
-04	A75					-05	YB23		
-05	A74					-09	YA22		
						-10	YA20		

ZONE		LTR		DESCRIPTION	DATE	APPROVED
				SEE SHEET 1		

WIRING CHANGES (USE 26 AWG WIRE)

- DELETE A02-11 (0392) TO F04-02 (0842)
- DELETE F04-05 (0845) TO A01-11 (0192)
- DELETE B17-02 (3480) TO C17-02 (3471)
- DELETE C17-02 (3471) TO A01-11 (0192)
- ADD B17-02 (3480) TO C17-02 (3471)
- ADD C17-02 (3471) TO A01-11 (0192)
- ADD C17-07 (3476) TO B02-07 (0485)
- ADD F04-05 (0845) TO A01-11 (0192)
- ADD F04-07 (0847) TO B02-07 (0485)
- ADD F04-02 (0842) TO A02-11 (0392)
- ADD F04-07 (0847) TO B03-07 (0685)

} TWISTED PAIR
 } TWISTED PAIR
 } TWISTED PAIR

SIZE	CODE IDENT NO.	REV
C	51360 201803 A4	A
SCALE	SHEET 2 OF 2	

DC-16-C TO DISK DRIVE SIGNAL CABLE (201809 WL1)

PINS	FUNCTION
1, 4	UNIT SELECT, BIT 0
2, 5	UNIT SELECT, BIT 1
3, 7	UNIT SELECT, BIT 2
8, 12	UNIT SELECT, BIT 3
10, 13	INDEX
11, 14	FAULT
15, 18	ON CYLINDER
16, 20	OPEN CABLE DETECT
17, 21	UNIT READY
22, 25	UNIT SELECT STROBE
23, 26	BUS BIT 0
24, 27	BUS BIT 1
28, 31	BUS BIT 2

PINS	FUNCTION
29, 32	BUS BIT 3
30, 33	BUS BIT 4
34, 37	BUS BIT 5
35, 38	BUS BIT 6
36, 39	BUS BIT 7
40, 43	BUS BIT 8
42, 45	ADDRESS MARK FOUND
46, 49	TAG 1
48, 51	TAG 2
52, 55	TAG 3
74, 77	SECTOR MARK
75, 78	SEEK ERROR

DC-16-C TO DISK DRIVE DATA CABLE (201809 WL2)

PINS	FUNCTION
A, B	WRITE DATA
H, J	WRITE CLOCK
M, N	SERVO CLOCK
U, V	READ DATA

PINS	FUNCTION
W, X	READ CLOCK
AA, CC	SEEK END
BB, DD	UNIT SELECTED

	SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
* 1	-5VCC	1	A A 15 10 2993	CS12	01	S	PIN B49	00000200
* 2	-5VCCA	1	A A 15 08 2995	CS12	01	S	PIN B50	00000300
	+5VCCA	1	A J 01 16 0112	RES	02	S		00000350
	+5VCCA	1	A J 01 15 0113	RES	02	S		00000360
	ACK	1	A A 06 11 1192	CS06	03	S	PIN A58	00000400
	ACK	1	A G 09 11 1733	74S74	03	S		00000500
	ACTIVE	0	A C 14 11 2773	74S02	05	S		00000600
	ACTIVE	0	A C 15 06 3075	74S74	05	S		00000700
	ACTIVE	1	A B 02 12 0391	74S40	05	S		00000800
	ACTIVE	1	A B 02 13 0380	74S40	05	S		00000900
	ACTIVE	1	A C 14 09 2775	74S02	05	S		00001000
	ACTIVE	1	A C 15 05 3074	74S74	05	S		00001100
	ALTSEC	1	A C 14 03 2872	74S02	05	S		00001200
	ALTSEC	1	A C 14 04 2873	74S02	05	S		00001300
	ATN	1	A B 10 11 1984	S112	03	S		00001400
	ATN	1	A C 10 03 2072	7408	03	S		00001500
	ATN0	0	A B 09 02 1880	S258	03	S		00001600
	ATN0	0	A D 08 07 1665	74155	03	S		00001700
	ATN1	0	A B 09 05 1883	S258	03	S		00001800
	ATN1	0	A D 08 06 1664	74155	03	S		00001900
	ATN2	0	A B 09 11 1784	S258	03	S		00002000
	ATN2	0	A D 08 05 1663	74155	03	S		00002100
	ATN3	0	A B 09 14 1781	S258	03	S		00002200
	ATN3	0	A D 08 04 1662	74155	03	S		00002300
	ATNMX	1	A C 02 11 0373	74H11	03	S		00002400
	ATNMX	1	A C 09 13 1771	7410	03	S		00002500
	ATNMX	1	A F 09 15 1742	9309	02	S		00002600
	ATNRS	0	A C 09 10 1774	7410	03	S		00002700
	ATNRS	0	A C 11 06 2275	S112	03	S		00002800
	ATNRS	1	A B 10 02 2080	S112	03	S		00002900
	ATNRS	1	A B 10 12 1983	S112	03	S		00003000
	ATNRS	1	A C 11 05 2274	S112	03	S		00003100

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	T.D.
ATNTAG	1	A B 10 03 2081	S112	03			00003200
ATNTAG	1	A C 02 08 0376	74H11	03	S		00003300
BIT0	0	A H 09 12 1723	75110	04	S		00003400
BIT0	0	A K 01 09 0106	RES	02			00003500
BIT0	0	A K 05 04 1004	CS18	04		XA18	00003600
BIT0	1	A H 09 13 1722	75110	04	S		00003700
BIT0	1	A K 01 08 0107	RDIP	02			00003800
BIT0	1	A K 05 05 1005	CS18	04		XB18	00003900
BIT1	0	A H 09 09 1726	75110	04	S		00004000
BIT1	0	A K 01 11 0104	RES	02			00004100
BIT1	0	A K 05 02 1002	CS18	04		XA19	00004200
BIT1	1	A H 09 08 1727	75110	04	S		00004300
BIT1	1	A K 01 10 0105	RDIP	04			00004400
BIT1	1	A K 05 03 1003	CS18	04		XB19	00004500
BIT2	0	A H 10 12 1923	75110	04	S		00004600
BIT2	0	A K 01 13 0102	RES	02			00004700
BIT2	0	A K 06 10 1105	CS19	04		XA20	00004800
BIT2	1	A H 10 13 1922	75110	04	S		00004900
BIT2	1	A K 01 12 0103	RDIP	04			00005000
BIT2	1	A K 05 01 1001	CS18	04		XB20	00005100
BIT3	0	A H 10 09 1926	75110	04	S		00005200
BIT3	0	A J 06 01 1212	RES	04			00005300
BIT3	0	A K 06 12 1103	CS19	04		XA21	00005400
BIT3	1	A H 10 08 1927	75110	04	S		00005500
BIT3	1	A J 06 02 1213	RDIP	04			00005600
BIT3	1	A K 06 11 1104	CS19	04		XB21	00005700
BIT4	0	A H 11 12 2123	75110	01	S		00005800
BIT4	0	A J 06 03 1214	RES	04			00005900
BIT4	0	A K 06 09 1106	CS19	04		XA22	00006000
BIT4	0	A K 10 12 1903	75110	04			00006100
BIT4	1	A H 11 13 2122	75110	01	S		00006200
BIT4	1	A J 06 05 1216	RDIP	04			00006300
BIT4	1	A K 06 13 1102	CS19	04		XB22	00006400
BIT4	1	A K 10 13 1902	75110	04			00006500
BIT5	0	A H 11 09 2126	75110	01	S		00006600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
8IT5	0	A J 06 10 1116	RES	04			00006700
8IT5	0	A K 06 04 1204	CS19	04		XA23	00006800
8IT5	1	A H 11 08 2127	75110	01	S		00006900
8IT5	1	A J 06 12 1114	RDIP	04			00007000
8IT5	1	A K 06 05 1205	CS19	04		X923	00007100
8IT6	0	A H 12 12 2323	75110	04	S		00007200
8IT6	0	A K 06 02 1202	CS19	04		XA24	00007300
8IT6	0	A K 08 01 1601	RES	04			00007400
8IT6	1	A H 12 13 2322	75110	04	S		00007500
8IT6	1	A K 06 03 1203	CS19	04		XB24	00007600
8IT6	1	A K 08 02 1602	RDIP	04			00007700
8IT7	0	A H 12 09 2326	75110	04	S		00007800
8IT7	0	A J 06 08 1118	RES	04			00007900
8IT7	0	A K 07 11 1304	CS20	04		XA25	00008000
8IT7	1	A H 12 08 2327	75110	04	S		00008100
8IT7	1	A K 06 01 1201	CS19	04		XB25	00008200
8IT7	1	A K 08 08 1507	RDIP	04			00008300
8IT8	0	A H 13 09 2526	75110	04	S		00008400
8IT8	0	A H 13 12 2523	75110	04	S		00008500
8IT8	0	A K 07 12 1303	CS20	04		XA26	00008600
8IT8	0	A K 08 14 1501	RES	04			00008700
3							
8IT8	1	A H 13 08 2527	75110	04	S		00008800
8IT8	1	A H 13 13 2522	75110	04	S		00008900
8IT9	1	A J 06 14 1112	RDIP	04			00009000
8IT9	1	A K 07 10 1305	CS20	04		X926	00009100
4							
8IT9	0	A D 06 09 1164	75110	02			00009200
8IT9	0	A D 06 12 1161	75110	02			00009300
8IT9	0	A H 16 09 3126	75110	04	S		00009400
8IT9	0	A J 15 12 2914	RES	04			00009500
8IT9	0	A K 03 11 0504	RES	04			00009600
8IT9	1	A D 06 08 1165	75110	02			00009700
8IT9	1	A D 06 13 1160	75110	02	S		00009800
8IT9	1	A H 16 08 3127	75110	04			00009900
8IT9	1	A J 15 13 2913	RES	04			00010000
8IT9	1	A K 03 12 0503	RES	02			00010100
8TCEN	1	A A 05 03 1091	CS05	03		PIN A54	00010200

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
BTCEN	1	A B 03 01 0679	7404	02			00010300
BTCEN	1	A F 06 13 1151	74164	02	S		00010400
BTCEN	1	A G 03 13 0531	74S20	02			00010500
BUFRW	0	A A 14 06 2894	CS11	04	S	PIN B43	00010600
BUFRW	0	A C 02 04 0473	74H11	04			00010700
BUFRW	0	A C 10 09 1975	7409	04			00010800
BUS0	1	A D 09 07 1865	74153	04	S		00010900
BUS0	1	A H 09 01 1821	75110	04			00011000
BUS0	1	A H 09 02 1822	75110	04			00011100
BUS1	1	A D 09 09 1766	74153	04	S		00011200
BUS1	1	A H 09 05 1825	75110	04			00011300
BUS1	1	A H 09 06 1826	75110	04			00011400
BUS2	1	A D 10 07 2065	74153	04	S		00011500
BUS2	1	A H 10 01 2021	75110	04			00011600
BUS2	1	A H 10 02 2022	75110	04			00011700
BUS3	1	A D 10 09 1966	74153	04	S		00011800
BUS3	1	A H 10 05 2025	75110	04			00011900
BUS3	1	A H 10 06 2026	75110	04			00012000
BUS4	1	A D 11 03 2261	8233	04	S		00012100
BUS4	1	A H 11 01 2221	75110	01			00012200
BUS4	1	A H 11 02 2222	75110	01			00012300
BUS5	1	A D 11 04 2262	8233	04	S		00012400
BUS5	1	A H 11 05 2225	75110	01			00012500
BUS5	1	A H 11 06 2226	75110	01			00012600
BUS6	1	A D 11 12 2163	8233	04	S		00012700
BUS6	1	A H 12 01 2421	75110	04			00012800
BUS6	1	A H 12 02 2422	75110	04			00012900
BUS7	1	A D 11 13 2162	8233	04	S		00013000
BUS7	1	A H 12 05 2425	75110	04			00013100
BUS7	1	A H 12 06 2426	75110	04			00013200
BUSY	0A	A C 02 10 0374	74H11	03			00013300
BUSY	0A	A D 02 02 0460	74S64	01			00013400
BUSY	0A	A D 06 02 1260	75110	02			00013500
BUSY	0A	A D 06 06 1264	75110	02			00013600
BUSY	0A	A E 05 06 1055	74S04	02	S		00013700
BUSY	0A	A E 05 09 0955	74S04	02			00013800

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
BUSY	0A	A K 10 06 2006	75110	02			00013900
BUSY	1	A A 01 03 0291	CS01	02	S	PTN A15	00014000
BUSY	1	A E 05 05 1054	74S04	02			00014100
BUSY	1A	A B 11 04 2282	7408	01			00014200
BUSY	1A	A C 02 01 0470	74H11	04			00014300
BUSY	1A	A C 09 02 1871	7410	03			00014400
BUSY	1A	A D 02 06 0464	74S64	01			00014500
BUSY	1A	A D 02 11 0362	74S64	01			00014600
BUSY	1A	A E 05 08 0956	74S04	02	S		00014700
BUSY	1A	A E 10 10 1954	74S11	04			00014800
BUSY	1A	A F 04 13 0742	74S74	05			00014900
BUSYRES	0	A C 09 09 1775	7410	03			00015000
BUSYRES	0	A C 09 12 1772	7410	03	S		00015100
BY0	0	A A 12 05 2493	CS09	04	S	PIN B26	00015200
BY0	0	A B 13 05 2683	7404	04			00015300
BY0	1	A B 13 06 2684	7404	04	S		00015400
BY0	1	A F 12 11 2346	S112	04			00015500
BY1	0	A A 12 04 2492	CS09	04	S	PIN B25	00015600
BY1	0	A D 12 10 2363	74S00	04			00015700
BY14	1	A D 12 08 2365	74S00	04	S		00015800
BY14	1	A D 13 04 2662	74H08	04			00015900
BY14T2	1	A D 13 06 2664	74H08	04	S		00016000
BY14T2	1	A F 13 11 2546	S112	04			00016100
BY2	0	A A 13 13 2590	CS10	04	S	PTN B28	00016200
BY2	0	A B 13 03 2681	7404	04			00016300
BY2	0	A D 12 12 2361	74S00	04			00016400
BY2	1	A B 13 04 2692	7404	04	S		00016500
BY2	1	A F 12 12 2345	S112	04			00016600
BY2	1	A F 13 03 2643	S112	04			00016700
BY25	1	A D 12 11 2362	74S00	04	S		00016800
BY25	1	A D 13 01 2659	74H08	04			00016900
BY25T4	1	A D 13 03 2661	74H08	04	S		00017000
BY25T4	1	A F 13 12 2545	S112	04			00017100

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
BY3	0	A A 13 12 2591	CS10	04	S	PIN 927	00017200
BY3	0	A B 13 11 2582	7404	04			00017300
BY3	1	A B 13 10 2583	7404	04	S		00017400
BY3	1	A F 07 03 1443	74S10	04			00017500
BY3T7	0	A D 12 01 2459	74S00	04			00017600
BY3T7	0	A F 07 06 1446	74S10	04	S		00017700
BY4	0	A A 13 08 2595	CS10	04	S	PIN 830	00017800
BY4	0	A D 12 09 2364	74S00	04			00017900
BY5	0	A A 13 10 2593	CS10	04	S	PIN 829	00018000
BY5	0	A B 13 01 2679	7404	04			00018100
BY5	0	A D 12 13 2360	74S00	04			00018200
BY5	1	A B 13 02 2680	7404	04	S		00018300
BY5	1	A F 13 02 2642	S112	04			00018400
BY6	0	A A 13 11 2592	CS10	04	S	PIN 832	00018500
BY6	0	A B 13 09 2584	7404	04			00018600
BY6	1	A B 13 08 2585	7404	04	S		00018700
BY6	1	A D 12 05 2463	74S00	04			00018800
BY6T7	0	A D 12 02 2460	74S00	04			00018900
BY6T7	0	A D 12 06 2464	74S00	04	S		00019000
CLOCK	0A	A E 16 02 3251	74S05	01	S		00019100
CLOCK	0A	A E 16 03 3252	74S05	01			00019200
CLOCK	0A	A E 17 02 3451	RC	01			00019300
CLOCK	0A	A E 17 03 3452	RC	01			00019400
CLOCK	1	A D 02 03 0461	74S64	01			00019500
CLOCK	1	A D 02 10 0363	74S64	01			00019600
CLOCK	1	A D 16 02 3260	74S04	01	S		00019700
CLOCK	1	A E 16 01 3250	74S05	01			00019800
CLOCK	1A	A D 16 01 3259	74S04	01			00019900
CLOCK	1A	A E 16 04 3253	74S05	01	S		00020000
CLOCK	1A	A E 17 04 3453	RC	01			00020100
CLOCK	1A	A E 17 05 3454	RC	01			00020200
CLRMODE	0	A A 12 02 2490	CS09	04	S	PIN 824	00020300
CLRMODE	0	A F 12 15 2342	S112	04			00020400

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STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
CLRREL 0	A B	04 06 0894	7408	02	S		00020500
CLRREL 0	A C	03 01 0670	7474	02			00020600
CLRSTAT 0	A A	01 05 0293	CS01	01	S	PTN A12	00020700
CLRSTAT 0	A D	04 05 0863	7400	01			00020800
CNTRLEN 1	A E	10 08 1956	74S11	04	S		00020900
CNTRLEN 1	A F	14 09 2746	74164	04			00021000
CNTRLEN 1	A H	13 05 2625	75110	04			00021100
CNTRLEN 1	A H	16 02 3222	75110	04			00021200
COMP 1	A C	09 01 1870	7410	03			00021300
COMP 1	A E	07 08 1356	74453	03	S		00021400
COMPCLK 0	A C	13 11 2573	74S00	05	S		00021500
COMPCLK 0	A C	14 08 2776	74S02	05			00021600
COMPCLK 0	A C	14 12 2772	74S02	05			00021700
COMPCLK 0	A C	15 03 3072	74S74	05			00021800
CONTAG 1	A C	10 08 1976	7408	04	S		00021900
CONTAG 1	A H	16 01 3221	75110	04			00022000
CONTAGT 1	A C	10 10 1974	7408	04			00022100
CONTAGT 1	A F	14 05 2845	74164	04	S		00022200
CTSCAR 1	A B	15 10 2985	74161	05			00022300
CTSCAR 1	A B	16 15 3180	74161	05	S		00022400
CTSEC1 1	A B	16 14 3181	74161	05			00022500
CTSEC1 1	A C	16 02 3271	93S46	05	S		00022600
CTSEC16 1	A B	15 14 2981	74161	05			00022700
CTSEC16 1	A C	16 13 3173	93S46	05	S		00022800
CTSEC2 1	A B	16 13 3182	74161	05			00022900
CTSEC2 1	A C	16 04 3273	93S46	05	S		00023000
CTSEC32 1	A B	15 13 2982	74161	05			00023100
CTSEC32 1	A C	16 15 3171	93S46	05	S		00023200
CTSEC4 1	A B	16 12 3183	74161	05			00023300
CTSEC4 1	A C	16 06 3275	93S46	05	S		00023400
CTSEC8 1	A B	16 11 3184	74161	05			00023500
CTSEC8 1	A C	16 11 3175	93S46	05	S		00023600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
CYL1	1	A A 11 01 2289	CS08	04	S	PIN B10	00023700
CYL1	1	A D 09 05 1863	74153	04			00023800
CYL128	1	A A 12 08 2395	CS09	04	S	PIN B19	00023900
CYL128	1	A D 11 14 2161	8233	04			00024000
CYL16	1	A A 11 06 2294	CS03	04	S	PIN B16	00024100
CYL16	1	A D 11 02 2260	8233	04			00024200
CYL2	1	A A 11 04 2292	CS08	04	S	PIN B13	00024300
CYL2	1	A D 09 11 1764	74153	04			00024400
CYL256	1	A A 12 11 2392	CS09	04	S	PIN B20	00024500
CYL256	1	A H 13 01 2621	75110	04			00024600
CYL32	1	A A 12 12 2391	CS09	04	S	PIN B17	00024700
CYL32	1	A D 11 05 2263	8233	04			00024800
CYL4	1	A A 11 03 2291	CS08	04	S	PIN B14	00024900
CYL4	1	A D 10 05 2063	74153	04			00025000
CYL512	1	A A 12 01 2489	CS09	04	S	PIN B21	00025100
CYL512	1	A H 16 06 3226	75110	04			00025200
CYL64	1	A A 12 13 2390	CS09	04	S	PIN B18	00025300
CYL64	1	A D 11 11 2164	8233	04			00025400
CYL8	1	A A 11 05 2293	CS08	04	S	PIN B15	00025500
CYL8	1	A D 10 11 1964	74153	04			00025600
CYLHDEN	1	A F 11 12 2143	74S00	05			00025700
CYLHDEN	1	A F 13 09 2548	S112	04	S		00025800
CYLHDEN	1	A H 15 02 3022	75110	04			00025900
CYLHDEN	1	A H 15 06 3026	75110	04			00026000
CYLTG	0	A D 11 09 2166	8233	04			00026100
CYLTG	0	A F 13 06 2646	S112	04	S		00026200
CYLTG	0	A H 13 04 2624	75110	04			00026300
CYLTG	1	A D 09 14 1761	74153	04			00026400
CYLTG	1	A D 10 14 1961	74153	04			00026500
CYLTG	1	A F 11 13 2142	74S00	05			00026600
CYLTG	1	A F 13 05 2645	S112	04	S		00026700
CYLTG	1	A H 13 02 2622	75110	04			00026800
CYLTG	1	A H 13 03 2623	75110	04			00026900
CYLTG	1	A H 15 05 3025	75110	04			00027000

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
CYLTG	1	A H 16 04 3224	75110	04			00027100
CYLTG	1	A H 16 05 3225	75110	04			00027200
DATAI00	1	A A 14 03 2891	CS11	02		PIN 848	00027300
DATAI00	1	A A 14 04 2892	CS11	02	S	PIN 845	00027400
DATAI00	1	A C 05 04 1073	74175	02			00027500
DATAI01	1	A A 14 05 2893	CS11	02	S	PIN 846	00027600
DATAI01	1	A A 15 13 2990	CS12	02		PIN 854	00027700
DATAI01	1	A C 05 05 1074	74175	02			00027800
DATAI02	1	A A 16 08 3195	CS13	02	S	PIN 857	00027900
DATAI02	1	A A 16 09 3194	CS13	02		PIN 860	00028000
DATAI02	1	A C 05 12 0974	74175	02			00028100
DATAI03	1	A A 16 10 3193	CS13	03	S	PIN 859	00028200
DATAI03	1	A A 16 12 3191	CS13	02		PIN 861	00028300
DATAI03	1	A C 03 02 0671					00028400
DATAI04	1	A A 16 05 3293	CS13	02		PIN 864	00028500
DATAI04	1	A A 16 11 3192	CS13	02	S	PIN 862	00028600
DATAI04	1	B C 05 13 0973					00028700
DATAI05	1	A A 16 04 3292	CS13	03	S	PIN 863	00028800
DATAI05	1	A A 17 03 3491	CS14	03		PIN872	00028900
DRUSY	0	A F 01 05 0245	RES	03			00029000
DRUSY	0	A G 11 13 2131	RES	03			00029100
DRUSY	0	A K 07 04 1404	RES	03	S		00029200
DRUSY	0	A K 08 12 1503	RES	03			00029300
DRUSY	1	A F 01 04 0244	RES	03			00029400
DRUSY	1	A F 15 13 2942	RES	03			00029500
DRUSY	1	A K 07 13 1302	RES	03	S		00029600
DRUSY	1	A K 08 10 1505	RES	03			00029700
DRUSYR	0	A F 01 10 0145	RES	03	S		00029720
DRUSYR	0	A E 03 12 0552	75107	03			00029740
DRUSYR	1	A F 01 11 0144	RES	03	S		00029760
DRUSYR	1	A E 03 11 0553	75107	03			00029780
DEFTRK	0	A A 06 03 1291	CS06	03	S	PIN A62	00029800
DEFTRK	0	A B 07 06 1484	S258	03			00029900
DISKTF	1	A C 02 12 0372	74411	04	S		00030000

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DISKTE	1	A E 14 02 2851	7474	04			00030100
DISKTE	1	A E 14 12 2752	7474	04			00030200
DRVALRT	1	A A 06 10 1193	CS06	02		PIN A57	00030300
DRVALRT	1	A B 02 06 0484	7440	02	S		00030400
DRVBSY	0	A A 06 09 1194	CS06	02		PIN A55	00030500
DRVBSY	0	A B 11 11 2182	74H08	02	S		00030600
DRVBSY	0	A C 02 13 0371	74H11	04			00030700
DRVBSY	0	A F 05 13 0942	74S05	02			00030800
DRVBSY	1	A A 06 08 1195	CS06	02		PIN A56	00030900
DRVBSY	1	A E 11 10 2154	74S00	04			00031000
DRVBSY	1	A F 05 12 0943	74S05	02	S		00031100
DRVBSY	1	A G 05 08 0936	1KPU	02			00031200
DRVRDY	1	A B 02 05 0483	7440	02			00031300
DRVRDY	1	A B 11 13 2180	74H08	02			00031400
DRVRDY	1	A C 10 04 2073	7408	02			00031500
DRVRDY	1	A H 06 09 1126	75107	02	S		00031600
DRVSKBY	0	A A 13 06 2694	CS10	04		PIN B33	00031700
DRVSKBY	0	A E 11 08 2156	74S00	04	S		00031800
DRWDAT	1	A D 17 02 3460	75110	06			00032000
DRWDAT	1	A B 17 02 3480	75110	06			00032100
DRWDAT	1	A C 17 02 3471	75110	06			00032150
DRWDAT	1	A A 01 11 0192	CS01	01		PIN A07	00032200
DRWDAT	1	A F 04 05 0845	74S74	01	S		00032300
DRWDAT	1	A H 04 02 0822	75110	01			00032400
DRWRPRT	0	A B 04 12 0781	7408	03			00032500
DRWRPRT	0	A E 03 04 0653	74107	03	S		00032600
DSEL1	0	A B 07 02 1480	S258	03			00032700
DSEL1	0	A C 06 03 1272	74175	02	S		00032800
DSEL1	0	A E 07 01 1450	74H53	03			00032900
DSEL1	1	A C 06 02 1271	74175	02	S		00033000
DSEL1	1	A C 07 13 1373	9309	03			00033100
DSEL1	1	A C 08 14 1572	74170	03			00033200
DSEL1	1	A E 07 02 1451	74H53	03			00033300
DSEL1	1	A H 07 05 1425	75110	02			00033400
DSEL1	1	A H 07 06 1426	75110	02			00033500
DSEL2	0	A B 07 05 1483	S258	03			00033600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DSEL2	0	A C 06 06 1275	74175	02	S		00033700
DSEL2	0	A E 07 10 1354	74H53	03			00033800
DSEL2	1	A C 06 07 1276	74175	02	S		00033900
DSEL2	1	A C 07 03 1472	9309	03			00034000
DSEL2	1	A C 08 13 1573	74170	03			00034100
DSEL2	1	A E 07 04 1453	74H53	03			00034200
DSEL2	1	A H 08 01 1621	75110	02			00034300
DSEL2	1	A H 08 02 1622	75110	02			00034400
DSEL4	0	A B 07 11 1384	S258	03			00034500
DSEL4	0	A C 06 11 1175	74175	02	S		00034600
DSEL4	1	A C 06 10 1176	74175	02	S		00034700
DSEL4	1	A H 08 05 1625	75110	02			00034800
DSEL4	1	A H 08 06 1626	75110	02			00034900
DSELB1	1	A C 05 02 1071	74175	02	S		00035000
DSEL91	1	A C 06 04 1273	74175	02			00035100
DSELB2	1	A C 05 07 1076	74175	02	S		00035200
DSELB2	1	A C 06 05 1274	74175	02			00035300
DSELB4	1	A C 05 10 0976	74175	02	S		00035400
DSELB4	1	A C 06 12 1174	74175	02			00035500
DSELCK	1	A C 04 03 0872	7474	02			00035600
DSELCK	1	A C 06 09 1177	74175	02			00035700
DSELCK	1	A E 06 06 1255	74164	02	S		00035800
DSTAT00	1	A A 02 05 0493	CS02	03		PIN A23	00035900
DSTAT00	1	A B 09 04 1882	S258	03	S		00036000
DSTAT01	1	A A 02 04 0492	CS02	03		PIN A24	00036100
DSTAT01	1	A B 09 07 1885	S258	03	S		00036200
DSTAT02	1	A A 02 03 0491	CS02	03		PIN A25	00036300
DSTAT02	1	A B 09 09 1786	S258	03	S		00036400
DSTAT03	1	A A 02 02 0490	CS02	03		PIN A26	00036500
DSTAT03	1	A B 09 12 1783	S258	03	S		00036600
DSTAT04	1	A A 02 01 0489	CS02	03		PIN A27	00036700
DSTAT04	1	A B 08 04 1682	S258	03	S		00036800
DSTAT05	1	A A 03 10 0593	CS03	03		PIN A28	00036900

