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# Series 5 Computer System

## User Manual

Revision D

February 26, 1982

**SERIES 5 USER MANUAL**

**REVISION D**

**FEBRUARY 26, 1982**

**NOTICE**

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**ACS Manual Part Number: 690-11089-001**

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**W A R N I N G**

**This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.**

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**ALTOS SERIES 5 COMPUTER SYSTEM****USER MANUAL****SECTION 1. INTRODUCTION****GENERAL INFORMATION****Scope and Purpose of this Manual**

This User Manual is divided into seven sections (described individually in the immediately following paragraphs), with appendices A through D, and an Index.

Section 1. INTRODUCTION introduces you to the Altos Series 5 Computer System, including its features, capabilities, configurations, component parts (both hardware and software), and related publications. It is general and descriptive, but neither instructive nor tutorial.

Section 2. INSTALLATION tells you how to remove the computer from the shipping container, identify the components and physically assemble the system, following the step-by-step instructions provided. This section instructs you in doing everything short of running the diagnostics.

Section 3. DIAGNOSTICS introduces you to SUPPLEMENT 3. EXECUTING DIAGNOSTIC PROGRAMS, which provides specific instructions for executing the individual diagnostic programs, verifying proper system operation and doing everything short of installing the operating system.

Section 4. OPERATING SYSTEMS introduces you to one or more of three supplements, each one of which provides information related to operating systems in general, and provides specific instructions for installing particular operating systems.

One or more of the operating system supplements will be provided with your system. You will get only the operating system supplement related to the Operating System(s) you buy (CP/M, MP/M II, or OASIS ).

Each subsection contains all the information necessary for you to install the operating system(s) after the diagnostics have been successfully executed. The Operating System Subsection also introduces you to the supplementary manuals related to the subject operating system.



Section 5. ALTOS UTILITY PROGRAMS introduces you to SUPPLEMENT 5. ALTOS UTILITY PROGRAMS which contains specific descriptions of utility programs available at the time of printing. (Revision C contains only a description of the File Transfer Program (FTP).

Section 6. introduces you to SUPPLEMENT 6. UPGRADE KITS AND ADD KITS which provides specific instructions for increasing the capabilities of your Series 5 Computer System. When you purchase an Add Kit or an Upgrade Kit you will be provided with an Installation Procedure written specifically for that kit. After the installation is completed, that procedure should be inserted in your User Manual in this section.

Section 7. ALTOS SERIES 5 COMPUTER SYSTEM HARDWARE SPECIFICATIONS provides more specific details related to: system functions; hardware functions; physical, electrical, and environmental specifications; operating systems and programming languages.

APPENDIX A. MATRIX MAPS includes all matrix maps in the form current at time the current revision of the manual is printed. (Early releases may not have this appendix.)

APPENDIX B. SCHEMATICS includes all schematic diagrams in the form current at the time the current revision of the manual is printed.

APPENDIX C. SHIPPING DAMAGE AND SYSTEM REPAIR PROCEDURES.

APPENDIX D. INSTRUCTIONS FOR PINNING SERIES 5 PRINTED CIRCUIT BOARDS.

INDEX (Early releases may not have this section.)

### **How to Use this Manual**

This manual guides you through the complete installation process for your computer system from unpacking the shipping container through calling in and executing your application programs. Perform the following steps to set up your Series 5 Computer system.

1. Read Section 1 to become familiar with your system.
2. Refer to Section 2 and follow the instructions for unpacking your system and physically connecting the system components.
3. Refer to Section 3 and Supplement 3 and follow the instructions for configuring your system and executing the diagnostic programs that initialize the system and verify correct operation of the system components. This section also instructs you in making backup copies as required.
4. Run the diagnostic programs to verify that your system is operating properly.



5. Refer to Section 4 and the applicable Supplement 4 for information regarding the specific operating system you are using. This section tells you how to install that operating system and how to load and execute your application programs.
6. Refer to Section 5 and Supplement 5 for information regarding available Altos Utility Programs. Revision C describes only the File Transfer Program (FTP).
7. Refer to Section 6 and Supplement 6 for information regarding Upgrade Kits and Add Kits. At this time of this printing, no kits have yet been released.
8. Refer to Section 7 (which was Section 5 in the previous revision) and the appendices if more specific information is desired regarding operation of either the hardware or software.

The set up procedure and diagnostic programs are similar for all Series 5 computer models. They will vary, depending upon the configuration of your model and the peripherals included with your system. You will load and run only those diagnostics programs appropriate for your system. You will use one of three operating systems, CP/M, MP/M II or OASIS (described in Section 4). Each of these systems has its own loading procedures and operating characteristics.

## **GENERAL SYSTEM DESCRIPTION**

### **General Hardware Description**

Your Series 5 computer system is a Z80A-based multiuser system designed to fit many commercial, technical, industrial, scientific, and educational applications. It can run under either CP/M, MP/M II, or OASIS operating systems. In its basic configuration, the system is contained in a single chassis, however, additional chassis (Add Kits and Upgrade Kits) may be connected to the basic chassis to increase system capabilities.

The basic computer system includes the CPU, four RS-232-C ports, one parallel port, 192 kilobytes of RAM, all peripheral controllers, and one 5-1/4 inch floppy disk drive. You have to add a keyboard terminal, provide your own floppy diskettes and cabling. You may also want to add a printer.

The Series 5-5D also includes a five-megabyte, five-inch hard disk drive.

Series 5-15D also includes a second one-megabyte, unformatted, 5 1/4-inch floppy disk drive unit. (See Table 1-1 Series 5 Configuration Chart for further details.)

An extra hard disk drive may be added to the basic system. Up to three terminals, one serial printer and one parallel printer may also be connected to the system.

### SYSTEM COMPONENTS

A complete ACS Series 5 system includes:

A Series 5 Computer (complete with power cord, fuse and fuse cap).

Model 5-5D, or 5-15D.

A user-supplied keyboard CRT terminal (minimum of one, maximum of 3).

Serial data transmission rate of 9600 baud is required for console number 1.

A user-supplied printer (dot matrix or impact quality print)

RS-232-C serial or Centronics parallel interface, one or two (one serial and one parallel interface) printers can be supported depending on the operating system used.

User-supplied Interface Cables for the Terminal and Printer

To maintain F.C.C. Class A compliance and limit possible radio/TV interference, all interface cables should have a grounded shield and be electrically and mechanically secured to the units they are connected to.

Altos Diagnostic Program Diskette and Operating Instructions

Provided with your system.

Operating System Software and Operating Instructions

At least one operating system (CP/M, MP/M II, or OASIS) is required.

### NOTE

All operating systems are registered with the licensed seller and distributed under license to the end user to operate only on a single computer. If your operating system is CP/M, MP/M II, or OASIS it must be registered with Altos Computer Systems and the label on the diskette should identify it as being so with a version number and serial number. Do not accept any others.

Altos Series 5 User Manual

User Manual supplement applicable to your Operating System.

Table 1-1. Altos Series 5 Configuration Chart

Ser.5 Model No:	No: of Floppy Drives	No: of Hard Disk Drives	Max. No: of Users	No: of additional hard drives supported	Diagnostic Notes
5-5D	1	1	3	1*	Run both floppy and Hard Disk diagnostic tests.
5-15D	2	0	3	2**	Run floppy disk diagnostics only

\* Series 5-5D supports only the addition of one Add-5 Kit which adds 5 Mbytes of formatted hard disk storage; this Series 5-5 configuration is incompatible with an Add-10 Kit.

\*\* Series 5-15D can support the addition of one UK-5 Upgrade Kit (which adds an additional 5 Mbytes of unformatted hard disk storage) and a later addition of an Add-5 Kit (which adds another 5 Mbytes of formatted hard disk storage for a total of 10 Mbytes).