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DSTAT05	1	A B 08 07 1685	S258	03	S		00037000
DSTAT06	1	A A 03 11 0592	CS03	03		PIN A29	00037100
DSTAT06	1	A B 08 09 1586	S258	03	S		00037200
DSTAT07	1	A A 03 12 0591	CS03	03		PIN A30	00037300
DSTAT07	1	A B 08 12 1583	S258	03	S		00037400
DSTAT08	1	A A 03 13 0590	CS03	3		PIN A31	00037500
DSTAT08	1	A B 07 04 1482	S258	03	S		00037600
DSTAT09	1	A A 03 04 0692	CS03	03		PIN A32	00037700
DSTAT09	1	A B 07 07 1485	S258	03	S		00037800
DSTAT10	1	A A 03 03 0691	CS03	03		PIN A33	00037900
DSTAT10	1	A B 07 09 1386	S258	03	S		00038000
DSTAT11	1	A A 03 02 0690	CS03	03		PTN A34	00038100
DSTAT11	1	A B 07 12 1383	S258	03	S		00038200
DSTE	1	A A 11 02 2290	CS03	04	S	PIN B09	00038300
DSTE	1	A D 11 15 2160	8233	04			00038400
DSTL	1	A A 07 04 1492	CS07	04	S	PIN A75	00038500
DSTL	1	A H 13 06 2626	75110	04			00038600
DVINH	0	A A 05 08 0995	CS05	02	S	PIN A47	00038700
DVINH	0	A D 02 01 0459	74S64	01			00038800
DVINH	0	A D 04 09 0764	7400	02			00038900
DVINH	0	A F 07 10 1345	74S10	01			00039000
DVINH	0	A G 05 04 1033	1KPU	02			00039100
DVINH	0	A H 05 06 1026	75107	02			00039200
DVINH	0	A H 06 06 1226	75107	02			00039300
EN0221	1	A G 05 01 1030	1KPU	01	S		00039400
EN0221	1	A H 01 05 0225	75107	01			00039500
EN0221	1	A H 01 06 0226	75107	01			00039600
EN0221	1	A H 01 08 0127	75107	01			00039700
EN0221	1	A H 02 05 0425	75107	01			00039800
EN0221	1	A H 02 06 0426	75107	01			00039900
FN0821	1	A G 05 02 1031	1KPU	01	S		00040000
EN0821	1	A H 04 03 0823	75110	01			00040100
EN0821	1	A H 04 04 0824	75110	01			00040200
EN0821	1	A H 04 05 0825	75110	01			00040300
EN0821	1	A H 04 10 0725	75110	01			00040400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
EN0850	1	A E 03 05 0654	75107	03			00040700
EN0850	1	A E 03 06 0655	75107	03			00040800
EN0850	1	A E 03 08 0556	75107	03			00040900
EN0850	1	A E 04 01 0850	74S15	01			00041200
EN0850	1	A E 04 02 0851	74S15	01			00041300
EN0850	1	A E 04 04 0853	74S15	01			00041400
EN0850	1	A E 04 05 0854	74S15	01			00041500
EN0850	1	A G 05 07 1036	RES	01	S		00042000
EN1421	1	A D 06 10 1163		02			00042100
EN1421	1	A G 05 05 1034	1KPU	02	S		00042200
EN1421	1	A H 07 10 1325	75110	02			00042300
EN1621	1	A G 05 06 1035	1KPU	02	S		00042400
EN1621	1	A H 08 10 1525	75110	02			00042500
EN1821	1	A G 13 01 2630	1KPU	04	S		00042600
EN1821	1	A H 09 10 1725	75110	04			00042700
EN2021	1	A G 13 02 2631	1KPU	04	S		00042800
EN2021	1	A H 10 10 1925	75110	04			00042900
EN2221	1	A G 13 03 2632	1KPU	04	S		00043000
EN2221	1	A H 11 10 2125	75110	04			00043100
EN2221	1	A K 10 10 1905	75110	04			00043200
EN2279	1	A B 11 01 2279	7408	03			00043300
EN2279	1	A B 12 01 2479	RC	03	S		00043400
EN2279	1	A B 12 02 2480	RC	03			00043500
EN2421	1	A G 13 04 2633	1KPU	04	S		00043600
EN2421	1	A H 12 10 2325	75110	04			00043700
EN2621	1	A G 13 05 2634	1KPU	04	S		00043800
EN2621	1	A H 13 10 2525	75110	04			00043900
EN2821	1	A G 13 06 2635	1KPU	04	S		00044000
EN2821	1	A H 14 06 2826	75107	04			00044100
EN3021	1	A G 13 07 2636	1KPU	04	S		00044200
EN3021	1	A H 15 10 2925	75110	04			00044300
EN3221	1	A G 13 08 2536	1KPU	04	S		00044400
EN3221	1	A H 16 10 3125	75110	04			00044500
ENB17	1	A B 17 03 3481	75110	01			00044600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.O.
ENB17	1	A B 17 04 3482	75110	01			00044700
ENB17	1	A B 17 05 3483	75110	01			00044800
ENB17	1	A B 17 10 3383	75110	01			00044900
ENB17	1	A G 13 10 2534	RES	01	S		00045000
ENC17	1	A C 17 03 3472	75110	01			00045100
ENC17	1	A C 17 04 3473	75110	01			00045200
ENC17	1	A C 17 05 3474	75110	01			00045300
ENC17	1	A C 17 10 3374	75110	01			00045400
ENC17	1	A G 05 13 0931	RES	01	S		00045500
END17	1	A D 17 03 3461	75110	01			00045600
END17	1	A D 17 04 3462	75110	01			00045700
END17	1	A D 17 05 3463	75110	01			00045800
END17	1	A D 17 10 3363	75110	01			00045900
END17	1	A G 05 11 0933	RES	01	S		00046000
ENDTRK	0	A A 12 03 2491	CS09	04	S	PIN B23	00046100
ENDTRK	0	A C 09 05 1874	7410	04			00046200
ENG12	1	A G 05 10 0934	RES	01	S		00046300
ENG12	1	A G 12 05 2434	75107	01			00046400
ENG12	1	A G 12 06 2435	75107	01			00046500
ENG12	1	A G 12 08 2336	75107	01			00046600
ENG12	1	A G 14 05 2834	75107	01			00046700
ENG12	1	A G 14 06 2835	75107	01			00046800
ENG16	1	A G 05 12 0932	RES	01	S		00046900
ENG16	1	A G 16 05 3234	75107	01			00047000
ENG16	1	A G 16 06 3235	75107	01			00047100
ENG16	1	A G 16 08 3136	75107	01			00047200
ENG16	1	A G 17 05 3434	75107	01			00047300
ENG16	1	A G 17 06 3435	75107	01			00047400
ENJ16	1	A G 13 09 2535	RES	01	S		00047500
ENJ16	1	A H 17 05 3425	75107	01			00047600
ENJ16	1	A H 17 06 3426	75107	01			00047700
ENJ16	1	A J 16 05 3216	75107	01			00047800
ENJ16	1	A J 16 06 3217	75107	01			00047900
ENJ16	1	A J 16 08 3118	75107	01			00048000
ENRDCK	0	A B 11 05 2283	7408	01			00048100
ENRDCK	0	A E 02 13 0351	74504	01			00048200
ENRDCK	0	A E 05 04 1053	74504	01	S		00048300
ENPDCK	1	A A 13 05 2693	CS10	04	S	PIN B36	00048400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I-D.
ENRDCK	1	A E 05 03 1052	74S04	01			00048500
ENRDCK	1	A G 01 14 0132	S112	01			00048600
ENRDCK	1A	A D 03 01 0659	74H53	01			00048700
ENRDCK	1A	A D 03 02 0660	74H53	01			00048800
ENRDCK	1A	A E 02 08 0356	74S04	01	S		00048900
ENRDCK	1A	A F 03 01 0641	7474	01			00049000
ENRDCK	1A	A F 03 13 0542	7474	01			00049100
ENRDDA	1	A A 07 12 1391	CS07	04	S	PIN A69	00049200
ENRDDA	1	A D 09 10 1765	74153	04			00049300
ENSTAG	0	A C 12 09 2375	74S00	05			00049400
ENSTAG	0	A D 16 06 3264	74S04	05	S		00049500
ENSTAG	1	A C 12 03 2472	74S00	05	S		00049600
ENSTAG	1	A C 12 04 2473	74S00	05			00049700
ENSTAG	1	A D 16 05 3263	74S04	05			00049800
EOP	0	A A 05 05 1093	CS05	03	S	PIN A52	00049900
EOP	0	A B 07 10 1385	S258	03			00050000
EVENSTG	0	A A 15 03 3091	CS12	05	S	PIN B58	00050100
EVENSTG	0	A B 06 03 1281	1KPUP	05			00050200
EVENSTG	0	A F 05 11 0944	74S05	05			00050300
EVENSTG	1	A C 15 04 3073	74S74	05			00050400
EVENSTG	1	A C 16 07 3276	93S46	05			00050500
EVENSTG	1	A F 05 10 0945	74S05	05	S		00050600
EVENSTG	1	A G 05 09 0935	1KPU	05			00050700
EXEN	1	A A 14 08 2795	CS11	04		PIN B40	00050800
EXEN	1	A F 14 12 2743	74164	04	S		00050900
FAKCK	1	A C 11 03 2272	S112	03			00051000
FAKCK	1	A G 09 09 1735	74S74	03	S		00051100
FALTSEC	0	A C 14 05 2874	74S02	05			00051200
FALTSEC	0	A C 15 08 2976	74S74	05	S		00051300
FALTSEC	0	A C 15 12 2972	74S74	05			00051400
FATN	0	A B 10 06 2084	74107	03	S		00051500
FATN	0	A F 11 02 2242	74S00	03			00051600
FATN	1	A B 10 05 2083	S112	03	S		00051700
FATN	1	A C 10 02 2071	7409	03			00051800

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
FATN0	1	A F 09 12 1745	9309	02			00051900
FATN0	1	A G 08 05 1634	7474	02	S		00052000
FATN1	1	A F 09 11 1746	9309	02			00052100
FATN1	1	A G 08 09 1535	7474	02	S		00052200
FATN2	1	A F 08 05 1645	7474	02	S		00052300
FATN2	1	A F 09 10 1747	9309	02			00052400
FATN3	1	A F 08 09 1546	7474	02	S		00052500
FATN3	1	A F 09 09 1748	9309	02			00052600
FAULT	0	A J 05 04 1015	RDIP	02			00052700
FAULT	0	A K 03 05 0605	CS16	02	S	XA8	00052800
FAULT	0	A J 01 01 0212	RES				00052850
FAULT	0	A K 08 04 1604	RES	02			00052900
FAULT	1	A J 05 03 1014	RDIP	02			00053000
FAULT	1	A J 06 04 1215	RDIP	02			00053100
FAULT	1	A J 01 05 0216	RES				00053150
FAULT	1	A K 03 04 0604	CS16	02	S	XB8	00053200
FLT	0	A H 05 01 1021	75107	02			00053300
FLT	0	A J 05 11 0915	RDIP	02	S		00053400
FLT	1	A H 05 02 1022	75107	02			00053500
FLT	1	A J 05 12 0914	RDIP	02	S		00053600
FMWSHR	0	A A 06 13 1190	CS06	05	S	PIN A60	00053700
FMWSHR	0	A G 10 04 2033	7400	05			00053800
FSECP	0	A D 14 08 2765	74574	04	S		00053900
FSECP	0	A E 14 13 2751	7474	04			00054000
FSECP	1	A B 15 10 3185	74161	05			00054100
FSECP	1	A C 13 01 2670	74500	05			00054200
FSECP	1	A D 14 09 2764	74574	04	S		00054300
FSKEND0	1	A F 09 04 1844	9309	02			00054400
FSKEND0	1	A G 07 03 1432	74175	02	S		00054500
FSKEND0	1	A G 08 03 1632	7474	02			00054600
FSKEND1	1	A F 09 05 1845	9309	02			00054700
FSKEND1	1	A G 07 06 1435	74175	02	S		00054800
FSKEND1	1	A G 08 11 1533	7474	02			00054900

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I-D.
FSKEND2	1	A F 08 03 1643	7474	02			00055000
FSKEND2	1	A F 09 06 1846	9309	02			00055100
FSKEND2	1	A G 07 11 1335	74175	02	S		00055200
FSKEND3	1	A F 08 11 1544	7474	02			00055300
FSKEND3	1	A F 09 07 1847	9309	02			00055400
FSKEND3	1	A G 07 14 1332	74175	02	S		00055500
FTAG	0	A C 03 08 0576	7474	02	S		00055600
FTAG	0	A C 10 13 1971	7408	02			00055700
GATN	0	A B 07 14 1381	S258	03			00055800
GATN	0	A B 10 07 2085	S112	03	S		00055900
GATN	1	A A 03 01 0689	CS03	03		PIN A35	00056000
GATN	1	A B 10 09 1986	S112	03	S		00056100
GATN	1	A D 08 01 1659	74155	03			00056200
GATN	1	A G 09 12 1732	74S74	03			00056300
GATN	1	A G 09 13 1731	74S74	03			00056400
GFSECP	0	A C 13 03 2672	74S00	05	S		00056500
GFSECP	0	A C 13 04 2673	74S00	05			00056600
GINXP	1	A C 13 05 2674	74S00	05			00056700
GINXP	1	A C 13 08 2576	74S00	05	S		00056800
GND0230	0	A G 01 02 0231	S112	01			00056900
GND0230	0	A G 01 08 0237	S112	01	S		00057000
GND0230	0	A G 01 12 0134	S112	01			00057100
GND1241	0	A F 06 08 1248	RCPCCK	01	S		00057200
GND1241	0	A F 06 11 1146	RCPCCK	01			00057300
GND1241	0	A F 06 13 1144	RCPCCK	01			00057400
GND1241	0	A F 06 15 1142	RCPCCK	01			00057500
GND1830	0	A G 09 02 1831	74S74	05			00057600
GND1830	0	A G 09 07 1836	74S74	05	S	GND	00057700
GND1859	0	A D 09 01 1859	74153	04			00057800
GND1859	0	A D 09 03 1861	74153	04			00057900
GND1859	0	A D 09 08 1866	74153	04	S		00058000
GND1859	0	A D 09 13 1762	74153	04			00058100
GND1859	0	A D 09 15 1760	74153	04			00058200
GND2059	0	A D 10 01 2059	74153	04			00058300
GND2059	0	A D 10 03 2061	74153	04			00058400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
GND2059 0	A	D 10 08 2066	74153	04	S		00058500
GND2059 0	A	D 10 13 1962	74153	04			00058600
GND2059 0	A	D 10 15 1960	74153	04			00058700
GND2259 0	A	D 11 06 2264	8233	04			00058800
GND2259 0	A	D 11 08 2266	8233	04	S		00058900
GND2479 0	A	B 12 08 2486	RC	03	S		00059000
GND2479 0	A	B 12 15 2380	RC	03			00059100
GND3066 0	A	D 15 03 3061	S161	05			00059200
GND3066 0	A	D 15 04 3062	S161	05			00059300
GND3066 0	A	D 15 05 3063	S161	05			00059400
GND3066 0	A	D 15 06 3064	S161	05			00059500
GND3066 0	A	D 15 08 3066	S161	05	S		00059600
GND3066 0	A	E 15 03 3052	S161	05			00059700
GND3066 0	A	E 15 04 3053	S161	05			00059800
GND3086 0	A	B 15 03 3081	74161	05			00059900
GND3086 0	A	B 15 04 3082	74161	05			00060000
GND3086 0	A	B 15 05 3083	74161	05			00060100
GND3086 0	A	B 15 06 3084	74161	05			00060200
GND3086 0	A	B 15 08 3086	74161	05	S		00060300
GND3270 0	A	C 16 08 3277	93S46	05	S		00060400
GND3270 0	A	C 16 14 3172	93S46	05			00060500
GND3286 0	A	B 16 03 3281	74161	05			00060600
GND3286 0	A	B 16 04 3282	74161	05			00060700
GND3286 0	A	B 16 05 3283	74161	05			00060800
GND3286 0	A	B 16 06 3284	74161	05			00060900
GND3286 0	A	B 16 08 3286	74161	05	S		00061000
GND3450 0	A	E 16 07 3256	74S05	01	S		00061100
GND3450 0	A	E 17 12 3354	RC	01			00061200
GND3450 0	A	E 17 14 3352	RC	01			00061300
GTAG 0	A	B 03 05 0683	7404	02			00061400
GTAG 0	A	C 10 11 1973	7408	02	S		00061500
GTAG 1	A	B 03 06 0684	7404	02	S		00061600
GTAG 1	A	H 07 01 1421	75110	02			00061700
GTAG 1	A	H 07 02 1422	75110	02			00061800
HDRER 0	A	D 03 08 0565	74H53	01	S		00061900
HDRER 0	A	D 04 01 0859	7400	01			00062000

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
HDRER9	0	A D 04 02 0860	7400	01			00062100
HDRER9	0	A D 04 06 0864	74S00	01	S		00062200
HDRER9	0	A F 07 09 1346	74S10	01			00062300
HDRER9	1	A A 14 12 2791	CS11	04		PIN B38	00062400
HDRER9	1	A D 04 03 0861	7400	01	S		00062500
HDRER9	1	A D 04 04 0862	7400	01			00062600
HEAD1	1	A A 11 10 2193	CS08	04	S	PIN B05	00062700
HEAD1	1	A C 16 01 3270	93S46	05			00062800
HEAD1	1	A D 09 04 1862	74153	04			00062900
HEAD16	1	A A 17 14 3389	CS14	04	S	PIN B74	00063000
HEAD16	1	A C 16 12 3174	93S46	05			00063100
HEAD16	1	A K 10 02 2002	75110	04			00063200
HEAD2	1	A A 11 11 2192	CS08	04	S	PIN B06	00063300
HEAD2	1	A C 16 03 3272	93S46	05			00063400
HEAD2	1	A D 09 12 1763	74153	04			00063500
HEAD4	1	A A 11 08 2195	CS08	04	S	PIN B07	00063600
HEAD4	1	A C 16 05 3274	93S46	05			00063700
HEAD4	1	A D 10 04 2062	74153	04			00063800
HEAD8	1	A A 17 01 3489	CS14	04	S	PIN B73	00063900
HEAD8	1	A C 16 10 3176	93S46	05			00064000
HEAD8	1	A D 10 12 1963	74153	04			00064100
IN1870B	1	A A 07 10 1393	CS07	04	S	PIN A67	00064200
IN1870B	1	A B 06 01 1279	1KPUP	04			00064300
IN1870B	1	A C 09 04 1873	7410	04			00064400
IN2050	1	A A 07 08 1395	CS07	04	S	PIN A66	00064500
IN2050	1	A B 06 02 1280	1KPUP	04			00064600
IN2050	1	A E 10 09 1955	74S11	04			00064700
INDEX	0	A J 14 02 2813	RDIP	04			00064800
INDEX	0	A J 15 01 3012	RDIP	04			00064900
INDEX	0	A K 02 10 0305	CS15	04	S	XA1	00065000
INDEX	1	A J 14 01 2812	RDIP	04			00065100
INDEX	1	A J 15 02 3013	RDIP	04			00065200
INDEX	1	A K 02 11 0304	CS15	04	S	XB1	00065300
INDX	0	A H 14 02 2822	75107	04			00065400
INDX	0	A J 14 13 2713	RDIP	04	S		00065500

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
INDX	1	A H 14 01 2821	75107	04			00065600
INDX	1	A J 14 14 2712	RDIP	04	S		00065700
INDXEN	0	A F 11 11 2144	74S00	05	S		00065800
INDXEN	0	A G 10 01 2030	74S00	05			00065900
INDXP	0	A E 14 03 2852	7474	04			00066000
INDXP	0	A H 14 04 2824	75107	04	S		00066100
INHATN	0	A C 02 09 0375	74H11	03			00066200
INHATN	0	A C 08 10 1576	74170	03	S		00066300
INHATN	0	A D 07 07 1465	560PU	03			00066400
INHATN	0	A D 13 12 2561	74408	03			00066500
INITALT	0	A C 15 10 2974	74S74	05			00066600
INITALT	0	A D 16 10 3163	74S04	05	S		00066700
INITALT	1	A C 14 13 2771	74S02	05	S		00066800
INITALT	1	A D 16 11 3162	74S04	05			00066900
INITSEC	1	A C 14 02 2871	74S02	05			00067000
INITSEC	1	A C 14 10 2774	74S02	05	S		00067100
INTLK	0	A D 16 04 3262	74S04	05	S		00067200
INTLK	0	A G 10 02 2031	7400	05			00067300
INTLK	1	A A 07 09 1394	CS07	04	S	PIN A65	00067400
INTLK	1	A D 16 03 3261	7404	05			00067500
INTLK	1	A F 11 10 2145	74S00	04			00067600
INTRCL	0	A C 09 03 1872	74S10	04			00067700
INTPCL	0	A F 11 08 2147	74S00	04	S		00067800
INX	1	A D 14 02 2860	74S74	04			00067900
INX	1	A E 14 05 2854	7474	04	S		00068000
INXFD	0	A C 13 02 2671	74S00	05			00068100
INXFD	0	A C 13 10 2574	74S00	05			00068200
INXFD	0	A C 15 01 3070	74S74	05			00068300
INXFD	0	A C 15 13 2971	74S74	05			00068400
INXFD	0	A D 15 07 3065	74161	05			00068500
INXFD	0	A D 15 09 2966	74161	05			00068600
INXFD	0	A E 15 07 3056	74161	05			00068700
INXFD	0	A E 15 09 2957	74161	05			00068800
INXFD	0	A G 09 06 1835	74S74	05	S		00068900

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
INXP	0	A B 15 07 3085	74161	05			00069000
INXP	0	A B 15 09 2986	74161	05			00069100
INXP	0	A B 16 07 3285	74161	05			00069200
INXP	0	A B 16 09 3186	74161	05			00069300
INXP	0	A D 14 06 2864	74S74	04	S		00069400
INXP	0	A E 14 01 2850	7474	04			00069500
INXP	0	A G 09 03 1832	74S74	05			00069600
INXP	1	A A 14 13 2790	CS11	04		PIN B35	00069700
INXP	1	A C 13 09 2575	74S00	05			00069800
INXP	1	A D 14 05 2863	74S74	04	S		00069900
MAJSEL	0	A A 17 09 3394	CS14	03	S	PIN B67	00070000
MAJSEL	0	A B 07 01 1479	S258	03			00070100
MAJSEL	0	A B 08 01 1679	S258	03			00070200
MAJSEL	0	A B 09 01 1879	S258	03			00070300
MAJSEL	0	A D 07 05 1463	560PU	03			00070400
MCO	0	A A 17 13 3390	CS14	04		PIN B66	00070500
MCO	0	A C 02 02 0471	74H11	04			00070600
MCO	0	A E 10 11 1953	74S11	04			00070700
MCO	0	A E 11 09 2155	74S00	04			00070800
MCO	0	A F 12 06 2446	S112	04	S		00070900
MCO	1	A A 14 10 2793	CS11	04		PIN B42	00071000
MCO	1	A C 02 03 0472	74H11	04			00071100
MCO	1	A F 12 05 2445	S112	04	S		00071200
MCOEN	1	A C 09 06 1875	7410	04	S		00071300
MCOEN	1	A F 12 03 2443	S112	04			00071400
MCOHB	0	A D 04 12 0761	74S00	04			00071500
MCOHB	0	A D 04 13 0760	74S00	04			00071600
MCOHB	0	A F 12 07 2447	S112	04	S		00071700
MCOHB	0A	A E 05 02 1051	74S04	04	S		00071800
MCOHB	0A	A H 11 03 2223	75110	04			00071900
MCOHB	1	A D 09 02 1860	74153	04			00072000
MCOHB	1	A D 10 02 2060	74153	04			00072100
MCOHB	1	A D 11 07 2265	8233	04			00072200
MCOHB	1	A E 05 01 1050	74S04	04			00072300
MCOHB	1	A F 12 09 2348	S112	04	S		00072400
MCOHB	1	A H 15 01 3021	75110	04			00072500
MCOHB	1	A K 10 01 2001	75110	04			00072600
MCOHB	1	A K 10 03 2003	75110	04			00072700

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
MCOHB	1A	A A 13 04 2692	CS10	04		PIN B34	00072800
MCOHB	1A	A D 04 11 0762	74S00	04	S		00072900
MCORS	1	A D 12 03 2461	74S00	04	S		00073000
MCORS	1	A F 12 02 2442	S112	04			00073100
MCLK	0	A A 14 02 2890	CS11	01		PIN B44	00073200
MCLK	0	A D 02 08 0365	74S64	01	S		00073300
MCLK	0	A D 05 01 1059	74S04	01			00073400
MCLK	0	A D 05 03 1061	74S04	01			00073500
MCLK	0	A F 03 11 0544	74S74	01			00073600
MCLK	0A	A D 05 06 1064	74S04	02	S		00073700
MCLK	0A	A D 14 03 2861	74S74	03			00073800
MCLK	0A	A D 14 11 2762	74S74	03			00073900
MCLK	0A	A F 04 03 0843	74S74	01			00074000
MCLK	0B	A B 15 02 3080	74161	05			00074100
MCLK	0B	A B 16 02 3280	74161	05			00074200
MCLK	0B	A D 15 02 3060	74161	05			00074300
MCLK	0B	A E 15 02 3051	74161	05			00074400
MCLK	0B	A F 11 06 2246	74S00	03	S		00074500
MCLK	0B	A F 14 08 2747	74164	04			00074600
MCLK	1	A C 11 13 2173	S112	03			00074700
MCLK	1	A D 05 02 1060	74S04	01	S		00074800
MCLK	1	A D 05 05 1063	74S04	02			00074900
MCLK	1	A E 10 05 2054	74S11	02			00075000
MCLK	1	A F 11 01 2241	74S00	03			00075100
MCLK	1	A F 11 04 2244	74S00	03			00075200
MCLK	1	A F 11 05 2245	74S00	03			00075300
MCLK	1A	A D 05 04 1062	74S04	02	S		00075400
MCLK	1A	A D 13 10 2563	74H08	04			00075500
MCLK	1A	A F 12 01 2441	S112	04			00075600
MCLK	1A	A F 13 13 2544	S112	04			00075700
MCLKER	1	A D 02 09 0364	74S64	01			00075800
MCLKER	1	A F 07 08 1347	74S10	01	S		00075900
MINST00	0	A A 05 09 0994	CS05	03	S	PIN A48	00076000
MINST00	0	A B 09 03 1881	S258	03			00076100
MINST01	0	A A 05 11 0992	CS05	03	S	PIN A49	00076200
MINST01	0	A B 09 06 1884	S258	03			00076300

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
MTNST02 0	A	A 05 12 0991	CS05	03	S	PIN A50	00076400
MTNST02 0	A	9 09 10 1785	S258	03			00076500
M00SEC 1	A	C 12 11 2373	74S00	05	S		00076600
M00SEC 1	A	D 15 10 2965	S151	05			00076700
M00SEC 1	A	E 10 13 1951	74S11	05			00076800
M00SEC 1	A	F 04 11 0744	74S74	05			00076900
NC0MCLK 0	A	R 02 08 0385	74S40	05	S		00077000
NC0MCLK 0	A	C 14 06 2875	74S02	05			00077100
NC0MCLK 0	A	C 15 11 2973	74S74	05			00077200
N00COMP 0	A	A 06 01 1289	CS06	03	S	PIN A64	00077300
N00COMP 0	A	B 08 13 1582	S258	03			00077400
OFFLINE 0	A	B 08 03 1681	S258	03			00077500
OFFLINE 0	A	C 10 06 2075	7408	02	S		00077600
0FSN 1	A	A 07 02 1490	CS07	04	S	PIN A77	00077700
0FSN 1	A	D 10 10 1965	74153	04			00077800
0FSP 1	A	A 07 05 1493	CS07	04	S	PIN A74	00077900
0FSP 1	A	D 10 06 2064	74153	04			00078000
0NCYL 0	A	H 06 02 1222	75107	02			00078100
0NCYL 0	A	J 07 13 1313	RDIP	02	S		00078200
0NCYL 1	A	H 06 01 1221	75107	02			00078300
0NCYL 1	A	J 07 14 1312	RDIP	02	S		00078400
0NCYL 1A	A	B 11 12 2181	74H08	02			00078500
0NCYL 1A	A	H 06 04 1224	75107	02	S		00078600
0NCYLDR 0	A	F 15 07 3047	RES	02			00078700
0NCYLDR 0	A	J 07 02 1413	RDIP	02			00078800
0NCYLDR 0	A	K 04 10 0705	CS17	02	S	XA10	00078900
0NCYLDR 0	A	K 08 09 1506	RES	02			00079000
0NCYLDR 1	A	G 11 07 2236	RDIP	02			00079100
0NCYLDR 1	A	J 06 09 1117	RDIP	02			00079200
0NCYLDR 1	A	J 07 01 1412	RDIP	02			00079300
0NCYLDR 1	A	K 03 01 0601	CS16	02	S	XB10	00079400
0PENCBL 0	A	K 04 07 0807	CS17	02	S	GND	00079500
0PENCBL 0	A	K 04 13 0702	CS17	02		PIN XB12	00079600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
DPENC3L 1	A	G 06 04 1233	RES	02	S		00079700
DPENCRL 1	A	K 04 09 0706	CS17	02		PIN XA12	00079800
POR 0	A	B 04 02 0880	7408	02			00079900
POR 0	A	B 04 05 0883	7408	02			00080000
POR 0	A	B 10 14 1981	S112	03			00080100
POR 0	A	B 10 15 1980	S112	03			00080200
POR 0	A	B 11 03 2281	7408	03	S		00080300
POR 0	A	C 11 15 2171	S112	03			00080400
POR 0	A	D 13 13 2560	74H08	03			00080500
POTF16 1	A	E 17 15 3351	POT	01			00080600
POTF16 1	A	F 16 06 3246	POT	01	S		00080700
POTF16 1	A	F 16 14 3143	POT	01	S		00080800
* 5							
POTF17 1	A	E 17 13 3353	POT	01			00080900
POTF17 1	A	F 17 06 3446	POT	01	S		00081000
POTF17 1	A	F 17 14 3343	POT	01	S		00081100
* 6							
PRISEL 1	A	C 04 05 0874		02	S		00081200
PRISEL 1	A	D 06 01 1259		02			00081300
PRISEL 1	A	D 06 03 1261		02			00081400
PRISEL 1A	A	C 04 02 0871		02			00081500
PRISEL 1A	A	C 05 15 0971	74175	02	S		00081600
RD 1	A	F 03 05 0645	74S74	01	S		00081700
RD 1	A	F 03 12 0543	74S74	01			00081800
RDATA0 0	A	A 01 07 0295	CS01	01		PIN A13	00081900
RDATA0 0	A	F 03 08 0547	74S74	01	S		00082000
RDATA0 1	A	A 17 12 3391	CS14	01		PIN B65	00082100
RDATA0 1	A	F 03 09 0546	74S74	01	S		00082200
RDATA0 0	A	G 03 01 0630	74S20	01			00082300
RDATA0 0	A	H 03 04 0624	75107	01	S		00082400
RDATA1 0	A	G 03 02 0631	74S20	01			00082500
RDATA1 0	A	G 15 04 3033	75107	06	S		00082600
RDATA2 0	A	G 03 04 0633	74S20	01			00082700
RDATA2 0	A	G 15 09 2935	75107	06	S		00082800
RDATA3 0	A	G 03 05 0634	74S20	01			00082900
RDATA3 0	A	H 03 09 0526	75107	06	S		00083000

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RDATAR 0	A	H 03 01 0621	75107	01			00083100
RDATAR 0	A	J 05 09 0917	RDTP	02	S		00083200
RDATAR 1	A	H 03 02 0622	75107	01			00083300
RDATAR 1	A	J 05 10 0916	RDIP	02	S		00083400
RDATAR1 0	A	G 15 01 3030	75107	06			00083500
RDATAR1 0	A	J 10 13 1913	RES	06	S		00083600
RDATAR1 1	A	G 15 02 3031	75107	06			00083700
RDATAR1 1	A	J 10 12 1914	RES	06	S		00083800
RDATAR2 0	A	G 15 12 2932	75107	06			00083900
RDATAR2 0	A	J 17 10 3316	RES	06	S		00084000
RDATAR2 1	A	G 15 11 2933	75107	06			00084100
RDATAR2 1	A	J 17 09 3317	RES	06	S		00084200
RDATAR3 0	A	H 03 12 0523	75107	06			00084300
RDATAR3 0	A	J 14 10 2716	RES	06	S		00084400
RDATAR3 1	A	H 03 11 0524	75107	06			00084500
RDATAR3 1	A	J 14 09 2717	RES	06	S		00084600
RDCK0 0	A	G 02 09 0335	74S20	01			00084700
RDCK0 0	A	H 02 09 0326	75107	01	S		00084800
RDCK1 0	A	G 02 10 0334	74S20	01			00084900
RDCK1 0	A	G 14 09 2735	75107	06	S		00085000
RDCK2 0	A	G 02 12 0332	74S20	01			00085100
RDCK2 0	A	G 17 09 3335	75107	06	S		00085200
RDCK3 0	A	G 02 13 0331	74S20	01			00085300
RDCK3 0	A	H 17 09 3326	75107	06	S		00085400
RDCLK0 0	A	H 02 12 0323	75107	01			00085500
RDCLK0 0	A	J 05 13 0913	RDIP	01	S		00085600
RDCLK0 1	A	H 02 11 0324	75107	01			00085700
RDCLK0 1	A	J 05 14 0912	RDIP	01	S		00085800
RDCLK1 0	A	G 14 12 2732	75107	06			00085900
RDCLK1 0	A	J 09 08 1718	RES	06	S		00086000
RDCLK1 1	A	G 14 11 2733	75107	06			00086100

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RDCLK1	1	A J 10 14 1912	RES	06	S		00086200
RDCLK2	0	A G 17 12 3332	75107	06			00086300
RDCLK2	0	A J 17 12 3314	RES	06	S		00086400
RDCLK2	1	A G 17 11 3333	75107	06			00086500
RDCLK2	1	A J 17 11 3315	RES	06	S		00086600
RDCLK3	0	A H 17 12 3323	75107	06			00086700
RDCLK3	0	A K 17 09 3306	RES	06	S		00086800
RDCLK3	1	A H 17 11 3324	75107	06			00086900
RDCLK3	1	A K 17 08 3307	RES	06	S		00087000
RDCLKEN	1	A D 02 05 0463	74S64	01			00087100
RDCLKEN	1	A G 01 09 0137	74107	01	S		00087200
RDCLOCK	0	A D 03 13 0560	74H53	01			00087300
RDCLOCK	0	A F 05 06 1046	74S05	01	S		00087400
RDCLOCK	0	A F 06 01 1241	RCPCCK	01			00087500
RDCLOCK	0	A F 06 02 1242	RCPCCK	01			00087600
RDCLOCK	1	A D 02 04 0462	74S64	01			00087700
RDCLOCK	1	A E 04 13 0751	74S15	01			00087800
RDCLOCK	1	A F 03 03 0643	74S74	01			00087900
RDCLOCK	1	A F 05 05 1045	74S05	01			00088000
RDCLOCK	1	A G J1 13 0133	S112	01			00088100
RDCLOCK	1	A G 02 08 0336	74S20	01	S		00088200
RDCLOCK	1A	A D 03 03 0661	74H53	01			00088300
RDCLOCK	1A	A E 04 12 0752	74S15	01	S		00088400
RDCLOCK	1A	A F 06 05 1245	RCPCCK	01			00088500
RDCLOCK	1A	A F 06 06 1246	RCPCCK	01			00088600
RDHWSH	0	A A 06 04 1292	CS06	05	S	PIN A61	00088700
RDHWSH	0	A G 10 13 1931	7400	05			00088800
RDWHDR	0	A A 06 12 1191	CS06	05	S	PIN A59	00088900
RDWHDR	0	A G 10 05 2034	7400	05			00089000
RDWHDR	0	A G 10 12 1932	7400	05			00089100
RDWRHR	1	A F 07 13 1342	74S10	05			00089200
RDWRHR	1	A G 10 11 1933	7400	05	S		00089300
READCK0	0	A J 02 09 0317	RES	01			00089400
READCK0	0	A J 05 02 1013	RDIP	01			00089500

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
READCK0 0	A	K 11 03 2203	CS21	01	S	YA4	00089600
READCK0 1	A	J 04 09 0717	RDIP	01			00089700
READCK0 1	A	J 05 01 1012	RDIP	01			00089800
READCK0 1	A	K 11 02 2202	CS21	01	S	YB4	00089900
READCK1 0	A	J 04 01 0812	RES	06			00090000
READCK1 0	A	J 09 07 1818	RES	06			00090100
READCK1 0	A	K 13 11 2504	CS23	06	S	YA11	00090200
READCK1 1	A	J 04 03 0814	RES	06			00090300
READCK1 1	A	J 10 01 2012	RES	06			00090400
READCK1 1	A	K 13 12 2503	CS23	06	S	YB11	00090500
READCK2 0	A	J 08 05 1616	RES	06			00090600
READCK2 0	A	J 17 03 3414	RES	06			00090700
READCK2 0	A	K 14 04 2804	CS24	06	S	YA18	00090800
READCK2 1	A	J 08 08 1518	RES	06			00090900
READCK2 1	A	J 17 04 3415	RES	06			00091000
READCK2 1	A	K 14 05 2805	CS24	06	S	YB18	00091100
READCK3 0	A	J 12 10 2316	RES	06			00091200
READCK3 0	A	K 16 10 3105	CS26	06	S	YA25	00091300
READCK3 0	A	K 17 06 3406	RES	06			00091400
READCK3 1	A	J 12 12 2314	RES	06			00091500
READCK3 1	A	K 15 01 3001	CS25	06	S	YB25	00091600
READCK3 1	A	K 17 07 3407	RES	06			00091700
READD0 0	A	J 02 11 0315	RES	01			00091800
READD0 0	A	J 05 06 1017	RDIP	02			00091900
READD0 0	A	K 12 10 2305	CS22	01	S	YA5	00092000
READD0 1	A	J 04 11 0715	RDIP	01			00092100
READD0 1	A	J 05 05 1016	RDIP	02			00092200
READD0 1	A	K 11 01 2201	CS21	01	S	YB5	00092300
READD1 0	A	J 04 05 0816	RES	06			00092400
READD1 0	A	J 10 02 2013	RES	06			00092500
READD1 0	A	K 13 13 2502	CS23	06	S	YA12	00092600
READD1 1	A	J 04 08 0718	RES	06			00092700
READD1 1	A	J 10 03 2014	RES	06			00092800
READD1 1	A	K 13 09 2506	CS23	06	S	YB12	00092900

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
READD2	0	A J 03 10 1516	RES	06			00093000
READD2	0	A J 17 05 3416	RES	06			00093100
READD2	0	A K 14 02 2802	CS24	06	S	YA19	00093200
READD2	1	A J 09 12 1514	RES	06			00093300
READD2	1	A J 17 06 3417	RES	06			00093400
READD2	1	A K 14 03 2803	CS24	06	S	YB19	00093500
READD3	0	A J 12 11 2315	RES	06			00093600
READD3	0	A J 14 05 2816	RES	06			00093700
READD3	0	A K 16 12 3103	CS26	06	S	YA26	00093800
READD3	1	A J 12 13 2313	RES	06			00093900
READD3	1	A J 14 06 2817	RES	06			00094000
READD3	1	A K 16 11 3104	CS26	06	S	YB26	00094100
READDAT	1	A F 03 02 0642	74S74	01			00094200
READDAT	1	A G 03 06 0635	74S20	01	S		00094300
RECL	0	A B 11 08 2185	7408	03	S		00094400
RECL	0	A C 02 05 0474	74H11	04			00094500
RECL	0	A D 05 13 0960	74S04	05			00094600
RECL	0	A E 11 13 2151	74S00	03			00094700
RECL	0	A F 11 09 2146	74S00	04			00094800
RECL	0A	A A 11 09 2194	CS08	03	S	B08	00094900
RECL	0A	A B 11 09 2184	7408	03			00095000
RECL	0A	A B 11 10 2183	7408	03			00095100
RECL	1	A D 05 12 0961	74S04	05	S		00095200
RECL	1	A D 11 01 2259	8233	04			00095300
RECL	1	A D 11 10 2165	8233	04			00095400
RELDR	0	A C 03 06 0675	7474	02	S		00095500
RELDR	0	A C 03 12 0572	7474	02			00095600
RELDR	1	A B 04 10 0783	7408	02			00095700
RELDR	1	A C 03 05 0674	7474	02	S		00095800
RELDR	1	A C 04 12 0772	7474	02			00095900
RELDR	1	A D 06 04 1262	75110	02			00096000
RELDR	1	A D 06 05 1263	75110	02			00096100
RELDR	1	A G 03 12 0532	74S20	02			00096200
RELTAG3	0	A C 04 09 0774	7474	02	S		00096300
RELTAG3	0	A C 10 12 1972	7408	02			00096400
RELTAG3	0	A H 16 03 3223	75110	04			00096500

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RELTAG3	1	A C 04 09 0775	7474	02	S		00096600
RELTAG3	1	A K 10 04 2004	75110	02			00096700
RELTAG3	1	A K 10 05 2005	75110	02			00096800
RESEN	0	A C 09 11 1773	7410	03			00096900
RESEN	0	A D 13 11 2562	74H08	03	S		00097000
RESETO	0	A D 08 09 1566	74155	03	S		00097100
RESETO	0	A G 08 01 1630	7474	02			00097200
RESET1	0	A D 08 10 1565	74155	03	S		00097300
RESET1	0	A G 08 13 1531	7474	02			00097400
RESET2	0	A D 08 11 1564	74155	03	S		00097500
RESET2	0	A F 08 01 1641	7474	02			00097600
RESET3	0	A D 08 12 1563	74155	03	S		00097700
RESET3	0	A F 08 13 1542	7474	02			00097800
RESETE	0	A D 08 14 1561	74155	03			00097900
RESETE	0	A D 08 15 1560	74155	03			00098000
RESETE	0	A E 11 03 2252	74S00	03	S		00098100
RESETH	1	A C 09 08 1776	7410	03	S		00098200
RESETH	1	A E 11 02 2251	74S00	03			00098300
RPRISEL	0	A B 04 03 0881	7408	02	S		00098400
RPRISEL	0	A C 04 01 0870	7474	02			00098500
RRELDR	0	A B 04 04 0882	7408	02			00098600
RRELDR	0	A G 03 08 0536	74S20	02	S		00098700
RRELTAG	0	A B 04 08 0785	7408	02	S		00098800
RRELTAG	0	A C 04 13 0771	7474	02			00098900
RWDATA0	0	A H 04 12 0723	75110	01	S		00099000
RWDATA0	0	A J 11 02 2213	RES	01			00099100
RWDATA0	0	A K 12 11 2304	CS22	01		YA6	00099200
RWDATA0	1	A H 04 13 0722	75110	01	S		00099300
RWDATA0	1	A J 11 04 2215	RDIP	01			00099400
RWDATA0	1	A K 12 12 2303	CS22	01		YB6	00099500
RWDATA1	0	A D 17 12 3361	75110	06	S		00099600
RWDATA1	0	A J 13 01 2612	RES	06			00099700
RWDATA1	0	A K 13 04 2604	CS23	06		YA13	00099800

STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
RWDATA1	1	A D 17 13 3360	75110	06	S		00099900
RWDATA1	1	A J 13 02 2613	RES	06			00100000
RWDATA1	1	A K 13 05 2605	CS23	06		YB13	00100100
RWDATA2	0	A C 17 12 3372	75110	06	S		00100200
RWDATA2	0	A J 11 01 2212	RES	06			00100300
RWDATA2	0	A K 15 10 2905	CS25	06		YA20	00100400
RWDATA2	1	A C 17 13 3371	75110	06	S		00100500
RWDATA2	1	A J 11 03 2214	RES	06			00100600
RWDATA2	1	A K 14 01 2801	CS24	06		YB20	00100700
RWDATA3	0	A B 17 12 3381	75110	06	S		00100800
RWDATA3	0	A J 13 05 2616	RES	06			00100900
RWDATA3	0	A K 16 09 3106	CS26	06		YA27	00101000
RWDATA3	1	A B 17 13 3380	75110	06	S		00101100
RWDATA3	1	A J 13 08 2518	RES	06			00101200
RWDATA3	1	A K 16 13 3102	CS26	06		YB27	00101300
SCAN1	0	A E 07 03 1452	74H53	03			00101400
SCAN1	0	A E 08 06 1655	S112	03	S		00101500
SCAN1	1	A C 08 05 1674	74170	03			00101600
SCAN1	1	A E 07 13 1351	74H53	03			00101700
SCAN1	1	A E 08 05 1654	S112	03	S		00101800
SCAN1	1	A E 08 11 1555	S112	03			00101900
SCAN1	1	A E 08 12 1554	S112	03			00102000
SCAN1	1	A F 09 13 1744	9309	02			00102100
SCAN1	1	A F 10 02 2042	7474	03			00102200
SCAN2	0	A E 07 05 1454	74H53	03			00102300
SCAN2	0	A E 08 07 1656	S112	03	S		00102400
SCAN2	1	A C 08 04 1673	74170	03			00102500
SCAN2	1	A E 07 09 1355	74H53	03			00102600
SCAN2	1	A E 09 09 1557	S112	03	S		00102700
SCAN2	1	A F 09 03 1843	9309	02			00102800
SCAN2	1	A F 10 12 1943	7474	03			00102900
SCANCK	0	A D 05 10 0963	74S04	02	S		00103000
SCANCK	0	A D 16 13 3160	74S04	02			00103100
SCANCK	0	A E 06 08 1156	74164	02			00103200
SCANCK	0	A G 07 09 1337	74175	02			00103300
SCANCK	1	A B 10 01 2079	S112	03			00103400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SCANCK	1	A B 10 13 1982	S112	03			00103500
SCANCK	1	A C 11 01 2270	S112	03			00103600
SCANCK	1	A D 05 11 0962	74S04	02			00103700
SCANCK	1	A E 10 06 2055	74S11	02	S		00103800
SCANCK	1	A E 11 01 2250	74S00	03			00103900
SCANCK	1	A E 11 04 2253	74S00	03			00104000
SCANCK	1A	A D 16 12 3161	74S04	02	S		00104100
SCANCK	1A	A E 08 01 1650	S112	03			00104200
SCANCK	1A	A E 08 13 1553	S112	03			00104300
SCANR1	1	A D 08 13 1562	74155	03			00104400
SCANR1	1	A F 10 05 2045	7474	03	S		00104500
SCANR2	1	A D 08 03 1661	74155	03			00104600
SCANR2	1	A F 10 09 1946	7474	03	S		00104700
SCANRCK	0	A F 10 03 2043	7474	03			00104800
SCANRCK	0	A F 10 11 1944	7474	03			00104900
SCANRCK	0	A F 11 03 2243	74S00	03	S		00105000
SCANT	1	A C 11 09 2177	S112	02	S		00105100
SCANT	1	A E 10 03 2052	74S11	02			00105200
SCANT	1	A E 10 04 2053	74S11	02			00105300
SCT	1	A D 14 12 2761	74S74	04			00105400
SCT	1	A E 14 09 2755	7474	04	S		00105500
SCTR	0	A H 14 11 2724	75107	04			00105600
SCTR	0	A J 14 11 2715	RDIP	04	S		00105700
SCTR	1	A H 14 12 2723	75107	04			00105800
SCTR	1	A J 14 12 2714	RDIP	04	S		00105900
SCTRP	0	A E 14 11 2753	7474	04			00106000
SCTRP	0	A H 14 09 2726	75107	04	S		00106100
SECAGR	0	A E 05 12 0952	74S04	05	S		00106200
SECAGR	0	A F 07 02 1442	74S10	05			00106300
SECAGR	1	A B 14 09 2786	93S46	05	S		00106400
SECAGR	1	A E 05 13 0951	74S04	05			00106500
SECAGR	1	A F 04 12 0743	74S74	05			00106600
SECC1	1	A B 14 01 2879	93S46	05			00106700
SECC1	1	A D 15 14 2961	74161	05	S		00106800

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SECC16	1	A B 14 12 2781	93S46	05			00106900
SECC16	1	A E 15 14 2952	74161	05	S		00107000
SECC2	1	A B 14 03 2881	93S46	05			00107100
SECC2	1	A D 15 13 2962	74161	05	S		00107200
SECC32	1	A B 14 14 2781	93S46	05			00107300
SECC32	1	A E 15 13 2953	74161	05	S		00107400
SECC4	1	A B 14 05 2883	93S46	05			00107500
SECC4	1	A D 15 12 2963	74161	05	S		00107600
SECC8	1	A B 14 10 2785	93S46	05			00107700
SECC8	1	A D 15 11 2964	74161	05	S		00107800
SECCOFL	1	A D 15 15 2960	74161	05	S		00107900
SECCOFL	1	A E 15 10 2956	74161	05			00108000
SEGENF	0	A F 04 08 0747	74S74	05	S		00108100
SEGENF	0	A F 04 10 0745	74S74	05			00108200
SEGENF	0	A F 07 01 1441	74S10	05			00108300
SECEQHD	0	A B 02 10 0383	74S40	05			00108400
SECEQHD	0	A B 13 12 2581	74S04	05	S		00108500
SECEQHD	1	A B 13 13 2580	74S04	05			00108600
SECEQHD	1	A C 13 13 2571	74S00	05			00108700
SECEQHD	1	A C 16 09 3177	93S46	05	S		00108800
SECINA	1	A A 15 04 3092	CS12	05	S	PIN B55	00108900
SECINA	1	A B 14 02 2880	93S46	05			00109000
SECINB	1	A A 15 05 3093	CS12	05	S	PIN B56	00109100
SECINB	1	A B 14 04 2882	93S46	05			00109200
SECINC	1	A A 15 06 3094	CS12	05	S	PIN B53	00109300
SECINC	1	A B 14 06 2884	93S46	05			00109400
SECIND	1	A A 15 09 2994	CS12	05	S	PIN B47	00109500
SECIND	1	A B 14 11 2784	93S46	05			00109600
SECINE	1	A A 15 11 2992	CS12	05	S	PIN B52	00109700
SECINE	1	A B 14 13 2782	93S46	05			00109800
SECINF	1	A A 15 12 2991	CS12	05	S	PIN B51	00109900
SECINF	1	A B 14 15 2780	93S46	05			00110000

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STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SECINHA	0	A E 10 01 2050	74S11	05			00110100
SECINHA	0	A E 10 02 2051	74S11	05			00110200
SECINHA	0	A F 07 12 1343	74S10	05	S		00110300
SECNORM	0	A C 12 06 2475	74S00	05	S		00110400
SECNORM	0	A C 12 13 2371	74S00	05			00110500
SECP	1	A A 14 09 2794	CS11	04		PIN B39	00110600
SECP	1	A E 10 12 1952	74S11	05	S		00110700
SECSTGD	0	A C 12 08 2376	74S00	05	S		00110800
SECSTGD	0	A C 12 12 2372	74S00	05			00110900
SECTME	1	A B 02 09 0384	74S40	05			00111000
SECTME	1	A C 12 05 2474	74S00	05			00111100
SECTME	1	A C 13 06 2675	74S00	05	S		00111200
SECTME	1	A C 13 12 2572	74S00	05			00111300
SECTOR	0	A J 14 04 2815	RDIP	04			00111400
SECTOR	0	A J 15 03 3014	RDIP	04			00111500
SECTOR	0	A K 02 12 0303	CS15	04	S	XA2	00111600
SECTOR	1	A J 14 03 2814	RDIP	04			00111700
SECTOR	1	A J 15 04 3015	RDIP	04			00111800
SECTOR	1	A K 02 05 0405	CS15	04	S	XB2	00111900
SEEK	0	A A 14 01 2889	CS11	03	S	PIN B41	00112000
SEEK	0	A E 11 12 2152	74S00	03			00112100
SEEKERR	1	A J 07 06 1417	RDIP	02			00112200
SEEKERR	1	A K 03 03 0603	CS16	02	S	PIN XB9	00112300
SEEKERR	1	A J 01 06 0217	RES				00112350
SEEKERR	1	A K 08 05 1605	RES	02			00112400
SEEKERR	0	A J 06 06 1217	RDIP	02			00112500
SEEKERR	0	A J 07 05 1416	RDIP	02			00112600
SEEKERR	0	A J 01 02 0213	RES				00112650
SEEKERR	0	A K 03 02 0602	CS16	02	S	PIN XA9	00112700
SEKENDO	0	A G 11 09 2135	RES	01			00112800
SEKENDO	0	A J 02 04 0415	RES	01			00112900
SEKENDO	0	A J 03 04 0615	RES	01			00113000
SEKENDO	0	A K 11 12 2103	CS21	01	S	YA2	00113100
SEKENDU	1	A F 15 09 2946	RES	01			00113200
SEKENDU	1	A J 03 03 0614	RES	01			00113300

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SEKEND0 1	A	J 04 04 0815	ROTP	01			00113400
SEKEND0 1	A	K 11 05 2205	CS21	01	S	YB2	00113500
SEKEND1 0	A	G 11 02 2231	RES	06			00113600
SEKEND1 0	A	J 02 05 0416	RES	06			00113700
SEKEND1 0	A	J 09 03 1814	RES	06			00113800
SEKEND1 0	A	K 12 03 2403	CS22	06	S	YA9	00113900
SEKEND1 1	A	F 15 02 3042	RES	06			00114000
SEKEND1 1	A	J 02 08 0318	RES	06			00114100
SEKEND1 1	A	J 09 04 1815	RES	06			00114200
SEKEND1 1	A	K 12 02 2402	CS22	06	S	YB9	00114300
SEKEND2 0	A	G 11 04 2233	RES	06			00114400
SEKEND2 0	A	J 08 11 1515	RES	06			00114500
SEKEND2 0	A	J 10 06 2017	RES	06			00114600
SEKEND2 0	A	K 14 12 2703	CS24	06	S	YA16	00114700
SEKEND2 1	A	F 15 04 3044	RES	06			00114800
SEKEND2 1	A	J 08 13 1513	RES	06			00114900
SEKEND2 1	A	J 10 07 2018	RES	06			00115000
SEKEND2 1	A	K 14 11 2704	CS24	06	S	YB16	00115100
SEKEND3 0	A	G 11 06 2235	RES	06			00115200
SEKEND3 0	A	J 12 01 2412	RES	06			00115300
SEKEND3 0	A	K 15 04 3004	CS25	06	S	YA23	00115400
SEKEND3 0	A	K 17 02 3402	RES	06			00115500
SEKEND3 1	A	F 15 06 3046	RES	06			00115600
SEKEND3 1	A	J 12 03 2414	RES	06			00115700
SEKEND3 1	A	K 15 05 3005	CS25	06	S	YB23	00115800
SEKEND3 1	A	K 17 03 3403	RES	06			00115900
SEL 0	A	D 04 10 0763	7400	02			00116000
SEL 0	A	D 05 08 0965	74S04	02	S		00116100
SEL 1	A	D 05 09 0964	74S04	02			00116200
SEL 1	A	E 02 06 0455	74S20	02	S		00116300
SELO 0	A	E 02 01 0450	74S20	02			00116400
SELO 0	A	F 02 12 0345	9301	02	S		00116500
SEL1 0	A	E 02 02 0451	74S20	02			00116600
SEL1 0	A	F 02 11 0346	9301	02	S		00116700
SEL2 0	A	E 02 04 0453	74S20	02			00116800

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I-D.
SEL2	0	A F 02 09 0343	9301	02	S		00116900
SEL3	0	A E 02 05 0454	74S20	02			00117000
SEL3	0	A F 02 06 0446	9301	02	S		00117100
SELCK	0	A A 05 13 0990	CS05	02	S	PIN A51	00117200
SELCK	0	A C 03 03 0672	7474	02			00117300
SELCK	0	A C 03 13 0571	7474	02			00117400
SELCK	0	A C 05 09 0977	74175	02			00117500
SELCK	0	A E 06 09 1155	74164	02			00117600
SELDORRS	0	A B 08 02 1680	S258	03			00117700
SELDORRS	0	A E 03 09 0555	75107	03	S		00117800
SELERR	0	A B 02 01 0479	7440	02			00117900
SELERR	0	A B 08 14 1581	S258	03			00118000
SELERR	0	A C 10 05 2074	7408	05			00118100
SELERR	0	A D 04 08 0765	7400	02	S		00118200
SEQSEC	0	A A 02 06 0494	CS02	05	S	PIN A22	00118300
SEQSEC	0	A B 06 09 1184	1KPU	05			00118400
SEQSEC	0	A C 12 02 2471	74S00	05			00118500
SERVCK0	0	A G 02 01 0430	74S20	01			00118600
SERVCK0	0	A G 04 03 0832	74S00	01	S		00118700
SERVCK0	1	A G 04 02 0831	74S00	01			00118800
SERVCK0	1	A H 02 04 0424	75107	01	S		00118900
SERVCK0	1	A H 04 06 0826	75110	01			00119000
SERVCK1	0	A G 02 02 0431	74S20	01			00119100
SERVCK1	0	A G 04 06 0835	74S00	01	S		00119200
SERVCK1	1	A D 17 06 3464	75110	01			00119300
SERVCK1	1	A G 04 04 0833	74S00	01			00119400
SERVCK1	1	A G 14 04 2833	74S00	01	S		00119500
SERVCK2	0	A G 02 04 0433	74S20	01			00119600
SERVCK2	0	A G 04 08 0736	74S00	01	S		00119700
SERVCK2	1	A C 17 06 3475	75110	01			00119800
SERVCK2	1	A G 04 09 0735	74S00	01			00119900
SERVCK2	1	A G 17 04 3433	75107	01	S		00120000
SERVCK3	0	A G 02 05 0434	74S20	01			00120100
SERVCK3	0	A G 04 11 0733	74S00	01	S		00120200

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SERVCK3	1	A B 17 06 3484	75110	01			00120300
SERVCK3	1	A G 04 12 0732	74500	01			00120400
SERVCK3	1	A H 17 04 3424	75107	06	S		00120500
SETEN	1	A C 12 01 2470	74500	05			00120600
SETEN	1	A G 10 06 2035	7400	05	S		00120700
SETEN	1	A G 10 10 1934	7400	05			00120800
SETINXF	0	A G 09 04 1833	74574	05			00120900
SETINXF	0	A G 10 08 1936	7400	05	S		00121000
SETTIME	1	A G 10 03 2032	7400	05	S		00121100
SETTIME	1	A G 10 09 1935	7400	05			00121200
SKEND0	0	A G 07 04 1433	74175	02			00121300
SKEND0	0	A H 01 09 0126	75107	01	S		00121400
SKEND1	0	A G 07 05 1434	74175	02			00121500
SKEND1	0	A G 12 09 2335	75107	06	S		00121600
SKEND2	0	A G 07 12 1334	74175	02			00121700
SKEND2	0	A G 16 09 3135	75107	06	S		00121800
SKEND3	0	A G 07 13 1333	74175	02			00121900
SKEND3	0	A J 16 09 3117	75107	06	S		00122000
SKERR	0	A H 05 11 0924	75107	02			00122100
SKERR	0	A J 07 09 1317	RDIP	02	S		00122200
SKERR	1	A H 05 12 0923	75107	02			00122300
SKERR	1	A J 07 10 1316	RDIP	02	S		00122400
SKINC	0	A B 02 04 0482	7440	02			00122500
SKINC	0	A B 08 06 1684	S258	03			00122600
SKINC	0	A H 05 09 0926	75107	02	S		00122700
SKND0	0	A H 01 12 0123	75107	01			00122800
SKND0	0	A J 03 11 0515	RES	01	S		00122900
SKND0	1	A H 01 11 0124	75107	01			00123000
SKND0	1	A J 03 12 0514	RES	01	S		00123100
SKND1	0	A G 12 12 2332	75107	06			00123200
SKND1	0	A J 09 12 1714	RES	06	S		00123300
SKND1	1	A G 12 11 2333	75107	06			00123400

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SKND1	1	A J 09 11 1715	RES	06	S		00123500
SKND2	0	A G 16 12 3132	75107	06			00123600
SKND2	0	A J 10 09 1917	RES	06	S		00123700
SKND2	1	A G 16 11 3133	75107	06			00123800
SKND2	1	A J 10 08 1918	RES	06	S		00123900
SKND3	0	A J 16 12 3114	75107	06			00124000
SKND3	0	A K 17 13 3302	RES	06	S		00124100
SKND3	1	A J 16 11 3115	75107	06			00124200
SKND3	1	A K 17 12 3303	RES	06	S		00124300
SKOLSK	0	A A 12 10 2393	CS09	04	S	PIN 822	00124400
SKOLSK	0	A F 07 04 1444	74S10	04			00124500
SKRCL	1	A E 11 05 2254	74S00	03			00124600
SKRCL	1	A E 11 11 2153	74S00	03	S		00124700
SRES	0	A A 04 09 0794	CS04	03	S	PIN A36	00125100
SRES	0	A B 11 02 2280	7408	03			00125200
SRES	0	A D 07 06 1464	560PU	03			00125300
SRVCK0	0	A H 02 01 0421	75107	01			00125400
SRVCK0	0	A J 03 09 0517	RES	01	S		00125500
SRVCK0	1	A H 02 02 0422	75107	01			00125600
SRVCK0	1	A J 03 10 0516	RES	01	S		00125700
SRVCK1	0	A G 14 01 2830	75107	01			00125800
SRVCK1	0	A J 09 10 1716	RES	01	S		00125900
SRVCK1	1	A G 14 02 2831	75107	01			00126000
SRVCK1	1	A J 09 09 1717	RES	01	S		00126100
SRVCK2	0	A G 17 01 3430	75107	01			00126200
SRVCK2	0	A J 17 14 3312	RES	01	S		00126300
SRVCK2	1	A G 17 02 3431	75107	01			00126400
SRVCK2	1	A J 17 13 3313	RES	01	S		00126500
SRVCK3	0	A H 17 01 3421	75107	01			00126600
SRVCK3	0	A K 17 11 3304	RES	01	S		00126700
SRVCK3	1	A H 17 02 3422	75107	01			00126800

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
SRVCK3 1	A	K 17 10 3305	RES	01	S		00126900
SRVOCK0 0	A	J 02 06 0417	RES	01			00127000
SRVOCK0 0	A	J 03 06 0617	RES	01			00127100
SRVOCK0 0	A	K 11 13 2102	CS21	01	S	YA3	00127200
SRVOCK0 1	A	J 03 05 0616	RES	01			00127300
SRVOCK0 1	A	J 04 06 0817	RDIP	01			00127400
SRVOCK0 1	A	K 11 04 2204	CS21	01	S	YB3	00127500
SRVOCK1 0	A	J 02 10 0316	RES	06			00127600
SRVOCK1 0	A	J 09 05 1816	RES	06			00127700
SRVOCK1 0	A	K 12 01 2401	CS22	06	S	YA10	00127800
SRVOCK1 1	A	J 02 12 0314	RES	06			00127900
SRVOCK1 1	A	J 09 06 1817	RES	06			00128000
SRVOCK1 1	A	K 13 10 2505	CS23	06	S	YB10	00128100
SRVOCK2 0	A	J 08 01 1612	RES	06			00128200
SRVOCK2 0	A	J 17 01 3412	RES	06			00128300
SRVOCK2 0	A	K 14 09 2706	CS24	06	S	YA17	00128400
SRVOCK2 1	A	J 08 03 1614	RES	06			00128500
SRVOCK2 1	A	J 17 02 3413	RES	06			00128600
SRVOCK2 1	A	K 14 13 2702	CS24	06	S	YB17	00128700
SRVOCK3 0	A	J 12 05 2416	RES	06			00128800
SRVOCK3 0	A	K 15 02 3002	CS25	06	S	YA24	00128900
SRVOCK3 0	A	K 17 04 3404	RES	06			00129000
SRVOCK3 1	A	J 12 08 2318	RES	06			00129100
SRVOCK3 1	A	K 15 03 3003	CS25	06	S	YB24	00129200
SRVOCK3 1	A	K 17 05 3405	RES	06			00129300
STAGSEC 0	A	C 14 01 2870	74S02	05	S		00129400
STAGSEC 0	A	D 16 09 3164	74S04	05			00129500
STAGSEC 1	A	C 12 10 2374	74S00	05			00129600
STAGSEC 1	A	D 16 08 3165	74S04	05	S		00129700
STATRD 0	A	A 11 12 2191	CS08	03	S	PIN B03	00129800
STATRD 0	A	C 10 01 2070	7408	03			00129900
STATSEL 0	A	A 17 08 3395	CS14	03	S	PIN B68	00130000
STATSEL 0	A	R 07 15 1380	S258	03			00130100
STATSEL 0	A	B 08 15 1580	S258	03			00130200

STGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
STATSEL 0	A B	09 15 1780	S258	03			00130300
STATSEL 0	A D	07 04 1462	560PU	03			00130400
SVCLOCK 0	A D	03 04 0662	74H53	01			00130500
SVCLOCK 0	A F	05 08 0947	74S05	01	S		00130600
SVCLOCK 0	A F	06 03 1243	RCPCCK	01			00130700
SVCLOCK 0	A F	06 04 1244	RCPCCK	01			00130800
SVCLOCK 1	A D	02 13 0360	74S64	01			00130900
SVCLOCK 1	A E	04 03 0852	74S15	01			00131000
SVCLOCK 1	A F	05 09 0946	74S05	01			00131100
SVCLOCK 1	A G	01 01 0230	74107	01			00131200
SVCLOCK 1	A G	02 06 0435	74S20	01	S		00131300
SVCLOCK 1A	A D	03 10 0563	74H53	01			00131400
SVCLOCK 1A	A E	04 06 0855	74S15	01	S		00131500
SVCLOCK 1A	A F	06 09 1148	RCPCCK	01			00131600
SVCLOCK 1A	A F	06 10 1147	RCPCCK	01			00131700
SWP0NC 1	A A	04 01 0889	CS04	03	S	PIN A46	00131800
SWP0NC 1	A B	06 08 1185	1KPU	03			00131900
SWP0NC 1	A C	07 12 1374	9309	03			00132000
SWP1NC 1	A A	04 02 0890	CS04	03	S	PIN A45	00132100
SWP1NC 1	A B	06 07 1285	1KPU	03			00132200
SWP1NC 1	A C	07 11 1375	9309	03			00132300
SWP2NC 1	A A	04 03 0891	CS04	03	S	PIN A44	00132400
SWP2NC 1	A B	06 06 1284	1KPU	03			00132500
SWP2NC 1	A C	07 10 1376	9309	03			00132600
SWP3NC 1	A A	04 04 0892	CS04	03	S	PIN A43	00132700
SWP3NC 1	A B	06 05 1283	1KPU	03			00132800
SWP3NC 1	A C	07 09 1377	9309	03			00132900
T2 1	A A	07 13 1390	CS07	04	S	PIN A70	00133000
T2 1	A D	13 05 2663	74H08	04			00133100
T4 1	A A	07 11 1392	CS07	04	S	PIN A68	00133200
T4 1	A D	13 02 2660	74H08	04			00133300
T7 1	A A	07 06 1494	CS07	04	S	PIN A73	00133400
T7 1	A D	12 04 2462	74S00	04			00133500
T7 1	A D	13 09 2564	74H08	04			00133600
T7 1	A F	07 05 1445	74S10	04			00133700