**CONVENTIONS USED IN THIS MANUAL**

Altos Computer Systems manufactures two types of equipment, "A" after the model number designates 100/115 VAC, 60 Hz equipment, and "E" after the model number designates 200/230 VAC, 50 Hz equipment. This convention is generally reflected in the part numbering scheme wherein the final three digits "001" usually designate parts manufactured for use with the 100/115 VAC equipment and "002" usually designate parts used with 200/230 VAC equipment. For brevity, the final three digits of the part number have been omitted throughout this manual.

**TERMS AND ABBREVIATIONS USED IN THIS MANUAL**

For brevity, the following abbreviations have been used in this manual:

MTU -	Magnetic Tape Unit
MTC -	Magnetic Tape Controller (Board)
HDU -	Hard Disk Unit
HDC -	Hard Disk Controller (Board)
CPU -	Central Processing Unit
PCB -	Printed Circuit Board
MBYTE -	Megabyte (One million bytes of storage)
CONSOLE -	CRT terminal with keyboard (with RS-232-C interface)

**RELATED PUBLICATIONS**

The following publications are related to and used with this Series 5 Computer System User Manual.

(LIST TO BE PROVIDED)

**SECTION 2. INSTALLING YOUR COMPUTER SYSTEM****GENERAL INFORMATION**

This section tells you how to; prepare a work station area, unpack the computer, identify the components and physically assemble the system by following the step-by-step instructions provided. This section instructs you in doing everything short of running the diagnostic programs.

You are guided through the following activities:

- a. Preparing a work station area for your computer system.
- b. Unpacking the computer and system components.
- c. Configuring your system to operate with the system components you have.
- d. Checking specifications for your system and hooking up data cables and power cords for system components.
- e. Turning on your computer system.

**PREPARING YOUR WORK STATION AREA**

Setting up your computer is a simple process. First, organize a comfortable, well-lighted work area. You must have power cords and data cables to connect every component in your computer system.

You must supply all CRT and printer interface cables your system will require. These cables are NOT supplied with your computer. You also will need at least four blank, unformatted diskettes not supplied with your system.

Carefully route all cords and cables away from traffic areas. All power cords may be plugged into a single power strip of adequate capacity, with minimal A.C. line noise interference. The line voltage requirements are 110 VAC (plus-or-minus 10%) or 220 VAC (plus-or-minus 10%) with a frequency range of 47 to 63 Hz.

ALTOS recommends you dedicate a separate power line to your Series 5 Computer System. Position your terminal away from windows to minimize screen glare. If static is a problem in your area you should minimize the risk of static damage by the use of anti-static mats and materials where appropriate; e.g. in front of each terminal and the computer.

Do not cover the air ventilation louvres on the computer.

**UNPACKING YOUR COMPUTER SYSTEM**

Remove the computer system from the shipping container as described below. Make note of the method used (if you have already opened the container, ignore step a):

- a. Turn the shipping container right side up and carefully cut the binding tape and open the container.

**CAUTION**

**Use reasonable care in opening the shipping container; sharp or pointed instruments may pierce the protective cover and scratch the finish of the computer.**

- b. Note the method of packing, and remove all of the computer components except for the computer. Store pertinent papers in a safe place for future reference. Check the components with the Shipping Container Contents List which follows in this section.
- c. Gently tip the container on its side and slide out the computer chassis and the foam packing pieces. Place the chassis on a suitable work surface and replace the molded foam pieces in the container.

**NOTE**

**It is not necessary to unlock the hard disk drive.**

- d. Store the shipping container and the packing materials in a safe place. You will need these if you wish to ship the computer in the future.

**SHIPPING CONTAINER CONTENTS LIST**

The shipping container should contain:

Warranty Card

Manual review card. Please make note of questions and problems you have as you read this manual, and return the card to the ALTOS Publications Department.

## Hardware/Software Serial Number Note Card

As you unpack your hardware and software, please note all model, name, version and serial numbers for your records.