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
TAG1	0	A H 15 09 2926	75110	04	S		00133800
TAG1	0	A J 15 10 2916	RDIP	04			00133900
TAG1	0	A K 02 02 0402	CS15	04		XA5	00134000
TAG1	1	A H 15 08 2927	75110	04	S		00134100
TAG1	1	A J 15 11 2915	RDIP	04			00134200
TAG1	1	A K 03 10 0505	CS16	04		XB5	00134300
TAG2	0	A H 15 12 2923	75110	04	S		00134400
TAG2	0	A J 15 08 2918	RDIP	04			00134500
TAG2	0	A K 02 03 0403	CS15	04		XA4	00134600
TAG2	1	A H 15 13 2922	75110	04	S		00134700
TAG2	1	A J 15 09 2917	RDIP	04			00134800
TAG2	1	A K 02 01 0401	CS15	04		XB4	00134900
TAG3	0	A H 16 12 3123	75110	04	S		00135000
TAG3	0	A J 15 05 3016	RDIP	04			00135100
TAG3	0	A K 02 13 0302	CS15	04		XA3	00135200
TAG3	0	A K 10 09 1906	75110	04			00135300
TAG3	1	A H 16 13 3122	75110	04	S		00135400
TAG3	1	A J 15 06 3017	RDIP	04			00135500
TAG3	1	A K 02 04 0404	CS15	04		XB3	00135600
TAG3	1	A K 10 08 1907	75110	02			00135700
TAGCLK	1	A D 13 08 2565	74H08	04	S		00135800
TAGCLK	1	A F 12 13 2344	S112	04			00135900
TAGCLK	1	A F 13 01 2641	S112	04			00136000
TAGTME	1	A C 02 06 0475	74H11	04	S		00136100
TAGTME	1	A F 12 14 2343	S112	04			00136200
TAGTME	1	A F 13 14 2543	S112	04			00136300
TAGTME	1	A F 13 15 2542	S112	04			00136400
TID2	0	A C 08 15 1571	74170	03			00136500
TID2	0	A E 05 10 0954	74S04	03	S		00136600
TID2	1	A A 04 08 0795	CS04	03	S	A37	00136700
TID2	1	A E 05 11 0953	74S04	03			00136800
TIMEB	1	A C 04 11 0773	7474	02			00136900
TIMEB	1	A E 06 04 1253	74164	02	S		00137000
TIMEG	0	A B 03 04 0682	7404	02	S		00137100
TIMEG	0	A B 04 09 0784	7408	02			00137200

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
TIMEG	1	A B 03 03 0681	7404	02			00137300
TIMEG	1	A C 03 11 0573	7474	02			00137400
TIMEG	1	A E 06 12 1152	74164	02	S		00137500
TIMEH	0	A B 03 02 0680	7404	02	S		00137600
TIMEH	0	A R 04 01 0879	7408	02			00137700
UNITRDY	0	A F 15 10 2945	RES	02			00137800
UNITRDY	0	A J 07 04 1415	RDIP	02			00137900
UNITRDY	0	A K 04 11 0704	CS17	02	S	XB11	00138000
UNITRDY	0	A K 08 11 1504	RES	02			00138100
UNITRDY	1	A G 11 10 2134	RES	02			00138200
UNITRDY	1	A J 06 11 1115	RDIP	02			00138300
UNITRDY	1	A J 07 03 1414	RDIP	02			00138400
UNITRDY	1	A K 04 12 0703	CS17	02	S	XA11	00138500
UNSAFE	0	A B 02 02 0480	7440	02			00138600
UNSAFE	0	A B 08 10 1585	S258	03			00138700
UNSAFE	0	A H 05 04 1024	75107	02	S		00138800
UNSELO	1	A F 02 15 0342	9301	02			00138900
UNSELO	1	A G 04 01 0830	74500	01			00139000
UNSELO	1	A H 01 04 0224	75107	01	S		00139100
UNSELO	1	A H 02 08 0327	75107	01			00139200
UNSELO	1	A H 03 05 0625	75107	01			00139300
UNSELO	1	A H 04 01 0821	75110	01			00139400
UNSEL1	1	A D 17 01 3459	75110	01			00139500
UNSEL1	1	A F 02 14 0343	9301	02			00139600
UNSEL1	1	A G 04 05 0834	74500	01			00139700
UNSEL1	1	A G 12 04 2433	75107	01	S		00139800
UNSEL1	1	A G 14 08 2736	75107	01			00139900
UNSEL1	1	A G 15 05 3034	75107	01			00140000
UNSEL2	1	A C 17 01 3470	75110	01			00140100
UNSEL2	1	A F 02 01 0441	9301	02			00140200
UNSEL2	1	A G 04 10 0734	74500	01			00140300
UNSEL2	1	A G 15 08 2936	75107	01			00140400
UNSEL2	1	A G 16 04 3233	75107	01	S		00140500
UNSEL2	1	A G 17 08 3336	75107	01			00140600
UNSEL3	1	A B 17 01 3479	75110	01			00140700
UNSEL3	1	A F 02 02 0442	9301	02			00140800
UNSEL3	1	A G 04 13 0731	74500	01			00140900
UNSEL3	1	A H 03 08 0527	75107	01			00141000

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
UNSEL3 1	A	H 17 08 3327	75107	01			00141100
UNSEL3 1	A	J 16 04 3215	75107	01	S		00141200
UNTRDY 0	A	H 06 11 1124	75107	02			00141300
UNTRDY 0	A	J 07 11 1315	RDIP	02	S		00141400
UNTRDY 1	A	H 06 12 1123	75107	02			00141500
UNTRDY 1	A	J 07 12 1314	RDIP	02	S		00141600
UNTSELO 0	A	F 15 08 2947	RES	01			00141700
UNTSELO 0	A	J 02 02 0413	RES	01			00141800
UNTSELO 0	A	J 03 02 0613	RES	01			00141900
UNTSELO 0	A	K 11 10 2105	CS21	01	S	YA1	00142000
UNTSELO 1	A	G 11 08 2136	RES	01			00142100
UNTSELO 1	A	J 03 01 0612	RES	01			00142200
UNTSELO 1	A	J 04 02 0813	RDIP	01			00142300
UNTSELO 1	A	K 11 11 2104	CS21	01	S	YB1	00142400
UNSEL1 0	A	F 15 01 3041	RES	06			00142500
UNSEL1 0	A	J 02 03 0414	RES	06			00142600
UNSEL1 0	A	J 09 02 1813	RES	06			00142700
UNSEL1 0	A	K 12 05 2405	CS22	06	S	YAB	00142800
UNSEL1 1	A	G 11 01 2230	RES	06			00142900
UNSEL1 1	A	J 02 01 0412	RES	06			00143000
UNSEL1 1	A	J 09 01 1812	RES	06			00143100
UNSEL1 1	A	K 12 04 2404	CS22	06	S	YBB	00143200
UNSEL2 0	A	F 15 03 3043	RES	06			00143300
UNSEL2 0	A	J 08 02 1613	RES	06			00143400
UNSEL2 0	A	J 10 05 2016	RES	06			00143500
UNSEL2 0	A	K 14 10 2705	CS23	06	S	YA15	00143600
UNSEL2 1	A	G 11 03 2232	RES	06			00143700
UNSEL2 1	A	J 08 04 1615	RES	06			00143800
UNSEL2 1	A	J 10 04 2015	RES	06			00143900
UNSEL2 1	A	K 13 01 2601	CS24	06	S	YB15	00144000
UNSEL3 0	A	F 15 05 3045	RES	06			00144100
UNSEL3 0	A	J 12 02 2413	RES	06			00144200
UNSEL3 0	A	K 15 09 2906	CS25	06	S	YA22	00144300
UNSEL3 0	A	K 17 01 3401	RES	06			00144400
UNSEL3 1	A	G 11 05 2234	RES	06			00144500
UNSEL3 1	A	J 12 04 2415	RES	06			00144600

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	T.O.
UNTSEL3	1	A J 17 07 3418	RES	06			00144700
UNTSEL3	1	A K 15 13 2902	CS25	06	S	YB22	00144800
US0	0	A H 01 01 0221	75107	01			00144900
US0	0	A J 03 13 0513	RES	01	S		00145000
US0	1	A H 01 02 0222	75107	01			00145100
US0	1	A J 03 14 0512	RES	01	S		00145200
US1	0	A G 12 02 2431	75107	06			00145300
US1	0	A J 09 14 1712	RES	06	S		00145400
US1	1	A G 12 01 2430	75107	06			00145500
US1	1	A J 09 13 1713	RES	06	S		00145600
US2	0	A G 16 02 3231	75107	06			00145700
US2	0	A J 10 11 1915	RES	06	S		00145800
US2	1	A G 16 01 3230	75107	06			00145900
US2	1	A J 10 10 1916	RES	06	S		00146000
US3	0	A J 16 02 3213	75107	06			00146100
US3	0	A J 17 08 3318	RES	06	S		00146200
US3	1	A J 16 01 3212	75107	06			00146300
US3	1	A K 17 14 3301	RES	06	S		00146400
USEL1	0	A H 07 09 1326	75110	02	S		00146500
USEL1	0	A K 01 02 0202	RES	02			00146600
USEL1	0	A K 04 02 0802	CS17	02		PIN XA14	00146700
USEL1	1	A H 07 08 1327	75110	02	S		00146800
USEL1	1	A K 01 01 0201	RDIP	02			00146900
USEL1	1	A K 04 03 0803	CS17	02		PIN XB14	00147000
USEL2	0	A H 08 12 1523	75110	02	S		00147100
USEL2	0	A K 01 04 0204	RES	02			00147200
USEL2	0	A K 05 10 0905	CS18	02		PIN XA15	00147300
USEL2	1	A H 08 13 1522	75110	02	S		00147400
USEL2	1	A K 01 03 0203	RDIP	02			00147500
USEL2	1	A K 04 01 0801	CS17	02		PIN XB15	00147600
USEL4	0	A H 08 09 1526	75110	02	S		00147700
USEL4	0	A K 01 06 0206	RES	02			00147800
USEL4	0	A K 05 12 0903	CS18	02		PIN XA16	00147900

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SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	I.D.
USEL4	1	A H 08 08 1527	75110	02	S		00148000
USEL4	1	A K 01 05 0205	RDIP	02			00148100
USEL4	1	A K 05 11 0904	CS18	02		PIN XB16	00148200
USEL8	0	A G 11 11 2133	RES	02	S		00148300
USEL8	0	A K 05 09 0906	CS18	02		XA17	00148400
USEL8	1	A F 15 11 2944	RES	02	S		00148500
USEL8	1	A K 05 13 0902	CS18	02		XB17	00148600
USELTAG	0	A H 07 12 1323	75110	02	S		00148700
USELTAG	0	A K 04 05 0805	CS17	02		PIN XB13	00148800
USELTAG	0	A K 08 13 1502	RES	02			00148900
USELTAG	1	A H 07 13 1322	75110	02	S		00149000
USELTAG	1	A J 06 13 1113	RDIP	02			00149100
USELTAG	1	A K 04 04 0804	CS17	02		PIN XA13	00149200
VCC1	1	A F 16 01 3241	POT	01			00149300
VCC1	1	A F 16 16 3141	POT	01	S		00149400
VCC1241	1	A F 06 07 1247	RCPCK	01			00149500
VCC1241	1	A F 06 12 1145	RCPCK	01			00149600
VCC1241	1	A F 06 14 1143	RCPCK	01			00149700
VCC1241	1	A F 06 16 1141	RCPCK	01	S		00149800
VCC2	1	A F 17 01 3441	POT	01			00149900
VCC2	1	A F 17 16 3341	POT	01	S		00150000
VCCG06	1	A G 05 14 0930	RES	02	S		00150100
VCCG06	1	A G 06 13 1133	RES	02			00150200
WPROT	0	A F 01 02 0242	RES	03			00150300
WPROT	0	A G 11 12 2132	RES	03			00150400
WPROT	0	A K 07 03 1403	RES	03	S	PIN XA28	00150500
WPROT	0	A K 08 03 1603	RES	03	S		00150600
WPROT	1	A F 01 03 0243	RES	03			00150700
WPROT	1	A F 15 12 2943	RES	03			00150800
WPROT	1	A K 08 06 1606	RES	03			00150900
WPROT	1	A K 07 09 1306	RES	03	S	PIN XB28	00151000
WPROTR	0	A F 01 13 0142	RES	03	S		00151020
WPROTR	0	A E 03 01 0650	75107	03			00151040
WPROTR	1	A F 01 12 0143	RES	03	S		00151060

STGNAL	P	LOCATTON	TYPE	SH	S	COMMENTS	I.D.
WPROTP	1	A E 03 02 0651	75107	03			00151080
WRCLK0	0	A H 04 09 0726	75110	01	S		00151100
WRCLK0	0	A J 11 12 2114	RES	01			00151200
WRCLK0	0	A K 12 09 2306	CS22	01		YA7	00151300
WRCLK0	1	A H 04 08 0727	75110	01	S		00151400
WRCLK0	1	A J 11 13 2113	RDIP	01			00151500
WRCLK0	1	A K 12 13 2302	CS22	01		YB7	00151600
WRCLK1	0	A D 17 09 3364	75110	06	S		00151700
WRCLK1	0	A J 13 03 2614	RES	06			00151800
WRCLK1	0	A K 13 03 2603	CS23	06		YA14	00151900
WRCLK1	1	A D 17 08 3365	75110	06	S		00152000
WRCLK1	1	A J 13 04 2615	RES	06			00152100
WRCLK1	1	A K 13 02 2602	CS23	06		YB14	00152200
WRCLK2	0	A C 17 09 3375	75110	06	S		00152300
WRCLK2	0	A J 11 05 2216	RES	06			00152400
WRCLK2	0	A K 15 12 2903	CS25	06		YA21	00152500
WRCLK2	1	A C 17 08 3376	75110	06	S		00152600
WRCLK2	1	A J 11 08 2118	RES	06			00152700
WRCLK2	1	A K 15 11 2904	CS25	06		YB21	00152800
WRCLK3	0	A B 17 09 3384	75110	06	S		00152900
WRCLK3	0	A J 13 10 2516	RES	06			00153000
WRCLK3	0	A K 16 03 3203	CS26	06		YA28	00153100
WRCLK3	1	A B 17 08 3385	75110	06	S		00153200
WRCLK3	1	A J 13 12 2514	RES	06			00153300
WRCLK3	1	A K 16 04 3204	CS26	06		YB28	00153400
WRCLKEN	1	A D 02 12 0361	74S64	01			00153500
WRCLKEN	1	A G 01 05 0234	74107	01	S		00153600
WRCLKRS	0	A B 11 06 2284	7408	01	S		00153700
WRCLKRS	0	A D 03 05 0663	74H53	01			00153800
WRCLKRS	0	A D 03 09 0564	74H53	01			00153900
WRCLKRS	0	A G 01 15 0131	S112	01			00154000
WRDATA	1	A A 02 11 0392	CS02	01	S	PIN A19	00154100
WRDATA	1	A F 04 02 0842	74S74	01			00154200
WRGATE	1	A A 14 11 2792	CS11	04	S	PIN B37	00154300

SIGNAL	P	LOCATION	TYPE	SH	S	COMMENTS	T.D.
WRGATE	1	A D 09 06 1864	74153	04			00154400
WRPERR	0	A A 06 02 1290	CS06	03	S	PIN A63	00154500
WRPERR	0	A B 07 03 1481	S258	03			00154600
WRPROT	0	A B 04 13 0780	7408	02			00154700
WRPROT	0	A C 07 14 1372	9309	03	S		00154800
WRPROT	0A	A B 03 13 0580	7404	03			00154900
WRPROT	0A	A B 04 11 0782	7408	03	S		00155000
WRPROT	0A	A B 09 13 1782	S258	03			00155100
WRPROT	1	A A 04 10 0793	CS04	03		PIN A38	00155200
WRPROT	1	A B 03 12 0581	7404	03	S		00155300
WSTROBE	0	A C 08 12 1574	74170	03			00155400
WSTROBE	0	A E 11 06 2255	74500	03	S		00155500
WXX1659	0	A D 08 02 1660	74155	03			00155600
WXX1659	0	A D 08 08 1666	74155	03	S		00155700
WXX1670	0	A C 08 08 1677	74170	03	S		00155800
WXX1670	0	A C 08 11 1575	74170	03			00155900
WXX1679	0	A B 08 05 1683	S258	03			00156100
WXX1679	0	A B 08 11 1584	S258	03			00156200
WXX1679	0	A G 05 03 1032	RES	03	S		00156300
XTERR	0	A A 05 04 1092	CS05	03	S	PIN A53	00156400
XTERR	0	A B 07 13 1382	S258	03			00156500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.	
A	A 01 03	0291 BUSY	1	CS01	02	S	PIN A15	00014000
A	A 01 05	0293 CLRSTAT	0	CS01	01	S	PIN A12	00020700
A	A 01 07	0295 RDATA	0	CS01	01		PIN A13	00081900
A	A 01 11	0192 DRWDAT	1	CS01	01		PIN A07	00032200
A	A 02 01	0489 DSTAT04	1	CS02	03		PIN A27	00036700
A	A 02 02	0490 DSTAT03	1	CS02	03		PIN A26	00036500
A	A 02 03	0491 DSTAT02	1	CS02	03		PIN A25	00036300
A	A 02 04	0492 DSTAT01	1	CS02	03		PIN A24	00036100
A	A 02 05	0493 DSTAT00	1	CS02	03		PIN A23	00035900
A	A 02 06	0494 SEQSEC	0	CS02	05	S	PIN A22	00118300
A	A 02 11	0392 WRDATA	1	CS02	01	S	PIN A19	00154100
A	A 03 01	0689 GATN	1	CS03	03		PIN A35	00056000
A	A 03 02	0690 DSTAT11	1	CS03	03		PIN A34	00038100
A	A 03 03	0691 DSTAT10	1	CS03	03		PIN A33	00037900
A	A 03 04	0692 DSTAT09	1	CS03	03		PIN A32	00037700
A	A 03 10	0593 DSTAT05	1	CS03	03		PIN A28	00036900
A	A 03 11	0592 DSTAT06	1	CS03	03		PIN A29	00037100
A	A 03 12	0591 DSTAT07	1	CS03	03		PIN A30	00037300
A	A 03 13	0590 DSTAT08	1	CS03	3		PIN A31	00037500
A	A 04 01	0889 SWP0NC	1	CS04	03	S	PIN A46	00131800
A	A 04 02	0890 SWP1NC	1	CS04	03	S	PIN A45	00132100
A	A 04 03	0891 SWP2NC	1	CS04	03	S	PIN A44	00132400
A	A 04 04	0892 SWP3NC	1	CS04	03	S	PIN A43	00132700
A	A 04 08	0795 TID2	1	CS04	03	S	A37	00136700
A	A 04 09	0794 SRES	0	CS04	03	S	PIN A36	00125100
A	A 04 10	0793 WRPROT	1	CS04	03		PIN A38	00155200
A	A 05 03	1091 BTCEN	1	CS05	03		PIN A54	00010200
A	A 05 04	1092 XTERR	0	CS05	03	S	PIN A53	00156400
A	A 05 05	1093 EOP	0	CS05	03	S	PIN A52	00049900
A	A 05 08	0995 DVINH	0	CS05	02	S	PIN A47	00038700
A	A 05 09	0994 MINST00	0	CS05	03	S	PIN A48	00076000
A	A 05 11	0992 MINST01	0	CS05	03	S	PIN A49	00076200
A	A 05 12	0991 MINST02	0	CS05	03	S	PIN A50	00076400
A	A 05 13	0990 SELCK	0	CS05	02	S	PIN A51	00117200
A	A 06 01	1289 NOCOMP	0	CS06	03	S	PIN A64	00077300
A	A 06 02	1290 WRPERR	0	CS06	03	S	PIN A63	00154500
A	A 06 03	1291 DEFTRK	0	CS06	03	S	PIN A62	00029800
A	A 06 04	1292 RDHWSH	0	CS06	05	S	PIN A61	00088700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A A	06 08	1195 DRVBSY	1	CS06	02	PIN A56	00030900
A A	06 09	1194 DRVBSY	0	CS06	02	PIN A55	00030500
A A	06 10	1193 DRVALRT	1	CS06	02	PIN A57	00030300
A A	06 11	1192 ACK	1	CS06	03	S PIN A58	00000400
A A	06 12	1191 RDWHDR	0	CS06	05	S PIN A59	00088900
A A	06 13	1190 FMWSHR	0	CS06	05	S PIN A60	00053700
A A	07 02	1490 OFSN	1	CS07	04	S PIN A77	00077700
A A	07 04	1492 DSTL	1	CS07	04	S PIN A75	00038500
A A	07 05	1493 OFSP	1	CS07	04	S PIN A74	00077900
A A	07 06	1494 T7	1	CS07	04	S PIN A73	00133400
A A	07 08	1395 IN2050	1	CS07	04	S PIN A66	00064500
A A	07 09	1394 INTLK	1	CS07	04	S PIN A65	00067400
A A	07 10	1393 IN1870B	1	CS07	04	S PIN A67	00064200
A A	07 11	1392 T4	1	CS07	04	S PIN A68	00133200
A A	07 12	1391 ENRDDA	1	CS07	04	S PIN A69	00049200
A A	07 13	1390 T2	1	CS07	04	S PIN A70	00133000
A A	11 01	2289 CYL1	1	CS08	04	S PIN B10	00023700
A A	11 02	2290 DSTE	1	CS08	04	S PIN B09	00038300
A A	11 03	2291 CYL4	1	CS08	04	S PIN B14	00024900
A A	11 04	2292 CYL2	1	CS08	04	S PIN B13	00024300
A A	11 05	2293 CYL8	1	CS08	04	S PIN B15	00025500
A A	11 06	2294 CYL16	1	CS08	04	S PIN B16	00024100
A A	11 08	2195 HEAD4	1	CS08	04	S PIN B07	00063600
A A	11 09	2194 RECL	0A	CS08	03	S B08	00094900
A A	11 10	2193 HEAD1	1	CS08	04	S PIN B05	00062700
A A	11 11	2192 HEAD2	1	CS08	04	S PIN B06	00063300
A A	11 12	2191 STATRD	0	CS08	03	S PIN B03	00129800
A A	12 01	2489 CYL512	1	CS09	04	S PIN B21	00025100
A A	12 02	2490 CLRMODE	0	CS09	04	S PIN B24	00020300
A A	12 03	2491 ENDTRK	0	CS09	04	S PIN B23	00046100
A A	12 04	2492 BY1	0	CS09	04	S PIN B25	00015600
A A	12 05	2493 BY0	0	CS09	04	S PIN B26	00015200
A A	12 08	2395 CYL128	1	CS09	04	S PIN B19	00023900
A A	12 10	2393 SKOLSK	0	CS09	04	S PIN B22	00124400
A A	12 11	2392 CYL256	1	CS09	04	S PIN B20	00024500
A A	12 12	2391 CYL32	1	CS09	04	S PIN B17	00024700
A A	12 13	2390 CYL64	1	CS09	04	S PIN B18	00025300
A A	13 04	2692 MCOHB	1A	CS10	04	PIN B34	00072800
A A	13 05	2693 ENRDCK	1	CS10	04	S PIN B36	00048400

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	A 13 06	2694 DRVSXBY	0	CS10 04		PIN B33	00031700
A	A 13 08	2595 BY4	0	CS10 04	S	PIN B30	00017800
A	A 13 10	2593 BY5	0	CS10 04	S	PIN B29	00018000
A	A 13 11	2592 BY6	0	CS10 04	S	PIN B32	00018500
A	A 13 12	2591 BY3	0	CS10 04	S	PIN B27	00017200
A	A 13 13	2570 BY2	0	CS10 04	S	PIN B28	00016200
A	A 14 01	2889 SEEK	0	CS11 03	S	PIN B41	00112000
A	A 14 02	2890 MCLK	0	CS11 01		PIN B44	00073200
A	A 14 03	2891 DATA100	1	CS11 02		PIN B48	00027300
A	A 14 04	2892 DATA100	1	CS11 02	S	PIN B45	00027400
A	A 14 05	2893 DATA101	1	CS11 02	S	PIN B46	00027600
A	A 14 06	2894 BUFFER	0	CS11 04	S	PIN B43	00010600
A	A 14 08	2795 EXEN	1	CS11 04		PIN B40	00050800
A	A 14 09	2794 SECP	1	CS11 04		PIN B39	00110600
A	A 14 10	2793 MCO	1	CS11 04		PIN B42	00071000
A	A 14 11	2792 WRGATE	1	CS11 04	S	PIN B37	00154300
A	A 14 12	2791 HORERR	1	CS11 04		PIN B38	00062400
A	A 14 13	2790 INXP	1	CS11 04		PIN B35	00069700
A	A 15 03	3091 EVENSTG	0	CS12 05	S	PIN B58	00050100
A	A 15 04	3092 SECINA	1	CS12 05	S	PIN B55	00108900
A	A 15 05	3093 SECINB	1	CS12 05	S	PIN B56	00109100
A	A 15 06	3094 SECINC	1	CS12 05	S	PIN B53	00109300
A	A 15 08	2995 -5VCCA	1	CS12 01	S	PIN B50	00000300
A	A 15 09	2994 SECIND	1	CS12 05	S	PIN B47	00109500
A	A 15 10	2993 -5VCC	1	CS12 01	S	PIN B49	00000200
A	A 15 11	2992 SECINE	1	CS12 05	S	PIN B52	00109700
A	A 15 12	2991 SECINF	1	CS12 05	S	PIN B51	00109900
A	A 15 13	2990 DATA101	1	CS12 02		PIN B54	00027700
A	A 16 04	3292 DATA105	1	CS13 03	S	PIN B63	00028800
A	A 16 05	3293 DATA104	1	CS13 02		PIN B64	00028500
A	A 16 08	3195 DATA102	1	CS13 02	S	PIN B57	00027900
A	A 16 09	3194 DATA102	1	CS13 02		PIN B60	00028000
A	A 16 10	3193 DATA103	1	CS13 03	S	PIN B59	00028200
A	A 16 11	3192 DATA104	1	CS13 02	S	PIN B62	00028600
A	A 16 12	3191 DATA103	1	CS13 02		PIN B61	00028300
A	A 17 01	3489 HEAD8	1	CS14 04	S	PIN B73	00063900
A	A 17 03	3491 DATA105	1	CS14 03		PIN B72	00028900
A	A 17 08	3395 STAYSEL	0	CS14 03	S	PIN B68	00130000
A	A 17 09	3394 MAJSEL	0	CS14 03	S	PIN B67	00070000

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A A	17 12	3391	RDATA	1	CS14	01		
A A	17 13	3390	MCO	0	CS14	04	PIN 865	00082100
A A	17 14	3389	HEAD16	1	CS14	04	PIN 866	00070500
							PIN 874	00063000
A B	02 01	0479	SELERR	0	7440	02		00117900
A B	02 02	0480	UNSAFE	0	7440	02		00138600
A B	02 04	0482	SKINC	0	7440	02		00122500
A B	02 05	0483	DRVRDY	1	7440	02		00031300
A B	02 06	0484	DRVALRT	1	7440	02	S	00030400
A B	02 08	0385	NCOMCLK	0	74S40	05	S	00077000
A B	02 09	0384	SECTME	1	74S40	05		00111000
A B	02 10	0383	SECEQHD	0	74S40	05		00108400
A B	02 12	0381	ACTIVE	1	74S40	05		00000800
A B	02 13	0380	ACTIVE	1	74S40	05		00000900
A B	03 01	0679	BTCEN	1	7404	02		00010300
A B	03 02	0680	TIMRH	0	7404	02	S	00137600
A B	03 03	0681	TIMRG	1	7404	02		00137300
A B	03 04	0682	TIMRG	0	7404	02	S	00137100
A B	03 05	0683	GTAG	0	7404	02		00061400
A B	03 06	0684	GTAG	1	7404	02	S	00061600
A B	03 12	0581	WRPRDT	1	7404	03	S	00155300
A B	03 13	0580	WRPRDT	0A	7404	03		00154900
A B	04 01	0879	TIMRH	0	7408	02		00137700
A B	04 02	0880	POR	0	7408	02		00079900
A B	04 03	0881	RPRISL	0	7408	02	S	00098400
A B	04 04	0882	RRELDL	0	7408	02		00098600
A B	04 05	0883	POR	0	7408	02		00080000
A B	04 06	0884	CLRREL	0	7408	02	S	00020500
A B	04 08	0785	RRELTAG	0	7408	02	S	00098800
A B	04 09	0784	TIMRG	0	7408	02		00137200
A B	04 10	0783	RELDL	1	7408	02		00095700
A B	04 11	0782	WRPRDT	0A	7408	03	S	00155000
A B	04 12	0781	DRWRPRT	0	7408	03		00032500
A B	04 13	0780	WRPRDT	0	7408	02		00154700
A B	06 01	1279	IN1870B	1	1KPUP	04		00064300
A B	06 02	1280	IN2050	1	1KPUP	04		00064600
A B	06 03	1281	EVENSTG	0	1KPUP	05		00050200
A B	06 05	1283	SWP3NC	1	1KPU	03		00132800
A B	06 06	1284	SWP2NC	1	1KPU	03		00132500
A B	06 07	1285	SWP1NC	1	1KPU	03		00132200