## Quality Control Check Off List

Place this list in the pocket provided in the inside front cover of the user manual binder.

(If your Series 5 Computer was damaged in shipment, please see Appendix C.)

One Altos computer (Model 5-5D, or 5-15D).

One three-pronged power cord.

One floppy diskette containing the diagnostic programs used to test your computer system.

Either one 3A fuse (for 115 volt systems) or one 1.5A fuse (for 220 volt systems) and a fuse cap.

One operating system package containing the User Manual Subsection(s) and program floppy diskettes for the operating system(s) you selected when you purchased the computer system.

The following operating systems are available for Series 5 computer system models.

- a. CP/M is a basic operating system that supports a single user system.
- b. MP/M II is a multiuser version of CP/M.
- c. OASIS supports more system features, and can be used on both single and multiuser systems.

**ITEMS YOU MUST SUPPLY**

A keyboard CRT terminal (minimum of one, maximum of 3).

Serial data transmission rate of 9600 baud is required for console number 1.

A printer (dot matrix or impact quality print)

This is optional and is not required for elementary system operation. RS-232-C serial or Centronics parallel interface, one or two (one serial and one parallel interface) printers can be supported depending on the operating system used.



## Interface Cables for the Terminal and Printer

## NOTE

To maintain F.C.C. Class A compliance and limit possible radio/TV interference, all interface cables should have a grounded shield and be electrically and mechanically secured to the units to when they are connected.

**SYSTEM CONFIGURATION**

You will have to configure your system if you are adding a peripheral to your system, or if your system has not already been configured for the peripheral devices comprising it.

Your Series 5 Computer is configured for immediate use, no jumper configuration is required. As shipped, the system is initialized for RS-232-C serial interfacing, with Data-Terminal-Ready (DTR) handshaking. The network interface and Request-to-send (RTS), Clear-to-Send (CTS) handshaking is disabled. (Refer to Appendix D and the schematics for specific pinning details.

**SETTING UP YOUR COMPUTER SYSTEM**

Now you are ready to install fuses and power cords, and connect terminals and printers to your computer. Follow this procedure to hook up your computer system.

1. Verify that the power specifications on the serial identification tag match the voltage you are using.
2. Insert the fuse provided with your computer system in the rear panel fuse outlet and attach the fuse cap.
3. Install the three pronged power cord provided with your computer system. ALTOS recommends that you dedicate a power outlet to the sole use of your computer. This dedicated line minimizes the transient power surges and overloads that may occur on that outlet. The line voltage requirements are 110 VAC (plus-or-minus 10%) or 220 VAC (plus-or-minus 10%) with a frequency range of 47 to 63 Hz.
4. Verify console configuration and check interface cable construction. The series 5 computer RS-232-C serial ports are configured as follows.
  - a. One Start and one Stop bit.
  - b. No Parity
  - c. Eight bit word length

## NOTE

To maintain F.C.C. Class A compliance and limit possible radio/TV interference, all interface cables must have a ground shield for all conductors. All cables should be fastened with the connector retaining screws to provide a proper shield ground path.

The ALTOS connector is wired as a modem with the following RS-232-C connection wiring required.\*

PIN 1	Chassis Ground*
PIN 2	Transmitted Data
PIN 3	Received Data
PIN 4	Request-to-Send (optional - requires jumpering)
PIN 5	Clear-to-Send
PIN 6	N/C
PIN 7	Signal Ground
PIN 8	+12 V.P.C.
PIN 9	N/C
PIN 10	N/C
PIN 11	N/C
PIN 12	N/C
PIN 13	N/C
PIN 14	N/C
PIN 15	N/C
PIN 16	N/C
PIN 17	N/C
PIN 18	N/C
PIN 19	N/C
PIN 20	Data-Terminal-Ready (DTR)

Your ALTOS computer under Altos Diagnostics, CP/M and MP/M operating systems uses DTR handshaking with pin 20 and requires a minimum cable of pin 1, 2, 3, and 20 for proper operation.

The OASIS Operating System initially requires no hand shaking, hand shaking protocols may be invoked from the command level or via system generation. OASIS requires a minimum cable of pins 1, 2, and 3 for proper operation.

Most RS-232-C interface cables can be easily made using male shielded RS-232-C 25-pin D type connectors, connecting the pins in a pin-#1-to-pin#1 correspondence. All cables should be fastened with connector retaining screws to provide a proper shield ground path.

IMPLEMENTATION:

The following list defines the pin to pin connections for the cable connecting the Altos computer to the parallel printer.

ACS	PRT	SIGNAL NAME
1	1	Data strobe
2	2	Data 0
3	5	Data 3
4	3	Data 1
5	8	Data 6
6	9	Data 7
7	10	Acknowledge (currently optional)
8	11	Busy
9	4	Data 2
10	6	Data 4
11	7	Data 5
13	13	Select
15	12	Paper empty
17	31	Input prime (currently optional)
19	17	Ground
20	19	Ground
21	20	Ground
22	23	Ground
23	21	Ground
24	26	Ground
25	27	Ground
27	28	Ground
28	29	Ground
29	22	Ground
30	24	Ground
31	25	Ground
32	16	Ground
33	30	Ground
34	32	Fault

Use 35-pin D type connector in the construction of the parallel interface connector. See Appendix for the following CRT's and printers:

- a. Altos -1
  - b. Televideo
  - c. Falco
  - d. Lear-Siegler
  - e. Hazeltine 1500
5. Install the interface cables and power cords for the terminal and printer. Connect a data cable between the RS-232-terminal Serial connector port (JC) and the RS-232-C port on your terminal. Connect the proper data cable between the printer and the J9 connector port for serial type interfaces and/or JE connector port for

parallel type Centronics printer interfaces. (See Table 2-1 for port locations on the rear panel.)

Table 2-1. Back Panel Designations and Connections

DESIGNATOR	CONNECTIONS
F1	FUSE
AC INPUT	AC POWER
JA	SERIAL PRINTER
JB	CONSOLE #3 (OASIS SIO4)
JC	CONSOLE #1 (OASIS SI01)
JD	CONSOLE #2 NETWORK (OASIS SIO3)
JE	PARALLEL PRINTER (OASIS LP)
JY	SECOND HARD DISK
JZ	SECOND HARD DISK

**TURNING ON YOUR SYSTEM**

Now that you have hooked up the system peripherals, you are ready to apply power to your computer system. Follow this procedure to initialize your computer system.

1. Check the floppy disk drive(s) to make sure that they are clear. Remove shipping card board.
2. Turn on the terminal before you power up the computer. This allows you to observe output from the computer at power up.
3. Turn on the computer. You will see the following screen prompt when you power up your system. Press [SYSTEM.RESET] momentary switch on the upper right corner of the front panel if this prompting display does not appear.

@@ SELF TEST COMPLETED

ALTOS COMPUTER SYSTEMS  
MONITOR VERSION X.XX

BOOTING FROM FLOPPY DISK

INSERT FLOPPY DISK FOR AUTOLOAD

(where X.XX is the current version of the EPROM monitor program)

5. The program responds by prompting you to insert a floppy diskette into THE RH drive.

You have now unpacked and set up your computer system, and turned it on. Make backup copies of your diagnostic diskettes. You are ready to test the system components to assure that they operate properly. The testing programs you will use are contained on the ADX Diagnostic disk that came with your system. The command programs it contains should be run before you load your operating system disk. Diagnostic procedures are covered in Section 3.

**SECTION 3. DIAGNOSTICS****GENERAL INFORMATION**

This section will serve to introduce you to SUPPLEMENT 3. EXECUTING DIAGNOSTIC PROGRAMS which accompanies your Series 5 Computer System. That supplement instructs you in running the individual diagnostic programs and performing all preparatory operations before installing your operating system.