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A B	06 08	1185 SWP0NC	1	1KPU	03		00131900
A B	06 09	1184 SEQSEC	0	1KPU	05		00118400
A B	07 01	1479 MAJSEL	0	S258	03		00070100
A B	07 02	1480 DSEL1	0	S258	03		00032700
A B	07 03	1481 WRPERR	0	S258	03		00154600
A B	07 04	1482 DSTAT08	1	S258	03	S	00037600
A B	07 05	1483 DSEL2	0	S258	03		00033600
A B	07 06	1484 DEFTRK	0	S258	03		00029900
A B	07 07	1485 DSTAT09	1	S258	03	S	00037800
A B	07 09	1386 DSTAT10	1	S258	03	S	00038000
A B	07 10	1385 EOP	0	S258	03		00050000
A B	07 11	1384 DSEL4	0	S258	03		00034500
A B	07 12	1383 DSTAT11	1	S258	03	S	00038200
A B	07 13	1382 XTERR	0	S258	03		00156500
A B	07 14	1381 GATH	0	S258	03		00055800
A B	07 15	1380 STATSEL	0	S258	03		00130100
A B	08 01	1679 MAJSEL	0	S258	03		00070200
A B	08 02	1680 SELDRRS	0	S258	03		00117700
A B	08 03	1681 OFFLINE	0	S258	03		00077500
A B	08 04	1682 DSTAT04	1	S258	03	S	00036800
A B	08 05	1683 WXX1679	0	S258	03		00156100
A B	08 06	1684 SKINC	0	S258	03		00122600
A B	08 07	1685 DSTAT05	1	S258	03	S	00037000
A B	08 09	1586 DSTAT06	1	S258	03	S	00037200
A B	08 10	1585 UNSAFE	0	S258	03		00138700
A B	08 11	1584 WXX1679	0	S258	03		00156200
A B	08 12	1583 DSTAT07	1	S258	03	S	00037400
A B	08 13	1582 NOCOMP	0	S258	03		00077400
A B	08 14	1581 SELERR	0	S258	03		00118000
A B	08 15	1580 STATSEL	0	S258	03		00130200
A B	09 01	1879 MAJSEL	0	S258	03		00070300
A B	09 02	1880 ATN0	0	S258	03		00001600
A B	09 03	1881 MINST00	0	S258	03		00076100
A B	09 04	1882 DSTAT00	1	S258	03	S	00036000
A B	09 05	1883 ATN1	0	S258	03		00001800
A B	09 06	1884 MINST01	0	S258	03		00076300
A B	09 07	1885 DSTAT01	1	S258	03	S	00036200
A B	09 09	1786 DSTAT02	1	S258	03	S	00036400
A B	09 10	1785 MINST02	0	S258	03		00076500
A B	09 11	1784 ATN2	0	S258	03		00002000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	B 09 12	1783 DSTAT03	1	S258	03		00036600
A	B 09 13	1782 WRPROT	0A	S258	03		00155100
A	B 09 14	1781 ATN3	0	S258	03		00002200
A	B 09 15	1780 STATSEL	0	S258	03		00130300
A	B 10 01	2079 SCANCK	1	S112	03		00103400
A	B 10 02	2080 ATNRS	1	S112	03		00002900
A	B 10 03	2081 ATNTAG	1	S112	03		00003200
A	B 10 05	2083 FATN	1	S112	03	S	00051700
A	B 10 06	2084 FATN	0	74107	03	S	00051500
A	B 10 07	2085 GATN	0	S112	03	S	00055900
A	B 10 09	1986 GATN	1	S112	03	S	00056100
A	B 10 11	1984 ATN	1	S112	03		00001400
A	B 10 12	1983 ATNRS	1	S112	03		00003000
A	B 10 13	1982 SCANCK	1	S112	03		00103500
A	B 10 14	1981 PDR	0	S112	03		00080100
A	B 10 15	1980 PDR	0	S112	03		00080200
A	B 11 01	2279 EN2279	1	7408	03		00043300
A	B 11 02	2280 SRES	0	7408	03		00125200
A	B 11 03	2281 PDR	0	7408	03	S	00080300
A	B 11 04	2282 BUSY	1A	7408	01		00014200
A	B 11 05	2283 ENRDCK	0	7408	01		00048100
A	B 11 06	2284 WRCLKRS	0	7408	01	S	00153700
A	B 11 08	2185 RECL	0	7408	03	S	00094400
A	B 11 09	2184 RECL	0A	7408	03		00095000
A	B 11 10	2183 RECL	0A	7408	03		00095100
A	B 11 11	2182 DRVBSY	0	74H08	02	S	00030600
A	B 11 12	2181 ONCYL	1A	74H08	02		00078500
A	B 11 13	2180 DRVRDY	1	74H08	02		00031400
A	B 12 01	2479 EN2279	1	RC	03	S	00043400
A	B 12 02	2480 EN2279	1	RC	03		00043500
A	B 12 08	2486 GND2479	0	RC	03	S	00059000
A	B 12 15	2380 GND2479	0	RC	03		00059100
A	B 13 01	2679 BY5	0	7404	04		00018100
A	B 13 02	2680 BY5	1	7404	04	S	00018300
A	B 13 03	2681 BY2	0	7404	04		00016300
A	B 13 04	2682 BY2	1	7404	04	S	00016500
A	B 13 05	2683 BY0	0	7404	04		00015300
A	B 13 06	2684 BY0	1	7404	04	S	00015400
A	B 13 08	2585 BY6	1	7404	04	S	00018700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	B 13 09	2584 BY6	0	7404	04		00018600
A	B 13 10	2583 BY3	1	7404	04	S	00017400
A	B 13 11	2582 BY3	0	7404	04		00017300
A	B 13 12	2581 SECEQHD	0	74S04	05	S	00108500
A	B 13 13	2580 SECEQHD	1	74S04	05		00108600
A	B 14 01	2879 SECC1	1	93S46	05		00106700
A	B 14 02	2880 SECINA	1	93S46	05		00109000
A	B 14 03	2881 SECC2	1	93S46	05		00107100
A	B 14 04	2882 SECINB	1	93S46	05		00109200
A	B 14 05	2883 SECC4	1	93S46	05		00107500
A	B 14 06	2884 SECINC	1	93S46	05		00109400
A	B 14 09	2786 SECAGR	1	93S46	05	S	00106400
A	B 14 10	2785 SECC8	1	93S46	05		00107700
A	B 14 11	2784 SECIND	1	93S46	05		00109600
A	B 14 12	2783 SECC16	1	93S46	05		00106900
A	B 14 13	2782 SECINE	1	93S46	05		00109800
A	B 14 14	2781 SECC32	1	93S46	05		00107300
A	B 14 15	2780 SECINF	1	93S46	05		00110000
A	B 15 02	3080 MCLK	0B	74161	05		00074100
A	B 15 03	3081 GND3086	0	74161	05		00059900
A	B 15 04	3082 GND3086	0	74161	05		00060000
A	B 15 05	3083 GND3086	0	74161	05		00060100
A	B 15 06	3084 GND3086	0	74161	05		00060200
A	B 15 07	3085 INXP	0	74161	05		00069000
A	B 15 08	3086 GND3086	0	74161	05	S	00060300
A	B 15 09	2986 INXP	0	74161	05		00069100
A	B 15 10	2985 CTSCAR	1	74161	05		00022300
A	B 15 13	2982 CTSEC32	1	74161	05		00023100
A	B 15 14	2981 CTSEC16	1	74161	05		00022700
A	B 16 02	3280 MCLK	0B	74161	05		00074200
A	B 16 03	3281 GND3286	0	74161	05		00060600
A	B 16 04	3282 GND3286	0	74161	05		00060700
A	B 16 05	3283 GND3286	0	74161	05		00060800
A	B 16 06	3284 GND3286	0	74161	05		00060900
A	B 16 07	3285 INXP	0	74161	05		00069200
A	B 16 08	3286 GND3286	0	74161	05	S	00061000
A	B 16 09	3186 INXP	0	74161	05		00069300
A	B 16 10	3185 FSECP	1	74161	05		00054100
A	B 16 11	3184 CTSEC8	1	74161	05		00023500
A	B 16 12	3183 CTSEC4	1	74161	05		00023300

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A B	16 13	3182	CTSEC2	1	74161	05		00022900
A B	16 14	3181	CTSEC1	1	74161	05		00022500
A B	16 15	3180	CTSCAR	1	74161	05	S	00022400
A B	17 01	3479	UNSEL3	1	75110	01		00140700
A B	17 02	3480	DRWDAT	1	75110	06		00032100
A B	17 03	3481	ENB17	1	75110	01		00044600
A B	17 04	3482	ENB17	1	75110	01		00044700
A B	17 05	3483	ENB17	1	75110	01		00044800
A B	17 06	3484	SERVCK3	1	75110	01		00120300
A B	17 08	3385	WRCLK3	1	75110	06	S	00153200
A B	17 09	3384	WRCLK3	0	75110	06	S	00152900
A B	17 10	3383	ENB17	1	75110	01		00044900
A B	17 12	3381	RWDATA3	0	75110	06	S	00100800
A B	17 13	3380	RWDATA3	1	75110	06	S	00101100
A C	02 01	0470	BUSY	1A	74H11	04		00014300
A C	02 02	0471	MCO	0	74H11	04		00070600
A C	02 03	0472	MCO	1	74H11	04		00071100
A C	02 04	0473	BUFRW	0	74H11	04		00010700
A C	02 05	0474	RECL	0	74H11	04		00094500
A C	02 06	0475	TAGTME	1	74H11	04	S	00136100
A C	02 08	0376	ATNTAG	1	74H11	03	S	00003300
A C	02 09	0375	INHATN	0	74H11	03		00066200
A C	02 10	0374	BUSY	0A	74H11	03		00013300
A C	02 11	0373	ATNMX	1	74H11	03		00002400
A C	02 12	0372	DISKTE	1	74H11	04	S	00030000
A C	02 13	0371	DRVBSY	0	74H11	04		00030700
A C	03 01	0670	CLRREL	0	7474	02		00020600
A C	03 02	0671	DATAI03	1				00028400
A C	03 03	0672	SELCK	0	7474	02		00117300
A C	03 05	0674	RELDL	1	7474	02	S	00095800
A C	03 06	0675	RELDL	0	7474	02	S	00095500
A C	03 08	0576	FTAG	0	7474	02	S	00055600
A C	03 11	0573	TIMEG	1	7474	02		00137400
A C	03 12	0572	RELDL	0	7474	02		00095600
A C	03 13	0571	SELCK	0	7474	02		00117400
A C	04 01	0870	RPRISEL	0	7474	02		00098500
A C	04 02	0871	PRISEL	1A		02		00081500
A C	04 03	0872	DSELCK	1	7474	02		00035600
A C	04 05	0874	PRISEL	1		02	S	00081200

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A C	04 08	0776 RELTAG3	0	7474	02	S	00096300
A C	04 09	0775 RELTAG3	1	7474	02	S	00096600
A C	04 11	0773 TIMEB	1	7474	02		00136900
A C	04 12	0772 RELDR	1	7474	02		00095900
A C	04 13	0771 RRELTAG	0	7474	02		00098900
A C	05 02	1071 DSEL31	1	74175	02	S	00035000
A C	05 04	1073 DATAI00	1	74175	02		00027500
A C	05 05	1074 DATAI01	1	74175	02		00027800
A C	05 07	1076 DSEL32	1	74175	02	S	00035200
A C	05 09	0977 SELCK	0	74175	02		00117500
A C	05 10	0976 DSEL34	1	74175	02	S	00035400
A C	05 12	0974 DATAI02	1	74175	02		00028100
A C	05 15	0971 PRISEL	1A	74175	02	S	00081600
A C	06 02	1271 DSEL1	1	74175	02	S	00033000
A C	06 03	1272 DSEL1	0	74175	02	S	00032800
A C	06 04	1273 DSELB1	1	74175	02		00035100
A C	06 05	1274 DSELB2	1	74175	02		00035300
A C	06 06	1275 DSEL2	0	74175	02	S	00033700
A C	06 07	1276 DSEL2	1	74175	02	S	00033900
A C	06 09	1177 DSELCK	1	74175	02		00035700
A C	06 10	1176 DSEL4	1	74175	02	S	00034700
A C	06 11	1175 DSEL4	0	74175	02	S	00034600
A C	06 12	1174 DSELB4	1	74175	02		00035500
A C	07 03	1472 DSEL2	1	9309	03		00034000
A C	07 09	1377 SWP3NC	1	9309	03		00132900
A C	07 10	1376 SWP2NC	1	9309	03		00132600
A C	07 11	1375 SWP1NC	1	9309	03		00132300
A C	07 12	1374 SWP0NC	1	9309	03		00132000
A C	07 13	1373 DSEL1	1	9309	03		00033100
A C	07 14	1372 WRPROT	0	9309	03	S	00154800
A C	08 04	1673 SCAN2	1	74170	03		00102500
A C	08 05	1674 SCAN1	1	74170	03		00101600
A C	08 08	1677 WXX1670	0	74170	03	S	00155900
A C	08 10	1576 INHATN	0	74170	03	S	00066300
A C	08 11	1575 WXX1670	0	74170	03		00155900
A C	08 12	1574 WSTROBE	0	74170	03		00155400
A C	08 13	1573 DSEL2	1	74170	03		00034100
A C	08 14	1572 DSEL1	1	74170	03		00033200
A C	08 15	1571 TID2	0	74170	03		00136500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	C 09 01	1870 COMP	1	7410	03		00021300
A	C 09 02	1871 BUSY	1A	7410	03		00014400
A	C 09 03	1872 INTRCL	0	74S10	04		00067700
A	C 09 04	1873 IN1870B	1	7410	04		00064400
A	C 09 05	1874 ENDTRK	0	7410	04		00046200
A	C 09 06	1875 MCDEN	1	7410	04	S	00071300
A	C 09 08	1776 RESETH	1	7410	03	S	00098200
A	C 09 09	1775 BUSYRES	0	7410	03		00015000
A	C 09 10	1774 ATNRS	0	7410	03		00002700
A	C 09 11	1773 RESEN	0	7410	03		00096900
A	C 09 12	1772 BUSYRES	0	7410	03	S	00015100
A	C 09 13	1771 ATNMX	1	7410	03		00002500
A	C 10 01	2070 STATRD	0	7408	03		00129900
A	C 10 02	2071 FATN	1	7408	03		00051800
A	C 10 03	2072 ATN	1	7408	03	S	00001500
A	C 10 04	2073 DRVYRDY	1	7408	02		00031500
A	C 10 05	2074 SELERR	0	7408	05		00118100
A	C 10 06	2075 OFFLINE	0	7408	02	S	00077600
A	C 10 08	1976 CONTAG	1	7408	04	S	00021900
A	C 10 09	1975 BUFFERW	0	7408	04		00010800
A	C 10 10	1974 CONTAGT	1	7408	04		00022100
A	C 10 11	1973 GTAG	0	7408	02	S	00061500
A	C 10 12	1972 RELTAG	0	7408	02		00096400
A	C 10 13	1971 FTAG	0	7408	02		00055700
A	C 11 01	2270 SCANCK	1	S112	03		00103600
A	C 11 03	2272 FACK	1	S112	03		00051000
A	C 11 05	2274 ATNRS	1	S112	03	S	00003100
A	C 11 06	2275 ATNRS	0	S112	03	S	00002800
A	C 11 09	2177 SCANT	1	S112	02	S	00105100
A	C 11 13	2173 MCLK	1	S112	03		00074700
A	C 11 15	2171 POR	0	S112	03		00080400
A	C 12 01	2470 SETEN	1	74S00	05		00120600
A	C 12 02	2471 SEQSEC	0	74S00	05		00118500
A	C 12 03	2472 ENSTAG	1	74S00	05	S	00049600
A	C 12 04	2473 ENSTAG	1	74S00	05		00049700
A	C 12 05	2474 SECTME	1	74S00	05		00111100
A	C 12 06	2475 SECNORM	0	74S00	05	S	00110400
A	C 12 08	2376 SECSTGO	0	74S00	05	S	00110800
A	C 12 09	2375 ENSTAG	0	74S00	05		00049400
A	C 12 10	2374 STAGSEC	1	74S00	05		00129600

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	C 12 11	2373 MODSEC 1	74S00	05	S		00076600
A	C 12 12	2372 SECSTGD 0	74S00	05			00110900
A	C 12 13	2371 SECNDRM 0	74S00	05			00110500
A	C 13 01	2670 FSECP 1	74S00	05			00054200
A	C 13 02	2671 INXFD 0	74S00	05			00068100
A	C 13 03	2672 GFSECP 0	74S00	05	S		00056500
A	C 13 04	2673 GFSECP 0	74S00	05			00056600
A	C 13 05	2674 GINXP 1	74S00	05			00056700
A	C 13 06	2675 SECTME 1	74S00	05	S		00111200
A	C 13 08	2576 GINXP 1	74S00	05	S		00056800
A	C 13 09	2575 INXP 1	74S00	05			00069800
A	C 13 10	2574 INXFD 0	74S00	05			00068200
A	C 13 11	2573 COMPCLK 0	74S00	05	S		00021500
A	C 13 12	2572 SECTME 1	74S00	05			00111300
A	C 13 13	2571 SECEQHD 1	74S00	05			00108700
A	C 14 01	2870 STAGSEC 0	74S02	05	S		00129400
A	C 14 02	2871 INITSEC 1	74S02	05			00067000
A	C 14 03	2872 ALTSEC 1	74S02	05			00001200
A	C 14 04	2873 ALTSEC 1	74S02	05	S		00001300
A	C 14 05	2874 FALTSEC 0	74S02	05			00051200
A	C 14 06	2875 NCOMCLK 0	74S02	05			00077100
A	C 14 08	2776 COMPCLK 0	74S02	05			00021600
A	C 14 09	2775 ACTIVE 1	74S02	05			00001000
A	C 14 10	2774 INITSEC 1	74S02	05	S		00067100
A	C 14 11	2773 ACTIVE 0	74S02	05			00000600
A	C 14 12	2772 COMPCLK 0	74S02	05			00021700
A	C 14 13	2771 INITIALI 1	74S02	05	S		00066800
A	C 15 01	3070 INXFD 0	74S74	05			00068300
A	C 15 03	3072 COMPCLK 0	74S74	05			00021800
A	C 15 04	3073 EVENSTG 1	74S74	05			00050400
A	C 15 05	3074 ACTIVE 1	74S74	05	S		00001100
A	C 15 06	3075 ACTIVE 0	74S74	05	S		00000700
A	C 15 08	2976 FALTSEC 0	74S74	05	S		00051300
A	C 15 10	2974 INITIALI 0	74S74	05			00066600
A	C 15 11	2973 NCOMCLK 0	74S74	05			00077200
A	C 15 12	2972 FALTSEC 0	74S74	05			00051400
A	C 15 13	2971 INXFD 0	74S74	05			00068400
A	C 16 01	3270 HEAD1 1	93S46	05			00062800
A	C 16 02	3271 CTSEC1 1	93S46	05	S		00022600

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	C 16 03	3272 HEAD2	1	93S46	05		00063400
A	C 16 04	3273 CTSEC2	1	93S46	05	S	00023000
A	C 16 05	3274 HEAD4	1	93S46	05		00063700
A	C 16 06	3275 CTSEC4	1	93S46	05	S	00023400
A	C 16 07	3276 EVENSTG	1	93S46	05		00050500
A	C 16 08	3277 GND3270	0	93S46	05	S	00060400
A	C 16 09	3177 SECEQHD	1	93S46	05	S	00108800
A	C 16 10	3176 HEAD8	1	93S46	05		00064000
A	C 16 11	3175 CTSEC8	1	93S46	05	S	00023600
A	C 16 12	3174 HEAD16	1	93S46	05		00063100
A	C 16 13	3173 CTSEC16	1	93S46	05	S	00022800
A	C 16 14	3172 GND3270	0	93S46	05		00060500
A	C 16 15	3171 CTSEC32	1	93S46	05	S	00023200
A	C 17 01	3470 UNSEL2	1	75110	01		00140100
A	C 17 02	3471 DRWDAT	1	75110	06		00032150
A	C 17 03	3472 ENC17	1	75110	01		00045100
A	C 17 04	3473 ENC17	1	75110	01		00045200
A	C 17 05	3474 ENC17	1	75110	01		00045300
A	C 17 06	3475 SERVCK2	1	75110	01		00119800
A	C 17 08	3376 WRCLK2	1	75110	06	S	00152600
A	C 17 09	3375 WRCLK2	0	75110	06	S	00152300
A	C 17 10	3374 ENC17	1	75110	01		00045400
A	C 17 12	3372 RWDATA2	0	75110	06	S	00100200
A	C 17 13	3371 RWDATA2	1	75110	06	S	00100500
A	D 02 01	0459 DVINH	0	74S64	01		00038800
A	D 02 02	0460 BUSY	0A	74S64	01		00013400
A	D 02 03	0461 CLOCK	1	74S64	01		00019500
A	D 02 04	0462 RDCLOCK	1	74S64	01		00087700
A	D 02 05	0463 RDCLKEN	1	74S64	01		00087100
A	D 02 06	0464 BUSY	1A	74S64	01		00014500
A	D 02 08	0365 MCLK	0	74S64	01	S	00073300
A	D 02 09	0364 MCLKER	1	74S64	01		00075800
A	D 02 10	0363 CLOCK	1	74S64	01		00019600
A	D 02 11	0362 BUSY	1A	74S64	01		00014600
A	D 02 12	0361 WRCLKEN	1	74S64	01		00153500
A	D 02 13	0360 SVCLOCK	1	74S64	01		00130900
A	D 03 01	0659 ENRDCK	1A	74H53	01		00048700
A	D 03 02	0660 ENRDCK	1A	74H53	01		00048800
A	D 03 03	0661 RDCLOCK	1A	74H53	01		00088300
A	D 03 04	0662 SVCLOCK	0	74H53	01		00130500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	D 03 05 0663	WRCLKRS 0	74H53	01			00153800
A	D 03 08 0565	HDRER 0	74H53	01	S		00061900
A	D 03 09 0564	WRCLKRS 0	74H53	01			00153900
A	D 03 10 0563	SVCLOCK 1A	74H53	01			00131400
A	D 03 13 0560	ROCLOCK 0	74H53	01			00087300
A	D 04 01 0859	HDRER 0	7400	01			00062000
A	D 04 02 0860	HDRERB 0	7400	01			00062100
A	D 04 03 0861	HDRERB 1	7400	01	S		00062500
A	D 04 04 0862	HDRERB 1	7400	01			00062600
A	D 04 05 0863	CLRSTAT 0	7400	01			00020800
A	D 04 06 0864	HDRERB 0	74500	01	S		00062200
A	D 04 08 0765	SELERR 0	7400	02	S		00118200
A	D 04 09 0764	DVINH 0	7400	02			00038900
A	D 04 10 0763	SEL 0	7400	02			00116000
A	D 04 11 0762	MCOHB 1A	74500	04	S		00072900
A	D 04 12 0761	MCOHB 0	74500	04			00071500
A	D 04 13 0760	MCOHB 0	74500	04			00071600
A	D 05 01 1059	MCLK 0	74504	01			00073400
A	D 05 02 1060	MCLK 1	74504	01	S		00074800
A	D 05 03 1061	MCLK 0	74504	01			00073500
A	D 05 04 1062	MCLK 1A	74504	02	S		00075400
A	D 05 05 1063	MCLK 1	74504	02			00074900
A	D 05 06 1064	MCLK 0A	74504	02	S		00073700
A	D 05 08 0965	SEL 0	74504	02	S		00116100
A	D 05 09 0964	SEL 1	74504	02			00116200
A	D 05 10 0963	SCANCK 0	74504	02	S		00103000
A	D 05 11 0962	SCANCK 1	74504	02			00103700
A	D 05 12 0961	RECL 1	74504	05	S		00095200
A	D 05 13 0960	RECL 0	74504	05			00094600
A	D 06 01 1259	PRISEL 1		02			00081300
A	D 06 02 1260	BUSY 0A	75110	02			00013500
A	D 06 03 1261	PRISEL 1		02			00081400
A	D 06 04 1262	RELDL 1	75110	02			00096000
A	D 06 05 1263	RELDL 1	75110	02			00096100
A	D 06 06 1264	BUSY 0A	75110	02			00013600
A	D 06 08 1165	BIT9 1	75110	02			00009700
A	D 06 09 1164	BIT9 0	75110	02			00009200
A	D 06 10 1163	EN1421 1		02			00042100
A	D 06 12 1161	BIT9 0	75110	02			00009300
A	D 06 13 1160	BIT9 1	75110	02	S		00009800

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	D 07 04	1462 STATSEL	0	560PU	03		00130400
A	D 07 05	1463 MAJSEL	0	560PU	03		00070400
A	D 07 06	1464 SRES	0	560PU	03		00125300
A	D 07 07	1465 INHATN	0	560PU	03		00066400
A	D 08 01	1659 GATN	1	74155	03		00056200
A	D 08 02	1660 WXX1659	0	74155	03		00155600
A	D 08 03	1661 SCANR2	1	74155	03		00104600
A	D 08 04	1662 ATN3	0	74155	03	S	00002300
A	D 08 05	1663 ATN2	0	74155	03	S	00002100
A	D 08 06	1664 ATN1	0	74155	03	S	00001900
A	D 08 07	1665 ATNO	0	74155	03	S	00001700
A	D 08 08	1666 WXX1659	0	74155	03	S	00155700
A	D 08 09	1566 RESETO	0	74155	03	S	00097100
A	D 08 10	1565 RESETE	0	74155	03	S	00097300
A	D 08 11	1564 RESETE	0	74155	03	S	00097500
A	D 08 12	1563 RESETE	0	74155	03	S	00097700
A	D 08 13	1562 SCANR1	1	74155	03		00104400
A	D 08 14	1561 RESETE	0	74155	03		00097900
A	D 08 15	1560 RESETE	0	74155	03		00098000
A	D 09 01	1859 GND1859	0	74153	04		00057800
A	D 09 02	1860 MCOHB	1	74153	04		00072000
A	D 09 03	1861 GND1859	0	74153	04		00057900
A	D 09 04	1862 HEAD1	1	74153	04		00062900
A	D 09 05	1863 CYL1	1	74153	04		00023800
A	D 09 06	1864 WRGATE	1	74153	04		00154400
A	D 09 07	1865 BUS0	1	74153	04	S	00010900
A	D 09 08	1866 GND1859	0	74153	04	S	00058000
A	D 09 09	1766 BUS1	1	74153	04	S	00011200
A	D 09 10	1765 ENRDDA	1	74153	04		00049300
A	D 09 11	1764 CYL2	1	74153	04		00024400
A	D 09 12	1763 HEAD2	1	74153	04		00063500
A	D 09 13	1762 GND1859	0	74153	04		00058100
A	D 09 14	1761 CYLTG	1	74153	04		00026400
A	D 09 15	1760 GND1859	0	74153	04		00058200
A	D 10 01	2059 GND2059	0	74153	04		00058300
A	D 10 02	2060 MCOHB	1	74153	04		00072100
A	D 10 03	2061 GND2059	0	74153	04		00058400
A	D 10 04	2062 HEAD4	1	74153	04		00063800
A	D 10 05	2063 CYL4	1	74153	04		00025000
A	D 10 06	2064 DFSP	1	74153	04		00078000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I-D.
A D 10 07 2065	BUS2	1	74153	04	S		00011500
A D 10 08 2066	GND2059	0	74153	04	S		00058500
A D 10 09 1966	BUS3	1	74153	04	S		00011800
A D 10 10 1965	DFSN	1	74153	04			00077800
A D 10 11 1964	CYL8	1	74153	04			00025600
A D 10 12 1963	HEAD3	1	74153	04			00064100
A D 10 13 1962	GND2059	0	74153	04			00058600
A D 10 14 1961	CYLTG	1	74153	04			00026500
A D 10 15 1960	GND2059	0	74153	04			00058700
A D 11 01 2259	RECL	1	8233	04			00095300
A D 11 02 2260	CYL16	1	8233	04			00024200
A D 11 03 2261	BUS4	1	8233	04	S		00012100
A D 11 04 2262	BUS5	1	8233	04	S		00012400
A D 11 05 2263	CYL32	1	8233	04			00024800
A D 11 06 2264	GND2259	0	8233	04			00058800
A D 11 07 2265	MCOH8	1	8233	04			00072200
A D 11 08 2266	GND2259	0	8233	04	S		00058900
A D 11 09 2166	CYLTG	0	8233	04			00026100
A D 11 10 2165	RECL	1	8233	04			00095400
A D 11 11 2164	CYL64	1	8233	04			00025400
A D 11 12 2163	BUS6	1	8233	04	S		00012700
A D 11 13 2162	BUS7	1	8233	04	S		00013000
A D 11 14 2161	CYL123	1	8233	04			00024000
A D 11 15 2160	DSTE	1	8233	04			00038400
A D 12 01 2459	BY3T7	0	74500	04			00017600
A D 12 02 2460	BY6T7	0	74500	04			00018900
A D 12 03 2461	MCOH8	1	74500	04	S		00073000
A D 12 04 2462	T7	1	74500	04			00133500
A D 12 05 2463	RY6	1	74500	04			00018800
A D 12 06 2464	BY6T7	0	74500	04	S		00019000
A D 12 08 2365	BY14	1	74500	04	S		00015800
A D 12 09 2364	RY4	0	74500	04			00017900
A D 12 10 2363	BY1	0	74500	04			00015700
A D 12 11 2362	RY25	1	74500	04	S		00016800
A D 12 12 2361	RY2	0	74500	04			00016400
A D 12 13 2360	BY5	0	74500	04			00018200
A D 13 01 2659	RY25	1	74H08	04			00016900
A D 13 02 2660	T4	1	74H08	04			00133300
A D 13 03 2661	RY25T4	1	74H08	04	S		00017000
A D 13 04 2662	BY14	1	74H08	04			00015900

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A	D 13 05	2663	T2	1	74H08	04		00133100
A	D 13 06	2664	BY14T2	1	74H08	04	S	00016000
A	D 13 08	2565	TAGCLK	1	74H08	04	S	00135800
A	D 13 09	2564	T7	1	74H08	04		00133600
A	D 13 10	2563	MCLK	1A	74H08	04		00075500
A	D 13 11	2562	RESEN	0	74H08	03	S	00097000
A	D 13 12	2561	INHATN	0	74H08	03		00066500
A	D 13 13	2560	PDR	0	74H08	03		00080500
A	D 14 02	2860	INX	1	74S74	04		00067900
A	D 14 03	2861	MCLK	0A	74S74	03		00073800
A	D 14 05	2863	INXP	1	74S74	04	S	00069900
A	D 14 06	2864	INXP	0	74S74	04	S	00069400
A	D 14 08	2765	FSECP	0	74S74	04	S	00053900
A	D 14 09	2764	FSECP	1	74S74	04	S	00054300
A	D 14 11	2762	MCLK	0A	74S74	03		00073900
A	D 14 12	2761	SCT	1	74S74	04		00105400
A	D 15 02	3060	MCLK	0B	74161	05		00074300
A	D 15 03	3061	GND3066	0	S161	05		00059200
A	D 15 04	3062	GND3066	0	S161	05		00059300
A	D 15 05	3063	GND3066	0	S161	05		00059400
A	D 15 06	3064	GND3066	0	S161	05		00059500
A	D 15 07	3065	INXFD	0	74161	05		00068500
A	D 15 08	3066	GND3066	0	S161	05	S	00059600
A	D 15 09	2966	INXFD	0	74161	05		00068600
A	D 15 10	2965	MOOSEC	1	S161	05		00076700
A	D 15 11	2964	SECC8	1	74161	05	S	00107800
A	D 15 12	2963	SECC4	1	74161	05	S	00107600
A	D 15 13	2962	SECC2	1	74161	05	S	00107200
A	D 15 14	2961	SECC1	1	74161	05	S	00106800
A	D 15 15	2960	SECCOFL	1	74161	05	S	00107900
A	D 16 01	3259	CLOCK	1A	74S04	01		00019900
A	D 16 02	3260	CLOCK	1	74S04	01	S	00019700
A	D 16 03	3261	INTLK	1	7404	05		00067500
A	D 16 04	3262	INTLK	0	74S04	05	S	00067200
A	D 16 05	3263	ENSTAG	1	74S04	05		00049800
A	D 16 06	3264	ENSTAG	0	74S04	05	S	00049500
A	D 16 08	3165	STAGSEC	1	74S04	05	S	00129700
A	D 16 09	3164	STAGSEC	0	74S04	05		00129500
A	D 16 10	3163	INITALT	0	74S04	05	S	00066700
A	D 16 11	3162	INITALT	1	74S04	05		00066900

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	D 16 12	3161 SCANCK 1A	74S04	02	S		00104100
A	D 16 13	3160 SCANCK 0	74S04	02			00103100
A	D 17 01	3459 UNSEL1 1	75110	01			00139500
A	D 17 02	3460 DRWDAT 1	75110	06			00032000
A	D 17 03	3461 END17 1	75110	01			00045600
A	D 17 04	3462 END17 1	75110	01			00045700
A	D 17 05	3463 END17 1	75110	01			00045800
A	D 17 06	3464 SERVCK1 1	75110	01			00119300
A	D 17 08	3365 WRCLK1 1	75110	06	S		00152000
A	D 17 09	3364 WRCLK1 0	75110	06	S		00151700
A	D 17 10	3363 END17 1	75110	01			00045900
A	D 17 12	3361 RWDATA1 0	75110	06	S		00099600
A	D 17 13	3360 RWDATA1 1	75110	06	S		00099900
A	E 02 01	0450 SELO 0	74S20	02			00116400
A	E 02 02	0451 SEL1 0	74S20	02			00116600
A	E 02 04	0453 SEL2 0	74S20	02			00116800
A	E 02 05	0454 SEL3 0	74S20	02			00117000
A	E 02 06	0455 SEL 1	74S20	02	S		00116300
A	E 02 08	0356 ENRDCK 1A	74S04	01	S		00048900
A	E 02 13	0351 ENRDCK 0	74S04	01			00048200
A	E 03 01	0650 WPROTR 0	75107	03			00151040
A	E 03 02	0651 WPROTR 1	75107	03			00151080
A	E 03 04	0653 DRWRPRT 0	74107	03	S		00032600
A	E 03 05	0654 EN0850 1	75107	03			00040700
A	E 03 06	0655 EN0350 1	75107	03			00040800
A	E 03 08	0556 EN0850 1	75107	03			00040900
A	E 03 09	0555 SELDRRS 0	75107	03	S		00117800
A	E 03 11	0553 DBUSYR 1	75107	03			00029780
A	E 03 12	0552 DBUSYR 0	75107	03			00029740
A	E 04 01	0850 EN0850 1	74S15	01			00041200
A	E 04 02	0851 EN0850 1	74S15	01			00041300
A	E 04 03	0852 SVCLOCK 1	74S15	01			00131000
A	E 04 04	0853 EN0850 1	74S15	01			00041400
A	E 04 05	0854 EN0950 1	74S15	01			00041500
A	E 04 06	0855 SVCLOCK 1A	74S15	01	S		00131500
A	E 04 12	0752 RDCLOCK 1A	74S15	01	S		00088400
A	E 04 13	0751 RDCLOCK 1	74S15	01			00087800
A	E 05 01	1050 MCOH9 1	74S04	04			00072300

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A E 05 02 1051	MCOHB	0A		74S04	04	S		00071800
A E 05 03 1052	ENRDCK	1		74S04	01			00048500
A E 05 04 1053	ENRDCK	0		74S04	01	S		00048300
A E 05 05 1054	BUSY	1		74S04	02			00014100
A E 05 06 1055	BUSY	0A		74S04	02	S		00013700
A E 05 08 0956	BUSY	1A		74S04	02	S		00014700
A E 05 09 0955	BUSY	0A		74S04	02			00013800
A E 05 10 0954	TID2	0		74S04	03	S		00136600
A E 05 11 0953	TID2	1		74S04	03			00136800
A E 05 12 0952	SECAGR	0		74S04	05	S		00106200
A E 05 13 0951	SECAGR	1		74S04	05			00106500
A E 06 04 1253	TIMEB	1		74164	02	S		00137000
A E 06 06 1255	DSELCK	1		74164	02	S		00035800
A E 06 08 1156	SCANCK	0		74164	02			00103200
A E 06 09 1155	SELCK	0		74164	02			00117600
A E 06 12 1152	TIMEG	1		74164	02	S		00137500
A E 06 13 1151	BTCEN	1		74164	02	S		00010400
A E 07 01 1450	DSEL1	0		74H53	03			00032900
A E 07 02 1451	DSEL1	1		74H53	03			00033300
A E 07 03 1452	SCAN1	0		74H53	03			00101400
A E 07 04 1453	DSEL2	1		74H53	03			00034200
A E 07 05 1454	SCAN2	0		74H53	03			00102300
A E 07 08 1356	COMP	1		74H53	03	S		00021400
A E 07 09 1355	SCAN2	1		74H53	03			00102600
A E 07 10 1354	DSEL2	0		74H53	03			00033800
A E 07 13 1351	SCAN1	1		74H53	03			00101700
A E 08 01 1650	SCANCK	1A		S112	03			00104200
A E 08 05 1654	SCAN1	1		S112	03	S		00101800
A E 08 06 1655	SCAN1	0		S112	03	S		00101500
A E 08 07 1656	SCAN2	0		S112	03	S		00102400
A E 08 09 1557	SCAN2	1		S112	03	S		00102700
A E 08 11 1555	SCAN1	1		S112	03			00101900
A E 08 12 1554	SCAN1	1		S112	03			00102000
A E 08 13 1553	SCANCK	1A		S112	03			00104300
A E 10 01 2050	SECINHA	0		74S11	05			00110100
A E 10 02 2051	SECINHA	0		74S11	05			00110200
A E 10 03 2052	SCANT	1		74S11	02			00105200
A E 10 04 2053	SCANT	1		74S11	02			00105300
A E 10 05 2054	MCLK	1		74S11	02			00075000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A E 10 06 2055	SCANCK	1	74S11	02	S		00103800
A E 10 08 1956	CNTRLEN	1	74S11	04	S		00020900
A E 10 09 1955	IN2050	1	74S11	04			00064700
A E 10 10 1954	BUSY	1A	74S11	04			00014800
A E 10 11 1953	MCO	0	74S11	04			00070700
A E 10 12 1952	SECP	1	74S11	05	S		00110700
A E 10 13 1951	MODSEC	1	74S11	05			00076800
A E 11 01 2250	SCANCK	1	74S00	03			00103900
A E 11 02 2251	RESETH	1	74S00	03			00098300
A E 11 03 2252	RESETE	0	74S00	03	S		00098100
A E 11 04 2253	SCANCK	1	74S00	03			00104000
A E 11 05 2254	SKRCL	1	74S00	03			00124600
A E 11 06 2255	WSTROBE	0	74S00	03	S		00155500
A E 11 08 2156	DRYSKBY	0	74S00	04	S		00031800
A E 11 09 2155	MCO	0	74S00	04			00070800
A E 11 10 2154	DRVBSY	1	74S00	04			00031000
A E 11 11 2153	SKRCL	1	74S00	03	S		00124700
A E 11 12 2152	SEEK	0	74S00	03			00112100
A E 11 13 2151	RECL	0	74S00	03			00094700
A E 14 01 2850	INXP	0	7474	04			00069500
A E 14 02 2851	DISKTE	1	7474	04			00030100
A E 14 03 2852	INDXP	0	7474	04			00066000
A E 14 05 2854	INX	1	7474	04	S		00068000
A E 14 09 2755	SCT	1	7474	04	S		00105500
A E 14 11 2753	SCTRP	0	7474	04			00106000
A E 14 12 2752	DISKTE	1	7474	04			00030200
A E 14 13 2751	FSECP	0	7474	04			00054000
A E 15 02 3051	MCLK	0B	74161	05			00074400
A E 15 03 3052	GND3066	0	S161	05			00059700
A E 15 04 3053	GND3066	0	S161	05			00059800
A E 15 07 3056	INXFD	0	74161	05			00068700
A E 15 09 2957	INXFD	0	74161	05			00068800
A E 15 10 2956	SECCOFL	1	74161	05			00108000
A E 15 13 2953	SECC32	1	74161	05	S		00107400
A E 15 14 2952	SECC16	1	74161	05	S		00107000
A E 16 01 3250	CLOCK	1	74S05	01			00019800
A E 16 02 3251	CLOCK	0A	74S05	01	S		00019100
A E 16 03 3252	CLOCK	0A	74S05	01			00019200
A E 16 04 3253	CLOCK	1A	74S05	01	S		00020000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A E	16 07	3256 GND3450 0	74S05	01	S		00061100
A E	17 02	3451 CLOCK 0A	RC	01			00019300
A E	17 03	3452 CLOCK 0A	RC	01			00019400
A E	17 04	3453 CLOCK 1A	RC	01			00020100
A E	17 05	3454 CLOCK 1A	RC	01			00020200
A E	17 12	3354 GND3450 0	RC	01			00061200
A E	17 13	3353 POTF17 1	POT	01			00080900
A E	17 14	3352 GND3450 0	RC	01			00061300
A E	17 15	3351 POTF16 1	POT	01			00080600
A F	01 02	0242 WPROT 0	RES	03			00150300
A F	01 03	0243 WPROT 1	RES	03			00150700
A F	01 04	0244 DBUSY 1	RES	03			00029400
A F	01 05	0245 DBUSY 0	RES	03			00029000
A F	01 10	0145 DBUSYR 0	RES	03	S		00029720
A F	01 11	0144 DBUSYR 1	RES	03	S		00029760
A F	01 12	0143 WPROTR 1	RES	03	S		00151060
A F	01 13	0142 WPROTR 0	RES	03	S		00151020
A F	02 01	0441 UNSEL2 1	9301	02			00140200
A F	02 02	0442 UNSEL3 1	9301	02			00140800
A F	02 06	0446 SEL3 0	9301	02	S		00117100
A F	02 09	0348 SEL2 0	9301	02	S		00116900
A F	02 11	0346 SEL1 0	9301	02	S		00116700
A F	02 12	0345 SEL0 0	9301	02	S		00116500
A F	02 14	0343 UNSEL1 1	9301	02			00139600
A F	02 15	0342 UNSEL0 1	9301	02			00138900
A F	03 01	0641 ENRDCK 1A	7474	01			00049000
A F	03 02	0642 READDAT 1	74S74	01			00094200
A F	03 03	0643 RDCLOCK 1	74S74	01			00087900
A F	03 05	0645 RD 1	74S74	01	S		00081700
A F	03 08	0547 RDATA 0	74S74	01	S		00082000
A F	03 09	0546 RDATA 1	74S74	01	S		00082200
A F	03 11	0544 MCLK 0	74S74	01			00073600
A F	03 12	0543 RD 1	74S74	01			00081800
A F	03 13	0542 ENROCK 1A	7474	01			00049100
A F	04 02	0842 WRDATA 1	74S74	01			00154200
A F	04 03	0843 MCLK 0A	74S74	01			00074000
A F	04 05	0845 DRWDAT 1	74S74	01	S		00032300
A F	04 08	0747 SECENF 0	74S74	05	S		00108100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	F 04 10	0745 SECENF	0	74S74	05		00108200
A	F 04 11	0744 MOOSEC	1	74S74	05		00076900
A	F 04 12	0743 SECAGR	1	74S74	05		00106600
A	F 04 13	0742 BUSY	1A	74S74	05		00014900
A	F 05 05	1045 RDCLOCK	1	74S05	01		00088000
A	F 05 06	1046 RDCLOCK	0	74S05	01	S	00087400
A	F 05 08	0947 SVCLOCK	0	74S05	01	S	00130600
A	F 05 09	0946 SVCLOCK	1	74S05	01		00131100
A	F 05 10	0945 EVENSTG	1	74S05	05	S	00050600
A	F 05 11	0944 EVENSTG	0	74S05	05		00050300
A	F 05 12	0943 DRVBSY	1	74S05	02	S	00031100
A	F 05 13	0942 DRVBSY	0	74S05	02		00030800
A	F 06 01	1241 RDCLOCK	0	RCPCCK	01		00087500
A	F 06 02	1242 RDCLOCK	0	RCPCCK	01		00087600
A	F 06 03	1243 SVCLOCK	0	RCPCCK	01		00130700
A	F 06 04	1244 SVCLOCK	0	RCPCCK	01		00130800
A	F 06 05	1245 RDCLOCK	1A	RCPCCK	01		00088500
A	F 06 06	1246 RDCLOCK	1A	RCPCCK	01		00088600
A	F 06 07	1247 VCC1241	1	RCPCCK	01		00149500
A	F 06 08	1248 GND1241	0	RCPCCK	01	S	00057200
A	F 06 09	1148 SVCLOCK	1A	RCPCCK	01		00131600
A	F 06 10	1147 SVCLOCK	1A	RCPCCK	01		00131700
A	F 06 11	1146 GND1241	0	RCPCCK	01		00057300
A	F 06 12	1145 VCC1241	1	RCPCCK	01		00149600
A	F 06 13	1144 GND1241	0	RCPCCK	01		00057400
A	F 06 14	1143 VCC1241	1	RCPCCK	01		00149700
A	F 06 15	1142 GND1241	0	RCPCCK	01		00057500
A	F 06 16	1141 VCC1241	1	RCPCCK	01	S	00149800
A	F 07 01	1441 SECENF	0	74S10	05		00108300
A	F 07 02	1442 SECAGR	0	74S10	05		00106300
A	F 07 03	1443 BY3	1	74S10	04		00017500
A	F 07 04	1444 SKOLSK	0	74S10	04		00124500
A	F 07 05	1445 T7	1	74S10	04		00133700
A	F 07 06	1446 BY3T7	0	74S10	04	S	00017700
A	F 07 08	1347 MCLKR	1	74S10	01	S	00075900
A	F 07 09	1346 HDRERB	0	74S10	01		00062300
A	F 07 10	1345 DVINH	0	74S10	01		00039000
A	F 07 12	1343 SECINHA	0	74S10	05	S	00110300
A	F 07 13	1342 RDWRHR	1	74S10	05		00089200
A	F 08 01	1641 RESET2	0	7474	02		00097600

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	F 08 03 1643	FSKEND2	1	7474	02		00055000
A	F 08 05 1645	FATN2	1	7474	02	S	00052300
A	F 08 09 1546	FATN3	1	7474	02	S	00052500
A	F 08 11 1544	FSKEND3	1	7474	02		00055300
A	F 08 13 1542	RESET3	0	7474	02		00097800
A	F 09 03 1843	SCAN2	1	9309	02		00102800
A	F 09 04 1844	FSKEND0	1	9309	02		00054400
A	F 09 05 1845	FSKEND1	1	9309	02		00054700
A	F 09 06 1846	FSKEND2	1	9309	02		00055100
A	F 09 07 1847	FSKEND3	1	9309	02		00055400
A	F 09 09 1748	FATN3	1	9309	02		00052600
A	F 09 10 1747	FATN2	1	9309	02		00052400
A	F 09 11 1746	FATN1	1	9309	02		00052100
A	F 09 12 1745	FATN0	1	9309	02		00051900
A	F 09 13 1744	SCAN1	1	9309	02		00102100
A	F 09 15 1742	ATNMX	1	9309	02	S	00002600
A	F 10 02 2042	SCAN1	1	7474	03		00102200
A	F 10 03 2043	SCANRCK	0	7474	03		00104800
A	F 10 05 2045	SCANR1	1	7474	03	S	00104500
A	F 10 09 1946	SCANR2	1	7474	03	S	00104700
A	F 10 11 1944	SCANRCK	0	7474	03		00104900
A	F 10 12 1943	SCAN2	1	7474	03		00102900
A	F 11 01 2241	MCLK	1	74500	03		00075100
A	F 11 02 2242	FATN	0	74500	03		00051600
A	F 11 03 2243	SCANRCK	0	74500	03	S	00105000
A	F 11 04 2244	MCLK	1	74500	03		00075200
A	F 11 05 2245	MCLK	1	74500	03		00075300
A	F 11 06 2246	MCLK	0B	74500	03	S	00074500
A	F 11 08 2147	INTRCL	0	74500	04	S	00067800
A	F 11 09 2146	RECL	0	74500	04		00094800
A	F 11 10 2145	INTLK	1	74500	04		00067600
A	F 11 11 2144	INDXEN	0	74500	05	S	00065800
A	F 11 12 2143	CYLHDEN	1	74500	05		00025700
A	F 11 13 2142	CYLTG	1	74500	05		00026600
A	F 12 01 2441	MCLK	1A	S112	04		00075600
A	F 12 02 2442	MCORS	1	S112	04		00073100
A	F 12 03 2443	MCOEN	1	S112	04		00071400
A	F 12 05 2445	MCO	1	S112	04	S	00071200
A	F 12 06 2446	MCO	0	S112	04	S	00070900

P	LOCATIONN	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	F 12 07	2447 MCOH8	0	S112	04	S	00071700
A	F 12 09	2348 MCOH9	1	S112	04	S	00072400
A	F 12 11	2346 BY0	1	S112	04		00015500
A	F 12 12	2345 BY2	1	S112	04		00016600
A	F 12 13	2344 TAGCLK	1	S112	04		00135900
A	F 12 14	2343 TAGTME	1	S112	04		00136200
A	F 12 15	2342 CLRMODE	0	S112	04		00020400
A	F 13 01	2641 TAGCLK	1	S112	04		00136000
A	F 13 02	2642 BY5	1	S112	04		00018400
A	F 13 03	2643 BY2	1	S112	04		00016700
A	F 13 05	2645 CYLTG	1	S112	04	S	00026700
A	F 13 06	2646 CYLTG	0	S112	04	S	00026200
A	F 13 09	2548 CYLHDEN	1	S112	04	S	00025800
A	F 13 11	2546 BY14T2	1	S112	04		00016100
A	F 13 12	2545 BY25T4	1	S112	04		00017100
A	F 13 13	2544 MCLK	1A	S112	04		00075700
A	F 13 14	2543 TAGTME	1	S112	04		00136300
A	F 13 15	2542 TAGTME	1	S112	04		00136400
A	F 14 05	2845 CONTAGT	1	74164	04	S	00022200
A	F 14 08	2747 MCLK	0B	74164	04		00074600
A	F 14 09	2746 CNTRLN	1	74164	04		00021000
A	F 14 12	2743 EXEN	1	74164	04	S	00050900
A	F 15 01	3041 UNTSEL1	0	RES	06		00142500
A	F 15 02	3042 SEKEND1	1	RES	06		00114000
A	F 15 03	3043 UNTSEL2	0	RES	06		00143300
A	F 15 04	3044 SEKEND2	1	RES	06		00114800
A	F 15 05	3045 UNTSEL3	0	RES	06		00144100
A	F 15 06	3046 SEKEND3	1	RES	06		00115600
A	F 15 07	3047 ONCYLDR	0	RES	02		00078700
A	F 15 08	2947 UNTSELO	0	RES	01		00141700
A	F 15 09	2946 SEKEND0	1	RES	01		00113200
A	F 15 10	2945 UNITROY	0	RES	02		00137800
A	F 15 11	2944 USEL8	1	RES	02	S	00148500
A	F 15 12	2943 WPROT	1	RES	03		00150800
A	F 15 13	2942 DBUSY	1	RES	03		00029500
A	F 16 01	3241 VCC1	1	POT	01		00149300
A	F 16 06	3246 POTF16	1	POT	01	S	00080700
A	F 16 14	3143 POTF16	1	POT	01	S	00080800
A	F 16 16	3141 VCC1	1	POT	01	S	00149400

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	F 17 01	3441 VCC2	1	POT	01		00149900
A	F 17 06	3446 POTF17	1	POT	01	S	00081000
A	F 17 14	3343 POTF17	1	POT	01	S	00081100
A	F 17 16	3341 VCC2	1	POT	01	S	00150000
A	G 01 01	0230 SVCLOCK	1	74107	01		00131200
A	G 01 02	0231 GND0230	0	S112	01		00056900
A	G 01 05	0234 WRCLKEN	1	74107	01	S	00153600
A	G 01 08	0237 GND0230	0	S112	01	S	00057000
A	G 01 09	0137 RDCLKEN	1	74107	01	S	00087200
A	G 01 12	0134 GND0230	0	S112	01		00057100
A	G 01 13	0133 RDCLOCK	1	S112	01		00088100
A	G 01 14	0132 ENRDCK	1	S112	01		00048600
A	G 01 15	0131 WRCLKRS	0	S112	01		00154000
A	G 02 01	0430 SERVCK0	0	74S20	01		00118600
A	G 02 02	0431 SERVCK1	0	74S20	01		00119100
A	G 02 04	0433 SERVCK2	0	74S20	01		00119600
A	G 02 05	0434 SERVCK3	0	74S20	01		00120100
A	G 02 06	0435 SVCLOCK	1	74S20	01	S	00131300
A	G 02 08	0336 RDCLOCK	1	74S20	01	S	00088200
A	G 02 09	0335 RDCK0	0	74S20	01		00084700
A	G 02 10	0334 RDCK1	0	74S20	01		00084900
A	G 02 12	0332 RDCK2	0	74S20	01		00085100
A	G 02 13	0331 RDCK3	0	74S20	01		00085300
A	G 03 01	0630 RDATA0	0	74S20	01		00082300
A	G 03 02	0631 RDATA1	0	74S20	01		00082500
A	G 03 04	0633 RDATA2	0	74S20	01		00082700
A	G 03 05	0634 RDATA3	0	74S20	01		00082900
A	G 03 06	0635 READDAT	1	74S20	01	S	00094300
A	G 03 08	0536 RRELDLDR	0	74S20	02	S	00098700
A	G 03 12	0532 RELDR	1	74S20	02		00096200
A	G 03 13	0531 BTCEN	1	74S20	02		00010500
A	G 04 01	0830 UNSELJ	1	74S00	01		00139000
A	G 04 02	0831 SERVCK0	1	74S00	01		00118800
A	G 04 03	0832 SERVCK0	0	74S00	01	S	00118700
A	G 04 04	0833 SERVCK1	1	74S00	01		00119400
A	G 04 05	0834 UNSEL1	1	74S00	01		00139700
A	G 04 06	0835 SERVCK1	0	74S00	01	S	00119200
A	G 04 08	0736 SERVCK2	0	74S00	01	S	00119700
A	G 04 09	0735 SERVCK2	1	74S00	01		00119900

P	LOCATTON	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	G 04 10 0734	UNSEL2 1	74S00	01			00140300
A	G 04 11 0733	SERVCK3 0	74S00	01	S		00120200
A	G 04 12 0732	SERVCK3 1	74S00	01			00120400
A	G 04 13 0731	UNSEL3 1	74S00	01			00140900
A	G 05 01 1030	EN0221 1	1KPU	01	S		00039400
A	G 05 02 1031	EN0821 1	1KPU	01	S		00040000
A	G 05 03 1032	WXX1679 0	RES	03	S		00156300
A	G 05 04 1033	DVINH 0	1KPU	02			00039100
A	G 05 05 1034	EN1421 1	1KPU	02	S		00042200
A	G 05 06 1035	EN1621 1	1KPU	02	S		00042400
A	G 05 07 1036	EN0850 1	RES	01	S		00042000
A	G 05 08 0936	DRV8SY 1	1KPU	02			00031200
A	G 05 09 0935	EVENSTG 1	1KPU	05			00050700
A	G 05 10 0934	ENG12 1	RES	01	S		00046300
A	G 05 11 0933	END17 1	RES	01	S		00046000
A	G 05 12 0932	ENG16 1	RES	01	S		00046900
A	G 05 13 0931	ENC17 1	RES	01	S		00045500
A	G 05 14 0930	VCCG06 1	RES	02	S		00150100
A	G 06 04 1233	OPENCBL 1	RES	02	S		00079700
A	G 06 13 1133	VCCG06 1	RES	02			00150200
A	G 07 03 1432	FSKEND0 1	74175	02	S		00054500
A	G 07 04 1433	SKEND0 0	74175	02			00121300
A	G 07 05 1434	SKEND1 0	74175	02			00121500
A	G 07 06 1435	FSKEND1 1	74175	02	S		00054800
A	G 07 09 1337	SCANCK 0	74175	02			00103300
A	G 07 11 1335	FSKEND2 1	74175	02	S		00055200
A	G 07 12 1334	SKEND2 0	74175	02			00121700
A	G 07 13 1333	SKEND3 0	74175	02			00121900
A	G 07 14 1332	FSKEND3 1	74175	02	S		00055500
A	G 08 01 1630	RESET0 0	7474	02			00097200
A	G 08 03 1632	FSKEND0 1	7474	02			00054600
A	G 08 05 1634	FATNO 1	7474	02	S		00052000
A	G 09 09 1535	FATN1 1	7474	02	S		00052200
A	G 08 11 1533	FSKEND1 1	7474	02			00054900
A	G 08 13 1531	RESET1 0	7474	02			00097400
A	G 09 02 1831	GND1830 0	74S74	05			00057600
A	G 09 03 1832	TNXP 0	74S74	05			00069600
A	G 09 04 1833	SETINXF 0	74S74	05			00120900

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	G 09 06 1335	INXFD 0	74S74	05	S		00068900
A	G 09 07 1836	GND1830 0	74S74	05	S	GND	00057700
A	G 09 09 1735	FAK 1	74S74	03	S		00051100
A	G 09 11 1733	ACK 1	74S74	03			00000500
A	G 09 12 1732	GATN 1	74S74	03			00056300
A	G 09 13 1731	GATN 1	74S74	03			00056400
A	G 10 01 2030	INDXEN 0	74S00	05			00065900
A	G 10 02 2031	INTLK 0	7400	05			00067300
A	G 10 03 2032	SETTIME 1	7400	05	S		00121100
A	G 10 04 2033	FMWSHR 0	7400	05			00053800
A	G 10 05 2034	RDWHDR 0	7400	05			00089000
A	G 10 06 2035	SETEN 1	7400	05	S		00120700
A	G 10 08 1936	SETINXF 0	7400	05	S		00121000
A	G 10 09 1935	SETTIME 1	7400	05			00121200
A	G 10 10 1934	SETEN 1	7400	05			00120800
A	G 10 11 1933	RDWRHR 1	7400	05	S		00089300
A	G 10 12 1932	RDWHDR 0	7400	05			00089100
A	G 10 13 1931	RDHWSH 0	7400	05			00088800
A	G 11 01 2230	UNTSEL1 1	RES	06			00142900
A	G 11 02 2231	SEKEND1 0	RES	06			00113600
A	G 11 03 2232	UNTSEL2 1	RES	06			00143700
A	G 11 04 2233	SEKEND2 0	RES	06			00114400
A	G 11 05 2234	UNTSEL3 1	RES	06			00144500
A	G 11 06 2235	SEKEND3 0	RES	06			00115200
A	G 11 07 2236	QNCYLDR 1	RDIP	02			00079100
A	G 11 08 2136	UNTSELO 1	RES	01			00142100
A	G 11 09 2135	SEKEND0 0	RES	01			00112800
A	G 11 10 2134	UNITRDY 1	RES	02			00138200
A	G 11 11 2133	USEL8 0	RES	02	S		00148300
A	G 11 12 2132	WPROT 0	RES	03			00150400
A	G 11 13 2131	DBUSY 0	RES	03			00029100
A	G 12 01 2430	US1 1	75107	06			00145500
A	G 12 02 2431	US1 0	75107	06			00145300
A	G 12 04 2433	UNSEL1 1	75107	01	S		00139800
A	G 12 05 2434	ENG12 1	75107	01			00046400
A	G 12 06 2435	ENG12 1	75107	01			00046500
A	G 12 08 2336	ENG12 1	75107	01			00046600
A	G 12 09 2335	SKEND1 0	75107	06	S		00121600
A	G 12 11 2333	SKND1 1	75107	06			00123400
A	G 12 12 2332	SKND1 0	75107	06			00123200

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	G 13 01	2630 EN1821	1	1KPU	04	S	00042600
A	G 13 02	2631 EN2021	1	1KPU	04	S	00042800
A	G 13 03	2632 EN2221	1	1KPU	04	S	00043000
A	G 13 04	2633 EN2421	1	1KPU	04	S	00043600
A	G 13 05	2634 EN2621	1	1KPU	04	S	00043800
A	G 13 06	2635 EN2821	1	1KPU	04	S	00044000
A	G 13 07	2636 EN3021	1	1KPU	04	S	00044200
A	G 13 08	2536 EN3221	1	1KPU	04	S	00044400
A	G 13 09	2535 ENJ16	1	RES	01	S	00047500
A	G 13 10	2534 EN117	1	RES	01	S	00045000
A	G 14 01	2830 SRVCK1	0	75107	01		00125800
A	G 14 02	2831 SRVCK1	1	75107	01		00126000
A	G 14 04	2833 SERVCK1	1	74500	01	S	00119500
A	G 14 05	2934 ENG12	1	75107	01		00046700
A	G 14 06	2835 ENG12	1	75107	01		00046800
A	G 14 08	2736 UNSEL1	1	75107	01		00139900
A	G 14 09	2735 RDCK1	0	75107	06	S	00085000
A	G 14 11	2733 RDCLK1	1	75107	06		00086100
A	G 14 12	2732 RDCLK1	0	75107	06		00085900
A	G 15 01	3030 RDATA1	0	75107	06		00083500
A	G 15 02	3031 RDATA1	1	75107	06		00083700
A	G 15 04	3033 RDATA1	0	75107	06	S	00082600
A	G 15 05	3034 UNSEL1	1	75107	01		00140000
A	G 15 08	2936 UNSEL2	1	75107	01		00140400
A	G 15 09	2935 RDATA2	0	75107	06	S	00082800
A	G 15 11	2933 RDATA2	1	75107	06		00084100
A	G 15 12	2932 RDATA2	0	75107	06		00083900
A	G 16 01	3230 US2	1	75107	06		00145900
A	G 16 02	3231 US2	0	75107	06		00145700
A	G 16 04	3233 UNSEL2	1	75107	01	S	00140500
A	G 16 05	3234 ENG16	1	75107	01		00047000
A	G 16 06	3235 ENG16	1	75107	01		00047100
A	G 16 08	3136 ENG16	1	75107	01		00047200
A	G 16 09	3135 SKND2	0	75107	06	S	00121800
A	G 16 11	3133 SKND2	1	75107	06		00123800
A	G 16 12	3132 SKND2	0	75107	06		00123600
A	G 17 01	3430 SRVCK2	0	75107	01		00126200
A	G 17 02	3431 SRVCK2	1	75107	01		00126400
A	G 17 04	3433 SERVCK2	1	75107	01	S	00120000

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	G 17 05	3434 ENG16	1	75107	01		00047300
A	G 17 06	3435 ENG16	1	75107	01		00047400
A	G 17 08	3336 UNSEL2	1	75107	01		00140600
A	G 17 09	3335 RDCK2	0	75107	06	S	00085200
A	G 17 11	3333 RDCLK2	1	75107	06		00086500
A	G 17 12	3332 RDCLK2	0	75107	06		00086300
A	H 01 01	0221 USO	0	75107	01		00144900
A	H 01 02	0222 USO	1	75107	01		00145100
A	H 01 04	0224 UNSELO	1	75107	01	S	00139100
A	H 01 05	0225 EN0221	1	75107	01		00039500
A	H 01 06	0226 EN0221	1	75107	01		00039600
A	H 01 08	0127 EN0221	1	75107	01		00039700
A	H 01 09	0126 SKNDO	0	75107	01	S	00121400
A	H 01 11	0124 SKNDO	1	75107	01		00123000
A	H 01 12	0123 SKNDO	0	75107	01		00122800
A	H 02 01	0421 SRVCK0	0	75107	01		00125400
A	H 02 02	0422 SRVCK0	1	75107	01		00125600
A	H 02 04	0424 SERVCK0	1	75107	01	S	00118900
A	H 02 05	0425 EN0221	1	75107	01		00039800
A	H 02 06	0426 EN0221	1	75107	01		00039900
A	H 02 08	0327 UNSELO	1	75107	01		00139200
A	H 02 09	0326 RDCK0	0	75107	01	S	00084800
A	H 02 11	0324 RDCLK0	1	75107	01		00085700
A	H 02 12	0323 RDCLK0	0	75107	01		00085500
A	H 03 01	0621 RDATA0	0	75107	01		00083100
A	H 03 02	0622 RDATA0	1	75107	01		00083300
A	H 03 04	0624 RDATA0	0	75107	01	S	00082400
A	H 03 05	0625 UNSELO	1	75107	01		00139300
A	H 03 08	0527 UNSEL3	1	75107	01		00141000
A	H 03 09	0526 RDATA3	0	75107	06	S	00083000
A	H 03 11	0524 RDATA3	1	75107	06		00084500
A	H 03 12	0523 RDATA3	0	75107	06		00084300
A	H 04 01	0821 UNSELO	1	75110	01		00139400
A	H 04 02	0822 DRWDAT	1	75110	01		00032400
A	H 04 03	0823 EN0821	1	75110	01		00040100
A	H 04 04	0824 EN0821	1	75110	01		00040200
A	H 04 05	0825 EN0821	1	75110	01		00040300
A	H 04 06	0826 SERVCK0	1	75110	01		00119000
A	H 04 08	0727 WRCLK0	1	75110	01	S	00151400