**SECTION 4. OPERATING SYSTEMS****GENERAL INFORMATION**

This section serves to introduce you to one or more versions of SUPPLEMENT 4. INSTALLING THE OPERATING SYSTEM, each of which contains all the information necessary for you to install the subject operating system after the diagnostics have been successfully executed.

One or more supplements will be provided with each Series 5 User Manual. (You will get only the Operating System Supplement related the Operating System you buy: (CP/M, MP/M, or OASIS).

The required vendor manuals related to your operating system(s) are also provided.



**SECTION 5. ALTOS UTILITIES**

**GENERAL INFORMATION**

This section will introduce you to SUPPLEMENT 5. ALTOS UTILITY PROGRAMS which accompanies you Series 5 Computer System. That supplement provides descriptive and instructive information related to whatever utility programs are available at the time of printing this manual.

**SECTION 6. UPGRADE KITS AND ADD KITS**

(NOTE: THIS INFORMATION WAS STILL BEING DEVELOPED WHEN THIS REVISION WAS PRINTED.)

**SECTION 7. HARDWARE OPERATING SPECIFICATIONS****SUMMARY OF SPECIFICATIONS**

Model: Series 5-5D, Series 5-15D

**Computer:**

## CHIP SET:

Z80A (4Mhz): CPU, DMA, CTC (X2), PIO (X2), SIO (X2).  
FD1797 floppy disk controller.

## I/O PORTS:

4 Serial (RS-232C). One of these ports can alternatively function as a high speed, multi-drop network port. Another is re-configurable for bisync operation.

1 Parallel port configured to support a printer with a standard parallel interface such as Centronics uses.

## SYSTEM MEMORY:

4K boot PROM that is switched out of memory space following initial program load.

192K of dynamic RAM based on 64K chips with parity.

**Mass Storage:**

Series 5-15D; Two Control Data 9409T, 5-1/4" flexible Disk Drive. Has expansion capabilities for one add-on 5-1/4" hard disk drive.

Series 5-5D; One Control Data 9409T, 5-1/4" flexible Disk Drive and one Seagate Technology ST506 Micro-Winchester. Has expansion capabilities for one additional add-on Seagate Technology ST506 Micro-Winchester 5 1/4" hard disk drive.

**DETAILED COMPUTER SPECIFICATIONS**

**System Memory**

MEMORY MAPPING

System memory is composed of 192K of dynamic RAM that is mapped or partitioned into one common or shared area and four user areas. The size and placement of these areas is determined by code in a PROM. The common area can be from 4K to 60K in 4K increments and can be placed anywhere in the Z80's 64K address space, but must begin and end on 4K boundaries. Each user area can take up the address space not occupied by the common area. Only one user area can be accessed at a time. The active user area is set by writing a bank select number to port 09. The user area for banks 0, 1, and 2 is 64K minus the common area, and for bank 3 twice the common area.

Mapping is done with a PROM that contains three different configurations; one for MP/M, one for multiuser OASIS and the third for diagnostics. Two bits outputted through port 09 (MM2 at bit 1 and MM1 at bit 2) control which of these maps is selected. Initially, following power on, both of these bits are set to 0 and the memory map is set for diagnostics. Following is a summary of memory configuration vs MM2 and MM1 bits:

MM2	MM1	Memory configuration
0	0	Diagnostics
0	1	OASIS
1	0	MP/M
1	1	(unassigned)

The memory configuration for MP/M sets the common area at C000 to FFFF, banks 0, 1, and 2 from 0000 to BFFF and bank 4 from 4000 to BFFF.

For OASIS the common area is set to 0000 through 4FFF, banks 0, 1, and 2 from 5000 to FFFF and bank 4 from 5000 to EFFF.

**BANK SELECTION**

Bank selection is done by writing to the PIO at port 09. UN1 and UN2 select the bank that the CPU addresses, UN3 and UN4 select the bank that the DMA addresses. Having separate numbers for the CPU and DMA permits the CPU to do processing while a sector is being located on a disk without waiting for the disk access to complete, (i.e., transfer from disk is done via the DMA).

WRITE PROTECTION

The memory has a write protect feature wherein if the write protect bit (WPRT, bit 5 at port 09) is set, the common area cannot be written into by the CPU. Writes by the DMA, however, are not inhibited. Following power on or reset this bit gets cleared and must be written again to inhibit writes.

PARITY

The dynamic memory circuit has a ninth bit added to each byte for the purpose of parity checking. If an error occurs, the Non-Maskable Interrupt (NMI) input to the CPU is pulled and the boot PROM switched back in. Code in the PROM notifies the user of a parity error.

**Boot PROM**

To allow initialization of the system, a 4K by 8 bit PROM is switched into memory space following initial power on or reset. This PROM acts as a "shadow PROM" in that it occupies system memory address space when "on" but can be switched off to accomodate a full 64K of read/write memory (RAM). By writing (anything) to port 14H, the PROM is switched out. Once out, the PROM cannot be switched in again by program control.

The PROM, when "on", occupies addresses from 0000 to 0FFF. From 1000 to 1FFF the system RAM memory is accessed. In addition, RAM addresses from 0000 to 0FFF can be written (but not read) until the PROM is switched off. From 2000 on, the PROM data is replicated as can be seen from the following table:

Memory Address	Physical memory read from	Physical memory written to
0000-0FFF	PROM 0000-0FFF	RAM 0000-0FFF
1000-1FFF	RAM 1000-1FFF	RAM 1000-1FFF
2000-2FFF	PROM 0000-0FFF	RAM 2000-2FFF
3000-3FFF	RAM 3000-3FFF	RAM 3000-3FFF
etc.		

**Floppy Disk Controller**

The floppy disk controller resides on the main processor board. It uses the Western Digital FD1797 controller chip and has the additional hardware needed to time out for seek settle, and erase head turn off.

The controller is capable of supporting two floppy drives, but the rear panel connector and cable required for an external drive is not provided.

## Hard Disk Controller

The hard disk controller resides on a separate board from the processor. It interfaces to the processor board through a 34 lead flat ribbon cable, to the internal hard disk drive through a 20 lead (radial) cable and a 34 lead (daisy-chain) cable, and to a possible external hard disk drive through another 20 lead cable which terminates at the rear panel in a 25 pin D connector (JY) and an extension of the 34 pin cable which also terminates at the rear panel in a 37 pin type D connector (JZ). D connectors are used to facilitate shielding these cables through the retaining screws.

To accommodate the next generation of drives with programmed seek capability for improved access time, the controller can be modified to output buffered seek pulses to the drive by making two cuts and adding two jumpers at S4 and S5.

To accommodate the requirements of different vendor's drives, jumpers on the PCB allow independent selection of the cylinder at which write current precompensation and write timing precompensation take place (S1). Drives with different precompensation requirements cannot be mixed on one controller, so if an ADD is used, the added drive must match the internal drive.

One external hard disk (ADD-5) can be supported. As noted, it must have the same write precompensation and seek timing requirements as the internal drive.

Sector size is selectable between 256 and 512 by two jumpers at S2. MP/M and OASIS only support 512 byte sectors.

## I/O Ports

There are four serial ports using SIOs that are buffered for RS-232C operation. Alternatively, one of the SIO ports (port address 2C at JD) can be used as a multi-drop network port at 800K baud. This SIO is able to request the DMA to sustain this high speed operation. This port is changed from an RS-232C port to a network port by the removal of the 1488 and 1489 (RS232-C line drivers and receivers), the insertion of an 26LS31 and 26LS32 (RS422 line drivers and receivers) and the changing of several jumpers on the processor board.

Another of the serial ports (port address 1C at JB) can be configured to accept external transmit and receive clocks to facilitate bisynchronous operation. This is done by changing two jumpers, S35 and S36.