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	H 04 09 0726	WRCLK0 0	75110	01	S		00151100
A	H 04 10 0725	EN0821 1	75110	01			00040400
A	H 04 12 0723	RWDATA0 0	75110	01	S		00099000
A	H 04 13 0722	RWDATA0 1	75110	01	S		00099300
A	H 05 01 1021	FLT 0	75107	02			00053300
A	H 05 02 1022	FLT 1	75107	02			00053500
A	H 05 04 1024	UNSAFE 0	75107	02	S		00138800
A	H 05 06 1026	DVINH 0	75107	02			00039200
A	H 05 09 0926	SKINC 0	75107	02	S		00122700
A	H 05 11 0924	SKERR 0	75107	02			00122100
A	H 05 12 0923	SKERR 1	75107	02			00122300
A	H 06 01 1221	ONCYL 1	75107	02			00078300
A	H 06 02 1222	ONCYL 0	75107	02			00078100
A	H 06 04 1224	ONCYL 1A	75107	02	S		00078600
A	H 06 06 1226	DVINH 0	75107	02			00039300
A	H 06 09 1126	DRVRDY 1	75107	02	S		00031600
A	H 06 11 1124	UNTRDY 0	75107	02			00141300
A	H 06 12 1123	UNTRDY 1	75107	02			00141500
A	H 07 01 1421	GTAG 1	75110	02			00061700
A	H 07 02 1422	GTAG 1	75110	02			00061800
A	H 07 05 1425	DSEL1 1	75110	02			00033400
A	H 07 06 1426	DSEL1 1	75110	02			00033500
A	H 07 08 1327	USEL1 1	75110	02	S		00146800
A	H 07 09 1326	USEL1 0	75110	02	S		00146500
A	H 07 10 1325	EN1421 1	75110	02			00042300
A	H 07 12 1323	USEL1TAG 0	75110	02	S		00148700
A	H 07 13 1322	USEL1TAG 1	75110	02	S		00149000
A	H 09 01 1621	DSEL2 1	75110	02			00034300
A	H 08 02 1622	DSEL2 1	75110	02			00034400
A	H 08 05 1625	DSEL4 1	75110	02			00034800
A	H 08 06 1626	DSEL4 1	75110	02			00034900
A	H 08 08 1527	USEL4 1	75110	02	S		00148000
A	H 08 09 1526	USEL4 0	75110	02	S		00147700
A	H 08 10 1525	EN1621 1	75110	02			00042500
A	H 08 12 1523	USEL2 0	75110	02	S		00147100
A	H 08 13 1522	USEL2 1	75110	02	S		00147400
A	H 09 01 1821	BUS0 1	75110	04			00011000
A	H 09 02 1822	BUS0 1	75110	04			00011100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	H 09 05	1825 BUS1	1	75110	04		00011300
A	H 09 06	1826 BUS1	1	75110	04		00011400
A	H 09 08	1727 BIT1	1	75110	04	S	00004300
A	H 09 09	1726 BIT1	0	75110	04	S	00004000
A	H 09 10	1725 EN1821	1	75110	04		00042700
A	H 09 12	1723 BIT0	0	75110	04	S	00003400
A	H 09 13	1722 BIT0	1	75110	04	S	00003700
A	H 10 01	2021 BUS2	1	75110	04		00011600
A	H 10 02	2022 BUS2	1	75110	04		00011700
A	H 10 05	2025 BUS3	1	75110	04		00011900
A	H 10 06	2026 BUS3	1	75110	04		00012000
A	H 10 08	1927 BIT3	1	75110	04	S	00005500
A	H 10 09	1926 BIT3	0	75110	04	S	00005200
A	H 10 10	1925 EN2021	1	75110	04		00042900
A	H 10 12	1923 BIT2	0	75110	04	S	00004600
A	H 10 13	1922 BIT2	1	75110	04	S	00004900
A	H 11 01	2221 BUS4	1	75110	01		00012200
A	H 11 02	2222 BUS4	1	75110	01		00012300
A	H 11 03	2223 MCOHB	0A	75110	04		00071900
A	H 11 05	2225 BUS5	1	75110	01		00012500
A	H 11 06	2226 BUS5	1	75110	01		00012600
A	H 11 08	2127 BIT5	1	75110	01	S	00006900
A	H 11 09	2126 BIT5	0	75110	01	S	00006600
A	H 11 10	2125 EN2221	1	75110	04		00043100
A	H 11 12	2123 BIT4	0	75110	01	S	00005800
A	H 11 13	2122 BIT4	1	75110	01	S	00006200
A	H 12 01	2421 BUS6	1	75110	04		00012800
A	H 12 02	2422 BUS6	1	75110	04		00012900
A	H 12 05	2425 BUS7	1	75110	04		00013100
A	H 12 06	2426 BUS7	1	75110	04		00013200
A	H 12 08	2327 BIT7	1	75110	04	S	00008100
A	H 12 09	2326 BIT7	0	75110	04	S	00007800
A	H 12 10	2325 EN2421	1	75110	04		00043700
A	H 12 12	2323 BIT6	0	75110	04	S	00007200
A	H 12 13	2322 BIT6	1	75110	04	S	00007500
A	H 13 01	2621 CYL256	1	75110	04		00024600
A	H 13 02	2622 CYLTG	1	75110	04		00026800
A	H 13 03	2623 CYLTG	1	75110	04		00026900
A	H 13 04	2624 CYLTG	0	75110	04		00026300

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A H 13 05 2625	CNTRLEN	1	75110	04			00021100
A H 13 06 2626	DSTL	1	75110	04			00038600
A H 13 08 2527	BIT8	1	75110	04	S		00008800
A H 13 09 2526	BIT8	0	75110	04	S		00008400
A H 13 10 2525	EN2621	1	75110	04			00043900
A H 13 12 2523	BIT8	0	75110	04	S		00008500
A H 13 13 2522	BIT8	1	75110	04	S		00008900
A H 14 01 2821	INDX	1	75107	04			00065600
A H 14 02 2822	INDX	0	75107	04			00065400
A H 14 04 2824	INDXP	0	75107	04	S		00066100
A H 14 06 2826	EN2821	1	75107	04			00044100
A H 14 09 2726	SCTRP	0	75107	04	S		00106100
A H 14 11 2724	SCTR	0	75107	04			00105600
A H 14 12 2723	SCTR	1	75107	04			00105800
A H 15 01 3021	MCOHB	1	75110	04			00072500
A H 15 02 3022	CYLHDEN	1	75110	04			00025900
A H 15 05 3025	CYLTG	1	75110	04			00027000
A H 15 06 3026	CYLHDEN	1	75110	04			00026000
A H 15 08 2927	TAG1	1	75110	04	S		00134100
A H 15 09 2926	TAG1	0	75110	04	S		00133800
A H 15 10 2925	EN3021	1	75110	04			00044300
A H 15 12 2923	TAG2	0	75110	04	S		00134400
A H 15 13 2922	TAG2	1	75110	04	S		00134700
A H 16 01 3221	CONTAG	1	75110	04			00022000
A H 16 02 3222	CNTRLEN	1	75110	04			00021200
A H 16 03 3223	RELTAG3	0	75110	04			00096500
A H 16 04 3224	CYLTG	1	75110	04			00027100
A H 16 05 3225	CYLTG	1	75110	04			00027200
A H 16 06 3226	CYL512	1	75110	04			00025200
A H 16 08 3127	BIT9	1	75110	04			00009900
A H 16 09 3126	BIT9	0	75110	04	S		00009400
A H 16 10 3125	EN3221	1	75110	04			00044500
A H 16 12 3123	TAG3	0	75110	04	S		00135000
A H 16 13 3122	TAG3	1	75110	04	S		00135400
A H 17 01 3421	SRVCK3	0	75107	01			00126600
A H 17 02 3422	SRVCK3	1	75107	01			00126800
A H 17 04 3424	SERVCK3	1	75107	06	S		00120500
A H 17 05 3425	ENJ16	1	75107	01			00047600
A H 17 06 3426	ENJ16	1	75107	01			00047700

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I-D.
A	H 17 08	3327 UNSEL3	1	75107	01		00141100
A	H 17 09	3326 RDCK3	0	75107	06	S	00085400
A	H 17 11	3324 RDCLK3	1	75107	06		00086900
A	H 17 12	3323 RDCLK3	0	75107	06		00086700
A	J 01 01	0212 FAULT	0	RES			00052850
A	J 01 02	0213 SEEKERR	0	RES			00112650
A	J 01 05	0216 FAULT	1	RES			00053150
A	J 01 06	0217 SEEKERR	1	RES			00112350
A	J 01 15	0113 +5VCCA	1	RES	02		00000360
A	J 01 16	0112 +5VCCA	1	RES	02	S	00000350
A	J 02 01	0412 UNTSEL1	1	RES	06		00143000
A	J 02 02	0413 UNTSELO	0	RES	01		00141800
A	J 02 03	0414 UNTSEL1	0	RES	06		00142600
A	J 02 04	0415 SEKENDO	0	RES	01		00112900
A	J 02 05	0416 SEKEND1	0	RES	06		00113700
A	J 02 06	0417 SRVCKO	0	RES	01		00127000
A	J 02 08	0318 SEKEND1	1	RES	06		00114100
A	J 02 09	0317 READCKO	0	RES	01		00089400
A	J 02 10	0316 SRVCKO1	0	RES	06		00127600
A	J 02 11	0315 READD0	0	RES	01		00091800
A	J 02 12	0314 SRVCKO1	1	RES	06		00127900
A	J 03 01	0612 UNTSELO	1	RES	01		00142200
A	J 03 02	0613 UNTSELO	0	RES	01		00141900
A	J 03 03	0614 SEKENDO	1	RES	01		00113300
A	J 03 04	0615 SEKENDO	0	RES	01		00113000
A	J 03 05	0616 SRVCKO	1	RES	01		00127300
A	J 03 06	0617 SRVCKO	0	RES	01		00127100
A	J 03 09	0517 SRVCKO	0	RES	01	S	00125500
A	J 03 10	0516 SRVCKO	1	RES	01	S	00125700
A	J 03 11	0515 SKNDO	0	RES	01	S	00122900
A	J 03 12	0514 SKNDO	1	RES	01	S	00123100
A	J 03 13	0513 USO	0	RES	01	S	00145000
A	J 03 14	0512 USO	1	RES	01	S	00145200
A	J 04 01	0812 READCK1	0	RES	06		00090000
A	J 04 02	0813 UNTSELO	1	RDIP	01		00142300
A	J 04 03	0814 READCK1	1	RES	06		00090300
A	J 04 04	0815 SEKENDO	1	RDIP	01		00113400
A	J 04 05	0816 READD1	0	RES	06		00092400
A	J 04 06	0817 SRVCKO	1	RDIP	01		00127400

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	J 04 08	0719 READD1	RES	06			00092700
A	J 04 09	0717 READCK0	RDIP	01			00089700
A	J 04 11	0715 READ00	RDIP	01			00092100
A	J 05 01	1012 READCK0	RDIP	01			00089800
A	J 05 02	1013 READCK0	RDIP	01			00089500
A	J 05 03	1014 FAULT	RDIP	02			00053000
A	J 05 04	1015 FAULT	RDIP	02			00052700
A	J 05 05	1016 READ00	RDIP	02			00092200
A	J 05 06	1017 READ00	RDIP	02			00091900
A	J 05 09	0917 RDATA0	RDIP	02	S		00083200
A	J 05 10	0916 RDATA0	RDIP	02	S		00083400
A	J 05 11	0915 FLT	RDIP	02	S		00053400
A	J 05 12	0914 FLT	RDIP	02	S		00053600
A	J 05 13	0913 RDCLK0	RDIP	01	S		00085600
A	J 05 14	0912 RDCLK0	RDIP	01	S		00085800
A	J 06 01	1212 BIT3	RES	04			00005300
A	J 06 02	1213 BIT3	RDIP	04			00085600
A	J 06 03	1214 BIT4	RES	04			00005900
A	J 06 04	1215 FAULT	RDIP	02			00053100
A	J 06 05	1216 BIT4	RDIP	04			00006300
A	J 06 06	1217 SEEKERR	RDIP	02			00112500
A	J 06 08	1118 BIT7	RES	04			00007900
A	J 06 09	1117 ONCYLDR	RDIP	02			00079200
A	J 06 10	1116 BITS	RES	04			00006700
A	J 06 11	1115 UNITRDY	RDIP	02			00130300
A	J 06 12	1114 BITS	RDIP	04			00007000
A	J 06 13	1113 USELYAG	RDIP	02			00149100
A	J 06 14	1112 BIT8	RDIP	04			00009000
A	J 07 01	1412 ONCYLDR	RDIP	02			00079300
A	J 07 02	1413 ONCYLDR	RDIP	02			00078800
A	J 07 03	1414 UNITRDY	RDIP	02			00138400
A	J 07 04	1415 UNITRDY	RDIP	02			00137900
A	J 07 05	1416 SEEKERR	RDIP	02			00112600
A	J 07 06	1417 SEEKERR	RDIP	02			00112200
A	J 07 09	1317 SKERR	RDIP	02	S		00122200
A	J 07 10	1316 SKERR	RDIP	02	S		00122400
A	J 07 11	1315 UNTRDY	RDIP	02	S		00141400
A	J 07 12	1314 UNTRDY	RDIP	02	S		00141600
A	J 07 13	1313 ONCYL	RDIP	02	S		00078200
A	J 07 14	1312 ONCYL	RDIP	02	S		00078400

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	J 09 01	1612 SRV0CK2 0	RES	06			00128200
A	J 08 02	1613 UNTSEL2 0	RES	06			00143400
A	J 08 03	1614 SRV0CK2 1	RES	06			00128500
A	J 08 04	1615 UNTSEL2 1	RES	06			00143800
A	J 08 05	1616 READCK2 0	RES	06			00090600
A	J 08 08	1518 READCK2 1	RES	06			00090900
A	J 08 10	1516 READD2 0	RES	06			00093000
A	J 08 11	1515 SEKEND2 0	RES	06			00114500
A	J 08 12	1514 READD2 1	RES	06			00093300
A	J 08 13	1513 SEKEND2 1	RES	06			00114900
A	J 09 01	1812 UNTSEL1 1	RES	06			00143100
A	J 09 02	1813 UNTSEL1 0	RES	06			00142700
A	J 09 03	1814 SEKEND1 0	RES	06			00113800
A	J 09 04	1815 SEKEND1 1	RES	06			00114200
A	J 09 05	1816 SRV0CK1 0	RES	06			00127700
A	J 09 06	1817 SRV0CK1 1	RES	06			00128000
A	J 09 07	1818 READCK1 0	RES	06			00090100
A	J 09 08	1718 RDCLK1 0	RES	06	S		00086000
A	J 09 09	1717 SRVCK1 1	RES	01	S		00126100
A	J 09 10	1716 SRVCK1 0	RES	01	S		00125900
A	J 09 11	1715 SKND1 1	RES	06	S		00123500
A	J 09 12	1714 SKND1 0	RES	06	S		00123300
A	J 09 13	1713 US1 1	RES	06	S		00145600
A	J 09 14	1712 US1 0	RES	06	S		00145400
A	J 10 01	2012 READCK1 1	RES	06			00090400
A	J 10 02	2013 READD1 0	RES	06			00092500
A	J 10 03	2014 READD1 1	RES	06			00092800
A	J 10 04	2015 UNTSEL2 1	RES	06			00143900
A	J 10 05	2016 UNTSEL2 0	RES	06			00143500
A	J 10 06	2017 SEKEND2 0	RES	06			00114600
A	J 10 07	2018 SEKEND2 1	RES	06			00115000
A	J 10 08	1918 SKND2 1	RES	06	S		00123900
A	J 10 09	1917 SKND2 0	RES	06	S		00123700
A	J 10 10	1916 US2 1	RES	06	S		00146000
A	J 10 11	1915 US2 0	RES	06	S		00145800
A	J 10 12	1914 RDATA1 1	RES	06	S		00083800
A	J 10 13	1913 RDATA1 0	RES	06	S		00083600
A	J 10 14	1912 RDCLK1 1	RES	06	S		00086200
A	J 11 01	2212 RWDATA2 0	RES	06			00100300
A	J 11 02	2213 RWDATA0 0	RES	01			00099100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	J 11 03	2214 RWDATA2	RES	06			00100600
A	J 11 04	2215 RWDATA0	RDIP	01			00099400
A	J 11 05	2216 WRCLK2	RES	06			00152400
A	J 11 08	2118 WRCLK2	RES	06			00152700
A	J 11 12	2114 WRCLK0	RES	01			00151200
A	J 11 13	2113 WRCLK0	RDIP	01			00151500
A	J 12 01	2412 SEKEND3	RES	06			00115300
A	J 12 02	2413 UNTSEL3	RES	06			00144200
A	J 12 03	2414 SEKEND3	RES	06			00115700
A	J 12 04	2415 UNTSEL3	RES	06			00144600
A	J 12 05	2416 SRVOCK3	RES	06			00128800
A	J 12 08	2318 SRVOCK3	RES	06			00129100
A	J 12 10	2316 READCK3	RES	06			00091200
A	J 12 11	2315 READD3	RES	06			00093600
A	J 12 12	2314 READCK3	RES	06			00091500
A	J 12 13	2313 READD3	RES	06			00093900
A	J 13 01	2612 RWDATA1	RES	06			00099700
A	J 13 02	2613 RWDATA1	RES	06			00100000
A	J 13 03	2614 WRCLK1	RES	06			00151800
A	J 13 04	2615 WRCLK1	RES	06			00152100
A	J 13 05	2616 RWDATA3	RES	06			00100900
A	J 13 08	2518 RWDATA3	RES	06			00101200
A	J 13 10	2516 WRCLK3	RES	06			00153000
A	J 13 12	2514 WRCLK3	RES	06			00153300
A	J 14 01	2812 INDEX	RDIP	04			00065100
A	J 14 02	2813 INDEX	RDIP	04			00064800
A	J 14 03	2814 SECTOR	RDIP	04			00111700
A	J 14 04	2815 SECTOR	RDIP	04			00111400
A	J 14 05	2816 READD3	RES	06			00093700
A	J 14 06	2817 READD3	RES	06			00094000
A	J 14 09	2717 RDATA3	RES	06	S		00084600
A	J 14 10	2716 RDATA3	RES	06	S		00084400
A	J 14 11	2715 SCTR	RDIP	04	S		00105700
A	J 14 12	2714 SCTR	RDIP	04	S		00105900
A	J 14 13	2713 INDX	RDIP	04	S		00065500
A	J 14 14	2712 INDX	RDIP	04	S		00065700
A	J 15 01	3012 INDEX	RDIP	04			00064900
A	J 15 02	3013 INDEX	RDIP	04			00065200
A	J 15 03	3014 SECTOR	RDIP	04			00111500

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I.D.
A	J 15 04	3015 SECTOR	RDIP	04			00111800
A	J 15 05	3016 TAG3	RDIP	04			00135100
A	J 15 06	3017 TAG3	RDIP	04			00135500
A	J 15 08	2918 TAG2	RDIP	04			00134500
A	J 15 09	2917 TAG2	RDIP	04			00134800
A	J 15 10	2916 TAG1	RDIP	04			00133900
A	J 15 11	2915 TAG1	RDIP	04			00134200
A	J 15 12	2914 BIT9	RES	04			00009500
A	J 15 13	2913 BIT9	RES	04			00010000
A	J 16 01	3212 US3	75107	06			00146300
A	J 16 02	3213 US3	75107	06			00146100
A	J 16 04	3215 UNSEL3	75107	01	S		00141200
A	J 16 05	3216 ENJ16	75107	01			00047800
A	J 16 06	3217 ENJ16	75107	01			00047900
A	J 16 08	3118 ENJ16	75107	01			00048000
A	J 16 09	3117 SKEND3	75107	06	S		00122000
A	J 16 11	3115 SKND3	75107	06			00124200
A	J 16 12	3114 SKND3	75107	06			00124000
A	J 17 01	3412 SRVCK2	RES	06			00128300
A	J 17 02	3413 SRVCK2	RES	06			00128600
A	J 17 03	3414 READCK2	RES	06			00090700
A	J 17 04	3415 READCK2	RES	06			00091000
A	J 17 05	3416 READD2	RES	06			00093100
A	J 17 06	3417 READD2	RES	06			00093400
A	J 17 07	3418 UNTSEL3	RES	06			00144700
A	J 17 08	3318 US3	RES	06	S		00146200
A	J 17 09	3317 RDATA2	RES	06	S		00084200
A	J 17 10	3316 RDATA2	RES	06	S		00084000
A	J 17 11	3315 RDCLK2	RES	06	S		00086600
A	J 17 12	3314 RDCLK2	RES	06	S		00086400
A	J 17 13	3313 SRVCK2	RES	01	S		00126500
A	J 17 14	3312 SRVCK2	RES	01	S		00126300
A	K 01 01	0201 USEL1	RDIP	02			00146900
A	K 01 02	0202 USEL1	RES	02			00146600
A	K 01 03	0203 USEL2	RDIP	02			00147500
A	K 01 04	0204 USEL2	RES	02			00147200
A	K 01 05	0205 USEL4	RDIP	02			00148100
A	K 01 06	0206 USEL4	RES	02			00147800
A	K 01 08	0107 BIT0	RDIP	02			00003800
A	K 01 09	0106 BIT0	RES	02			00003500

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A K	01 10	0105 BIT1	1	RDIP	04			00004400
A K	01 11	0104 BIT1	0	RES	02			00004100
A K	01 12	0103 BIT2	1	RDIP	04			00005000
A K	01 13	0102 BIT2	0	RES	02			00004700
A K	02 01	0401 TAG2	1	CS15	04		X84	00134900
A K	02 02	0402 TAG1	0	CS15	04		XA5	00134000
A K	02 03	0403 TAG2	0	CS15	04		XA4	00134600
A K	02 04	0404 TAG3	1	CS15	04		XB3	00135600
A K	02 05	0405 SECTOR	1	CS15	04	S	XB2	00111900
A K	02 10	0305 INDEX	0	CS15	04	S	XA1	00065000
A K	02 11	0304 INDEX	1	CS15	04	S	XB1	00065300
A K	02 12	0303 SECTOR	0	CS15	04	S	XA2	00111600
A K	02 13	0302 TAG3	0	CS15	04		XA3	00135200
A K	03 01	0601 ONCYLDR	1	CS16	02	S	XB10	00079400
A K	03 02	0602 SEEKERR	0	CS16	02	S	PIN XA9	00112700
A K	03 03	0603 SEEKERR	1	CS16	02	S	PIN XB9	00112300
A K	03 04	0604 FAULT	1	CS16	02	S	XB8	00053200
A K	03 05	0605 FAULT	0	CS16	02	S	XA8	00052800
A K	03 10	0505 TAG1	1	CS16	04		XB5	00134300
A K	03 11	0504 BIT9	0	RES	04			00009600
A K	03 12	0503 BIT9	1	RES	02			00010100
A K	04 01	0801 USEL2	1	CS17	02		PIN XB15	00147600
A K	04 02	0802 USEL1	0	CS17	02		PIN XA14	00146700
A K	04 03	0803 USEL1	1	CS17	02		PIN XB14	00147000
A K	04 04	0804 USELTAG	1	CS17	02		PIN XA13	00149200
A K	04 05	0805 USELTAG	0	CS17	02		PIN X913	00148800
A K	04 07	0807 OPENCBL	0	CS17	02	S	GND	00079500
A K	04 09	0706 OPENCBL	1	CS17	02		PIN XA12	00079800
A K	04 10	0705 ONCYLDR	0	CS17	02	S	XA10	00078900
A K	04 11	0704 UNITRDY	0	CS17	02	S	XB11	00138000
A K	04 12	0703 UNITRDY	1	CS17	02	S	XA11	00138500
A K	04 13	0702 OPENCBL	0	CS17	02		PIN XR12	00079600
A K	05 01	1001 BIT2	1	CS18	04		XB20	00005100
A K	05 02	1002 BIT1	0	CS18	04		XA19	00004200
A K	05 03	1003 BIT1	1	CS18	04		XB19	00004500
A K	05 04	1004 BIT0	0	CS18	04		XA18	00003600
A K	05 05	1005 BIT0	1	CS18	04		XB18	00003900
A K	05 09	0906 USELR	0	CS18	02		XA17	00148400
A K	05 10	0905 USEL2	0	CS18	02		PIN XA15	00147300

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A K	05 11	0904 USEL4	1	CS18	02		PIN XB16	00148200
A K	05 12	0903 USEL4	0	CS18	02		PTN XA16	00147900
A K	05 13	0902 USEL8	1	CS18	02		XB17	00148600
A K	06 01	1201 BIT7	1	CS19	04		XB25	00008200
A K	06 02	1202 BIT6	0	CS19	04		XA24	00007300
A K	06 03	1203 BIT6	1	CS19	04		XB24	00007600
A K	06 04	1204 BIT5	0	CS19	04		XA23	00006800
A K	06 05	1205 BIT5	1	CS19	04		XB23	00007100
A K	06 09	1106 BIT4	0	CS19	04		XA22	00006000
A K	06 10	1105 BIT2	0	CS19	04		XA20	00004800
A K	06 11	1104 BIT3	1	CS19	04		XB21	00005700
A K	06 12	1103 BIT3	0	CS19	04		XA21	00005400
A K	06 13	1102 BIT4	1	CS19	04		XB22	00006400
A K	07 03	1403 WPROT	0	RES	03	S	PIN XA28	00150500
A K	07 04	1404 DBUSY	0	RES	03	S		00029200
A K	07 09	1306 WPROT	1	RES	03	S	PIN XB28	00151000
A K	07 10	1305 BIT8	1	CS20	04		XB26	00009100
A K	07 11	1304 BIT7	0	CS20	04		XA25	00008000
A K	07 12	1303 BIT8	0	CS20	04		XA26	00008600
A K	07 13	1302 DBUSY	1	RES	03	S		00029600
A K	08 01	1601 BIT6	0	RES	04			00007400
A K	08 02	1602 BIT6	1	RDIP	04			00007700
A K	08 03	1603 WPROT	0	RES	03	S		00150600
A K	08 04	1604 FAULT	0	RES	02			00052900
A K	08 05	1605 SEEKERR	1	RES	02			00112400
A K	08 06	1606 WPROT	1	RES	03			00150900
A K	08 08	1507 BIT7	1	RDIP	04			00008300
A K	08 09	1506 DNCYLDR	0	RES	02			00079000
A K	08 10	1505 DBUSY	1	RES	03			00029700
A K	08 11	1504 UNITRDY	0	RES	02			00138100
A K	08 12	1503 DBUSY	0	RES	03			00029300
A K	08 13	1502 USELTAG	0	RES	02			00148900
A K	08 14	1501 BIT8	0	RES	04			00008700
A K	10 01	2001 MCOHB	1	75110	04			00072600
A K	10 02	2002 HEAD16	1	75110	04			00063200
A K	10 03	2003 MCOHB	1	75110	04			00072700
A K	10 04	2004 RELTAG3	1	75110	02			00096700
A K	10 05	2005 RELTAG3	1	75110	02			00096800
A K	10 06	2006 BUSY	0A	75110	02			00013900

P	LOCATION	SIGNAL		TYPE	SH	S	COMMENTS	I.D.
A	K 10 08	1907 TAG3	1	75110	02			00135700
A	K 10 09	1906 TAG3	0	75110	04			00135300
A	K 10 10	1905 EN2221	1	75110	04			00043200
A	K 10 12	1903 BIT4	0	75110	04			00006100
A	K 10 13	1902 BIT4	1	75110	04			00006500
A	K 11 01	2201 READDD	1	CS21	01	S	YB5	00092300
A	K 11 02	2202 READCK0	1	CS21	01	S	YB4	00089900
A	K 11 03	2203 READCK0	0	CS21	01	S	YA4	00089600
A	K 11 04	2204 SRVCK0	1	CS21	01	S	YB3	00127500
A	K 11 05	2205 SEKEND0	1	CS21	01	S	YB2	00113500
A	K 11 10	2105 UNTSELO	0	CS21	01	S	YA1	00142000
A	K 11 11	2104 UNTSELO	1	CS21	01	S	YB1	00142400
A	K 11 12	2103 SEKEND0	0	CS21	01	S	YA2	00113100
A	K 11 13	2102 SRVCK0	0	CS21	01	S	YA3	00127200
A	K 12 01	2401 SRVCK1	0	CS22	06	S	YA10	00127800
A	K 12 02	2402 SEKEND1	1	CS22	06	S	YB9	00114300
A	K 12 03	2403 SEKEND1	0	CS22	06	S	YA9	00113900
A	K 12 04	2404 UNTSEL1	1	CS22	06	S	YB8	00143200
A	K 12 05	2405 UNTSEL1	0	CS22	06	S	YA8	00142800
A	K 12 09	2305 WRCLK0	0	CS22	01		YA7	00151300
A	K 12 10	2305 READDD	0	CS22	01	S	YA5	00092000
A	K 12 11	2304 RWDATA0	0	CS22	01		YA6	00099200
A	K 12 12	2303 RWDATA0	1	CS22	01		YB6	00099500
A	K 12 13	2302 WRCLK0	1	CS22	01		YB7	00151600
A	K 13 01	2601 UNTSEL2	1	CS24	06	S	YB15	00144000
A	K 13 02	2602 WRCLK1	1	CS23	06		YB14	00152200
A	K 13 03	2603 WRCLK1	0	CS23	06		YA14	00151900
A	K 13 04	2604 RWDATA1	0	CS23	06		YA13	00099800
A	K 13 05	2605 RWDATA1	1	CS23	06		YB13	00100100
A	K 13 09	2506 READD1	1	CS23	06	S	YB12	00092900
A	K 13 10	2505 SRVCK1	1	CS23	06	S	YB10	00128100
A	K 13 11	2504 READCK1	0	CS23	06	S	YA11	00090200
A	K 13 12	2503 READCK1	1	CS23	06	S	YB11	00090500
A	K 13 13	2502 READD1	0	CS23	06	S	YA12	00092600
A	K 14 01	2801 RWDATA2	1	CS24	06		YB20	00100700
A	K 14 02	2802 READD2	0	CS24	06	S	YA19	00093200
A	K 14 03	2803 READD2	1	CS24	06	S	YB19	00093500
A	K 14 04	2804 READCK2	0	CS24	06	S	YA18	00090800
A	K 14 05	2805 READCK2	1	CS24	06	S	YB18	00091100

P	LOCATION	SIGNAL	TYPE	SH	S	COMMENTS	I-D.	
A	K 14 09	2706 SRV0CK2	0	CS24	06	S	YA17	00128400
A	K 14 10	2705 UNTSEL2	0	CS23	06	S	YA15	00143600
A	K 14 11	2704 SEKEND2	1	CS24	06	S	YB16	00115100
A	K 14 12	2703 SEKEND2	0	CS24	06	S	YA16	00114700
A	K 14 13	2702 SRV0CK2	1	CS24	06	S	YB17	00128700
A	K 15 01	3001 READCK3	1	CS25	06	S	YB25	00091600
A	K 15 02	3002 SRV0CK3	0	CS25	06	S	YA24	00128900
A	K 15 03	3003 SRV0CK3	1	CS25	06	S	YB24	00129200
A	K 15 04	3004 SEKEND3	0	CS25	06	S	YA23	00115400
A	K 15 05	3005 SEKEND3	1	CS25	06	S	YB23	00115800
A	K 15 09	2906 UNTSEL3	0	CS25	06	S	YA22	00144300
A	K 15 10	2905 RWDATA2	0	CS25	06		YA20	00100400
A	K 15 11	2904 WRCLK2	1	CS25	06		YB21	00152800
A	K 15 12	2903 WRCLK2	0	CS25	06		YA21	00152500
A	K 15 13	2902 UNTSEL3	1	CS25	06	S	YB22	00144800
A	K 16 03	3203 WRCLK3	0	CS26	06		YA28	00153100
A	K 16 04	3204 WRCLK3	1	CS26	06		YB28	00153400
A	K 16 09	3106 RWDATA3	0	CS26	06		YA27	00101000
A	K 16 10	3105 READCK3	0	CS26	06	S	YA25	00091300
A	K 16 11	3104 READD3	1	CS26	06	S	YB26	00094100
A	K 16 12	3103 READD3	0	CS26	06	S	YA26	00093800
A	K 16 13	3102 RWDATA3	1	CS26	06		YB27	00101300
A	K 17 01	3401 UNTSEL3	0	RES	06			00144400
A	K 17 02	3402 SEKEND3	0	RES	06			00115500
A	K 17 03	3403 SEKEND3	1	RES	06			00115900
A	K 17 04	3404 SRV0CK3	0	RES	06			00129000
A	K 17 05	3405 SRV0CK3	1	RES	06			00129300
A	K 17 06	3406 READCK3	0	RES	06			00091400
A	X 17 07	3407 READCK3	1	RES	06			00091700
A	K 17 08	3307 RDCLK3	1	RES	06	S		00087000
A	K 17 09	3306 RDCLK3	0	RES	06	S		00086800
A	K 17 10	3305 SRVCK3	1	RES	01	S		00126900
A	K 17 11	3304 SRVCK3	0	RES	01	S		00126700
A	K 17 12	3303 SKND3	1	RES	06	S		00124300
A	K 17 13	3302 SKND3	0	RES	06	S		00124100
A	K 17 14	3301 US3	1	RES	06	S		00146400
B	C 05 13	0973 DATAI04	1					00028700

APPENDIX B

COMPUTER INTERFACE MODULE

DC-16-C COMPUTER INTERFACE MODULE
FOR DATA GENERAL/NOVA PROCESSORS

TECHNICAL MANUAL

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February 17, 1977
TM-610-1000-1A

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1.0 INTRODUCTION

This specification defines the functional characteristics of the Computer Interface Module (CIM) that interfaces the Telefile DC-16-C Disk Controller to Data General Processors.

The CIM connects the DC-16-C to the CPU via the high speed data channel and I/O bus as shown in Figure 1. Refer to the Telefile DC-16-C Disk Controller Product Specification, SS-600-0027-2A, for a description of the CIM/DC-16-C General Interface. The CIM/Data Channel interface is in accordance with the standard I/O interface scheme defined in the Data General Reference Manual for each processor.

1.1 CIM DESCRIPTION

The CIM is a single plug-in circuit card assembly that is designed to fit inside the CPU or I/O expansion chassis. Two 100-pin edge connectors on the CIM mate with backplane receptacles to provide the CIM/Data General interface. The CIM/DC-16-C interface is accomplished by a single cable with three 34-pin connectors attached to the Data General backplane pins.

The CIM provides the following major logic functions:

- Receiver/driver circuits for bidirectional data lines.
- Interrupt handling.
- Device address selection.
- Memory address register.
- Word count register.
- Bootstrap logic.

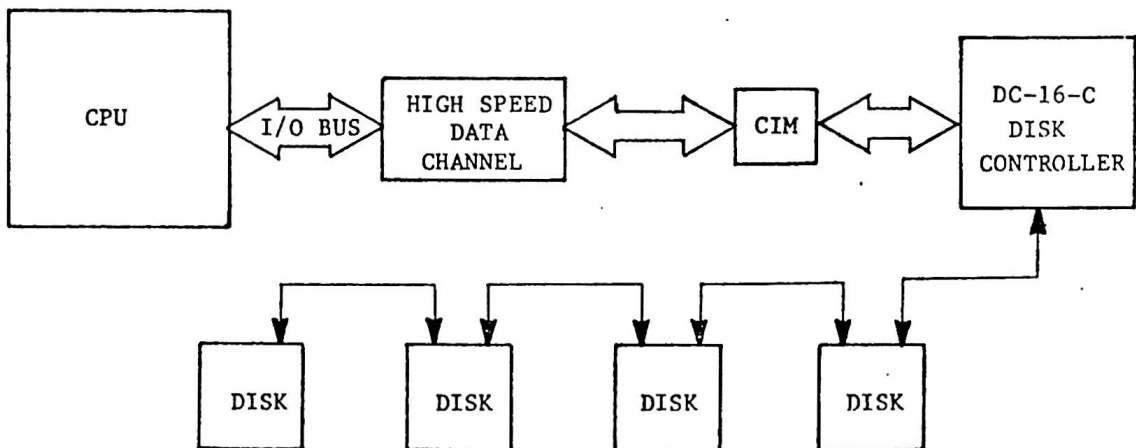


Figure 1. DC-16-C System Configuration.

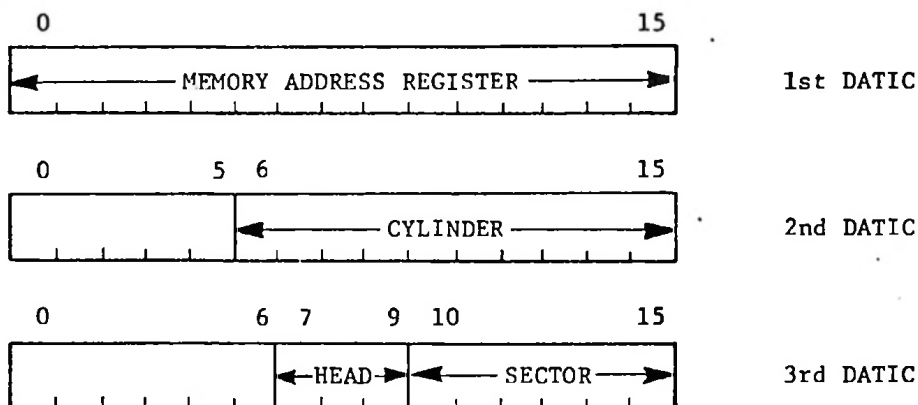
2.0 INSTRUCTIONS AND COMMANDS

The Computer Interface Module transfers appropriate commands and status responses between the CPU and the DC-16-C. Refer to the DC-16-C Product Specification for a detailed discussion of the controller commands and status word structures.

2.1 STATUS DEFINITION

Data In "A" (DATIA) is executed to transfer major status information from the DC-16-C to the CPU; Data In "B" (DATIB) transfers minor status information to the CPU. Bit assignments for the major and minor status words are shown in Figure 2. Refer to the DC-16-C Product Specification for a definition of each status bit.

Execution of three consecutive Data In "C" (DATIC) instructions will transfer the contents of the memory address, cylinder status and record status registers to the CPU as follows:



An I/O reset, a programmed I/O pulse or execution of a Data Out "A" (DATOA) will reset the DC-16-C DATIC counter, enabling the next DATIC to transfer the contents of the memory address register to the CPU.

2.2 COMMAND STRUCTURE

Controller commands are initiated when the CPU executes a DATOA instruction. To accept commands, the DC-16-C must be properly addressed and online; the drives must be powered up and at operational speed. The memory address register and word counter must be loaded before a data transfer operation is executed.

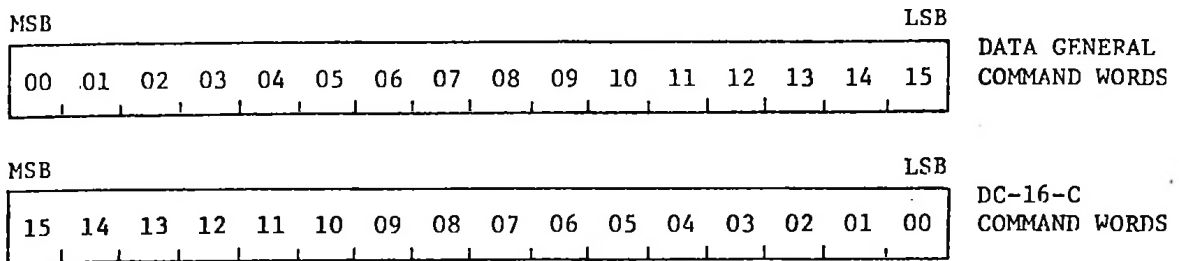
The device address is selectable by switches on the Computer Interface Module.

Controller command word organization and bit configurations are defined in the DC-16-C Product Specification.

MAJOR STATUS - FIRST WORD	DATA GENERAL I/O BUS BIT	MINOR STATUS - SECOND WORD
CONTROLLER BUSY	00	INVALID ADDRESS
CONTROLLER ALERT	01	TRACK IDENT VERIFY ERROR
SELECTED DRIVE BUSY	02	HEADER ERROR
SELECTED DRIVE ALERT	03	DATA ERROR
GATED ATTENTION	04	TRANSFER TIMING ERROR
DRIVE	05	END OF PACK
SELECTION	06	DEFECTIVE TRACK
REGISTER	07	WRITE PROTECT ERROR
SELECT ERROR	08	NO COMPARE
0	09	SELECTED DRIVE UNSAFE
0	10	SELECTED DRIVE SEEK INCOMPLETE
0	11	SELECTED DRIVE OFFLINE
DRIVE 3 ATTENTION	12	SELECTED DRIVE WRITE PROTECTED
DRIVE 2 ATTENTION	13	(not used)
DRIVE 1 ATTENTION	14	(not used)
DRIVE 0 ATTENTION	15	(not used)

Figure 2. Major/Minor Status Bit Assignments.

Observe that the bit orientation of the DC-16-C command words and the Data General command words differs as follows:



3.0 INTERFACE LINES

Following is a definition of the interface lines which connect the Computer Interface Module to the high speed data channel:

CLR, Clear; generated by the processor to clear the done and gated attention flags.

DATA0-DATA15, Data Bus; 16 bidirectional lines for status, data and control information.

DATIA, Data In "A"; generated by the processor to input major status.

DATIB, Data In "B"; generated by the processor to input minor status.

DATIC, Data In "C"; generated by the processor to input the contents of memory address, cylinder status and record status registers.

DATOA, Data Out "A"; generated by the processor to transfer commands.

DATOB, Data Out "B"; generated by the processor to transfer a starting address to the memory address register.

DATOC, Data Out "C"; generated by the processor to transfer the word count to the word count register. The word count is the 2's complement of the number of words to be transferred.

DCHA, Data Channel Acknowledge; generated by the processor at the beginning of a data channel transfer causing the Computer Interface Module to place the contents of the memory address register on the data bus.

DCHI, Data Channel In; generated by the processor during read operations to load data into the memory location specified during a DCHA operation.

DCHMO, Data Channel Mode 0; generated by the DC-16-C to indicate the direction of a data transfer operation - true when transferring data to memory; false when reading from memory.

DCHO, Data Channel Out; generated by the processor during write or write check operations to output data from the memory location specified during a DCHA operation.

DCHPI, Data Channel Priority (In); generated by the processor and transmitted serially from device to device. Indicates that data channel requests can occur if true.

DCHPO, Data Channel Priority (Out); generated by the Computer Interface Module for transmission to the next device if data channel request is cleared or if the DC-16-C is offline and data channel priority (in) is true.

DCHR, Data Channel Request; generated by the Computer Interface Module to indicate a DC-16-C request for a data channel cycle.

DS0-DS5, Device Select; six lines generated by the processor to select the device for command or status transfers.

INTA, Interrupt Acknowledge; generated by the processor during an interrupt operation causing the Computer Interface Module to place the DC-16-C device address on lines DATA10-DATA15.

INTPI, Interrupt Priority (In); generated by the processor and transmitted serially from device to device. Indicates that interrupt requests can occur if true.

INTPO, Interrupt Priority (Out); generated by the Computer Interface Module for transmission to the next device if interrupt request is cleared or the DC-16-C is offline and interrupt priority (in) is true.

INTR, Interrupt Request; generated by the Computer Interface Module indicating a DC-16-C request for a program interrupt.

IOPLS, I/O Pulse; generated by the processor causing the DC-16-C to system reset if specified by lines DS0-DS5.

IORST, I/O Reset; generated by the processor to cause an unconditional DC-16-C reset.

MSKO, Mask Out; generated by the processor and used in conjunction with a data bit to enable or disable interrupts.

RQENB, Request Enable; generated by the processor at the beginning of each memory cycle allowing the DC-16-C to request an interrupt or data channel cycle.

SELB, Selected Busy; generated by the Computer Interface Module to reflect controller busy (FBUSY) when the DC-16-C address true.

SELD, Selected Done; generated by the Computer Interface Module to reflect the done flip-flop (FDONE) when the DC-16-C address is true.

STRT, Start; generated by the processor to initiate the bootstrap sequence, qualified by device select.

4.0 GENERAL PROGRAMMING INFORMATION

Exercise caution when using the DATO or DATI instructions with an I/O pulse coded to initialize the DC-16-C, as erroneous operation could result if the controller is busy.

The DC-16-C will not accept a command while it is busy or if the selected disk drive is busy. The DC-16-C will accept a select drive command to allow operation with a different drive, however, if the selected drive is busy.

If the selected drive alert status bit is true due to a seek incomplete condition, a recalibrate command may clear the condition. If not, the drive must be powered down and then up again.

The DC-16-C does not go busy after accepting a select drive or special command, or when a linked seek command is loaded.

The DC-16-C goes busy for 10 to 20 usecs after a positioning command (seek or recalibrate) is received. The selected drive may be busy for up to 55 msec for a seek operation; 500 msec for a recalibrate operation. As soon as the DC-16-C goes not busy, a different drive can be accessed, assuming it is ready. This permits offline or overlapped seek capability.

The gated attention status bit is set when any drive attention line transitions to the true state and the DC-16-C is not busy (controller busy reset). This occurs when a drive completes a power-up sequence or upon completion of a positioning command. Exceptions to this are linked seek commands followed by data transfer commands (command codes 7 through F) and controller-generated seeks used to cross cylinder boundaries during data operations.

4.1 INTERRUPTS

Interrupt requests are inhibited by the high speed data channel when it is active. To simplify programming, interrupt requests will not be generated while the controller busy status bit is true.

An interrupt request will be generated (if the interrupt enable flip-flop is set) when either gated attention is true or the DC-16-C goes not busy. Gated attention is reset upon receipt of a clear pulse coded on a data instruction to the DC-16-C.

4.2 BOOTSTRAP FEATURE

Bootstrap operation is initiated when a start pulse is received, provided that the DC-16-C is not busy and is properly addressed. When the bootstrap feature is triggered, the DC-16-C will automatically select drive 0 and seek to cylinder 0. Starting at head 0 and record 0, the first 256 words of data will automatically be transferred from disk to the first 256 location in the processor's main memory.

4.3 LINKED SEEK AND PARTIAL RECORD OPERATION

Link seek and partial record operation is as specified in the DC-16-C Product Specification.

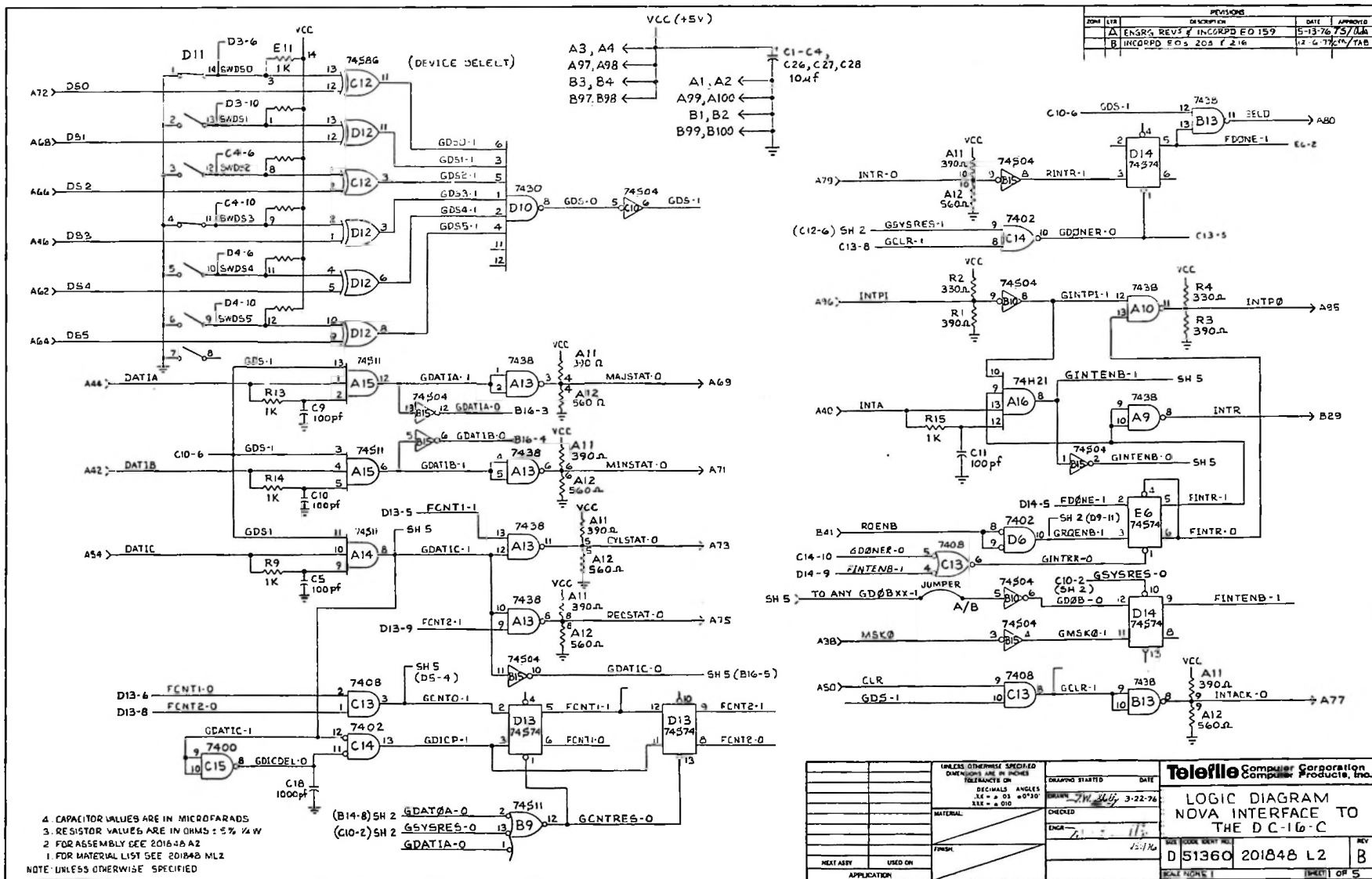
The two track identifier bits in the headers may be used in any manner to identify the track. The track identifier bits read from the track are compared with those specified during a read or write operation and must match for the operation to take place unless the track identifier check has been inhibited.

The linked seek command enables the programmer to give a seek command chained to a data command sequence without having to wait for the DC-16-C to complete its operation between commands.

COMPUTER INTERFACE MODULE

CPU/DATA GENERAL

- DC-16-C/Data General CIM Logic Diagram (201848 L2).
- DC-16-C/Data General CIM Assembly Drawing (201848 A2).
- DC-16-C to Computer Interface Module Cable (201882 A1).



REV	DATE	APPROVED
A	5-13-76	TS/LA
B	12-6-77	CM/TAB

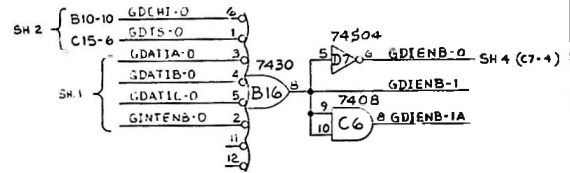
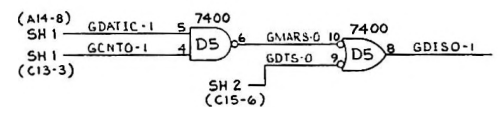
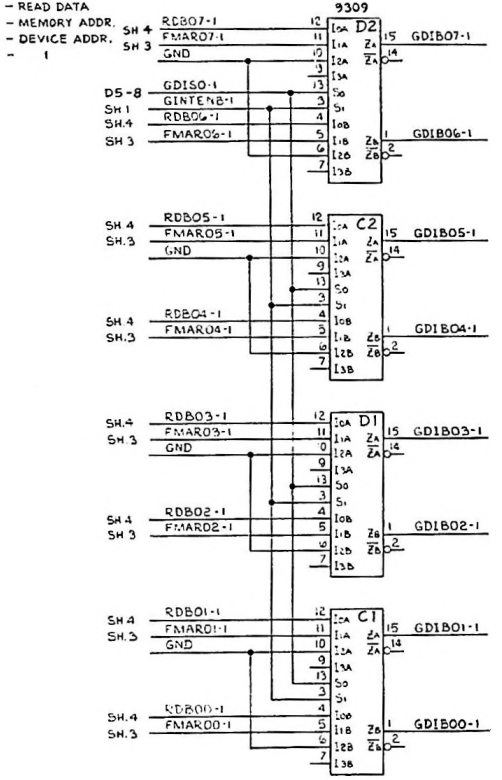
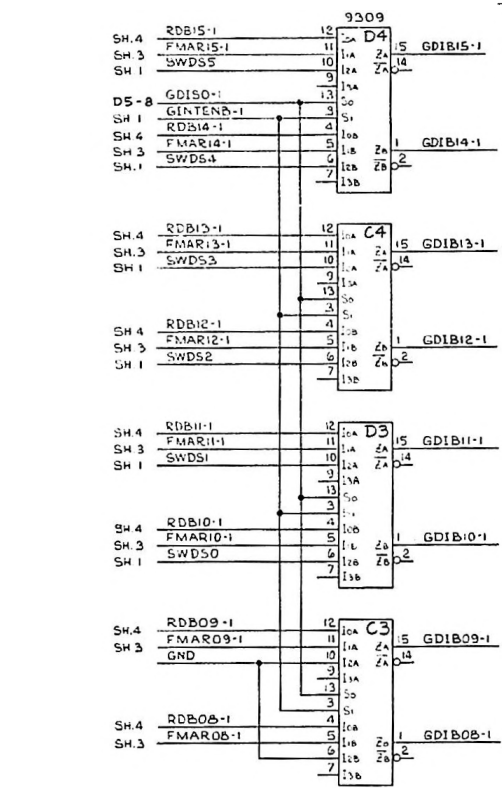
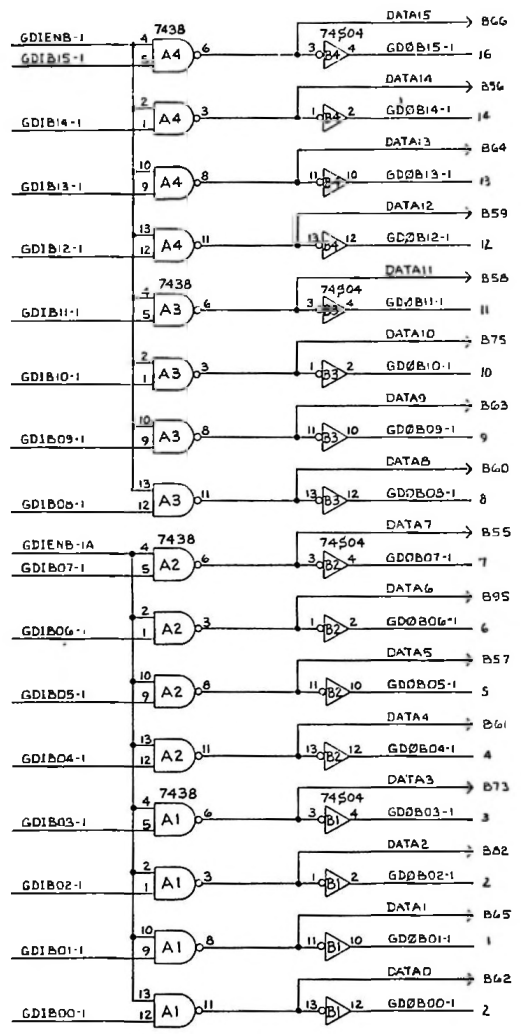
- 4. CAPACITOR VALUES ARE IN MICROFARADS
 - 3. RESISTOR VALUES ARE IN OHMS ± 5% 1/4 W
 - 2. FOR ASSEMBLY SEE 201848 A2
 - 1. FOR MATERIAL LIST SEE 201848 MLZ
- NOTE: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED		DRAWING STARTED		DATE	
DIMENSIONS ARE IN INCHES		7/11/76		3-22-76	
DECIMALS ANGLES		CHECKED			
1/16" = 0.0150"		ENGR		7/11/76	
3/32" = 0.0125"		MATERIAL			
1/8" = 0.0125"		FINISH			
1/4" = 0.0125"		NEXT ASBY		USED ON	
3/8" = 0.0125"		APPLICATION			

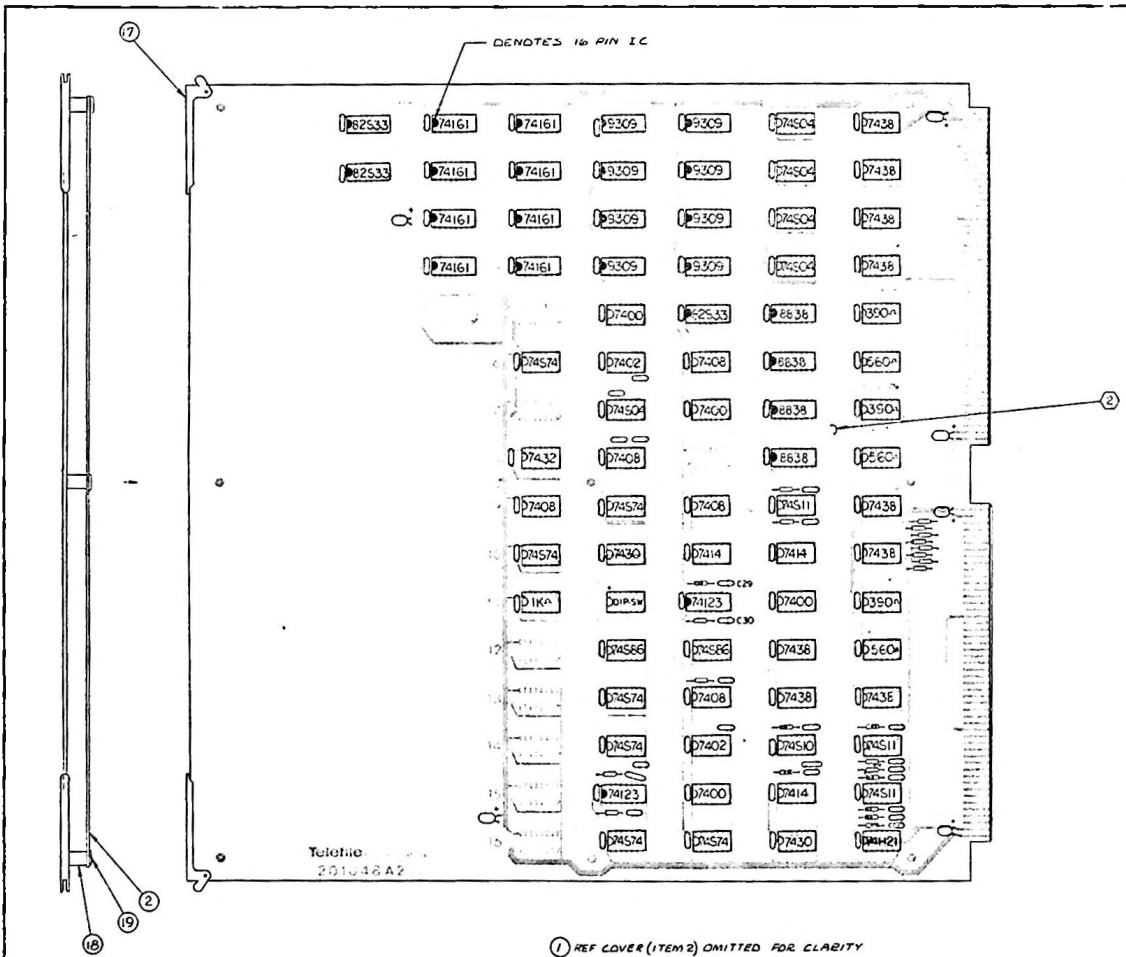
Telefile Computer Corporation Computer Products, Inc.			
LOGIC DIAGRAM NOVA INTERFACE TO THE D C-16-C			
REV	CODE	DATE	REV
D	51360	201848	L2
SCALE: NONE			SHEET: 1 OF 5

REVISIONS: SEE SH 1

S1	S0	Z
0	0	READ DATA
0	1	MEMORY ADDR.
1	0	DEVICE ADDR.
1	1	



REV#	DATE	DESCRIPTION	APPROVED
12	2-15-78	REVISED DRAWING - INC. EQ 205	[Signature]



Telefile
201C48A2

① REF COVER (ITEM 2) OMITTED FOR CLARITY

- 4. CUT COMPONENT LEADS FLUSH WITH BOARD ON SOLDER SIDE.
- 3. REF LOGIC DIAGRAM 201B4B L2.
- ② JUMPERWIRE TO BE INSTALLED AT FUNCTIONAL TEST.
- 1. ASSEMBLE COMPONENTS (PER MATERIAL LIST 201B4B ML2) AS SHOWN. NOTE: UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES UNLESS NOTED		DATE	Telefile Computer Products, Inc. PRINTED CIRCUIT BOARD ASSY, NOVA DC-16-C CPU INTERFACE
DESIGNED BY A. CARROLL	ISSUED BY L. S. BIRD	DATE 5/17/78	
MATERIAL	DATE	SCALE 1/1	SHEET 1 OF 1
DATE	CODE IDENT NO D51360	REV 3	

DC-16-C/COMPUTER INTERFACE MODULE CABLE WIRING (201882 A1)

FROM	TO	TERM
P06-A	J1-20	COMO-0
P06-K	J1-BUS	GND
P06-B	J1-26	COMACK-0
P06-L	J1-BUS	GND
P06-C	J1-04	MAJSTAT-0
P06-M	J1-BUS	GND
P06-D	J1-06	MINSTAT-0
P06-N	J1-BUS	GND
P06-E	J1-08	CYLSTAT-0
P06-P	J1-BUS	GND
P06-F	J1-10	RECSTAT-0
P06-R	J1-BUS	GND
P06-H	J1-22	DMAREQ-0
P06-S	J1-BUS	GND
P06-J	J1-24	DMAACK-0
P06-T	J1-BUS	GND
P06-V	J1-16	DMASTRB-0
P06-AD	J1-BUS	GND
P06-W	J1-25	EOXFR-0
P06-AE	J1-BUS	GND
P06-X	J1-14	INTR-0
P06-AF	J1-BUS	GND
P06-Y	J1-12	INTACK-0
P06-AH	J1-BUS	GND
P06-Z	J1-18	SYSRES-0
P06-AJ	J1-BUS	GND
P06-AA	J1-05	DOUT-0
P06-AK	J1-BUS	GND
P06-AB	J1-12	DB00-0
P06-AL	J1-BUS	GND

FROM	TO	TERM
P06-U	J1-14	DB01-0
P06-AC	J1-BUS	GND
P06-AN	J1-16	DB02-0
P06-AM	J1-BUS	GND
P06-AP	J1-20	DB03-0
P06-AY	J1-BUS	GND
P06-AR	J1-24	DB04-0
P06-AZ	J1-BUS	GND
P06-AS	J1-26	DB05-0
P06-BA	J1-BUS	GND
P06-AT	J1-28	DB06-0
P06-BB	J1-BUS	GND
P06-AU	J1-32	DB07-0
P06-BC	J1-BUS	GND
P06-AV	J1-03	DB08-0
P06-BD	J1-BUS	GND
P06-AW	J1-05	DB09-0
P06-BE	J1-BUS	GND
P06-AX	J1-13	DB10-0
P06-BF	J1-BUS	GND
P06-BJ	J1-16	DB11-0
P06-BR	J1-BUS	GND
P06-BK	J1-18	DB12-0
P06-BS	J1-BUS	GND
P06-BL	J1-17	DB13-0
P06-BT	J1-BUS	GND
P06-BH	J1-20	DB14-0
P06-BP	J1-BUS	GND
P06-BN	J1-19	DB15-0
P06-BM	J1-BUS	GND