Two of the serial ports have independently programmable baud rates to 9600 baud (console 1 and printer 1). For higher baud rates, provision is made to install a DIP packaged oscillator which can be used to clock either console 1 or the printer when jumpers S31 and S32 are changed from B to A. Jumper S31

controls the clock for the printer, and S32 controls the clock for console 1 (Motorola K115A crystal oscillator 308 KHz). The other two serial ports share a common programmable baud rate to 9600 baud (consoles 2 and 3). The RS232 ports support a DSR-DTR handshake. By changing shunts, CTS-RTS can be used. SIGNAL DETECT is held true.

One PIO is used to support an 18 line parallel port. This port is buffered to interface to a Centronix type printer. The connector is a 37 pin 'D', JE on the rear panel.

**Configuration Port**

The three least significant bits at port 08 are set aside to provide information on the configuration of the system. The significance of bit 2 has not been assigned. Bits 1 and 0 define the number of hard disks attached to the processor as follows:

*WRONG*  
→

Bit 1	Bit 0	Meaning
1	1	No hard disks
1	0	A hard disk at drive 1 (either internal as for a -5 or external as for an UK-5)
0	0	Hard disks at drive 1 and drive 2 (i.e., an -5 with an ADD-5)

**I/O Port Assignment**

*CONF. SURE AS  
4-2-82 11:00 AM*

PORT NUMBER	SCHEMATIC REFERENCE	FUNCTION
00-03	Y0 (DMA)	Initialize DMA.
04	Y1 (FD1797)	Input: drive/controller status. Output: commands to drive/controller.
05	(floppy disk)	Input/output: track number.
06		Input/output: sector number.
07		Input: data. Output: data when WRITING to the disk and the desired track number prior to doing a SEEK.
08	Y2 (PIO-CHA)	Input: interrupt from the floppy disk and configuration information. Output: floppy disk drive select, side select and recording density.
09	Y2 (PIO-CHB)	Input: interrupt from the hard disk. Output: memory bank select, write protect and memory mapping bits.
0A	Y2 (PIO-CHA)	Initialize channel A.
0B	Y2 (PIO-CHB)	Initialize channel B.



0C	Y3 (CTC-CH0)	Baud rate generator for console number 1 at JC.
0D	Y3 (CTC-CH1)	Baud rate generator for consoles 2 and 3 at JB and JD.
0E	Y3 (CTC-CH2)	Baud rate generator for printer at JA.
0F	Y3 (CTC-CH3)	Real time clock.
10	Y4 (PIO-CHA)	Parallel port I/O (normally used in I/O mode).
11	Y4 (PIO-CHB)	Parallel port I/O (normally used for data in an I/O mode).
12	Y4 (PIO-CHA)	Initialize channel A.
13	Y4 (PIO-CHB)	Initialize channel B.
14-17	Y5 (IPL)	IPL switch, an output to any of these ports turns off the PROM and enables system RAM (done after IPL).
1C	Y7 (SIO-CHA)	Input/output: data to I/O port at JB (normally console number 3, also bisync port).
1D	Y7 (SIO-CHA)	Input: status of channel A. Output: commands to CH A.
1E	Y7 (SIO-CHB)	Input/output: data to I/O port at JA (normally printer).
1F	Y7 (SIO-CHB)	Input: status of channel B. Output: commands to CH B.
20	Y8 (HD DSK)	Output: head number to the hard disk controller.
21	"	Output: old cylinder number prior to a SEEK, sector number prior to a READ and input/output: data (via the DMA only) during data transfer to the hard disk controller.
22	"	Output: new cylinder number to the controller.
23	"	Input: drive/controller status. Output: commands to drive/controller.
2C	Y11 (SIO-CHA)	Input/output: data to I/O port at JD (normally console number 2). Also, I/O data to network port.
2D	Y11 (SIO-CHA)	Input: status of channel A. Output: commands to CH A.
2E	Y11 (SIO-CHB)	Input/output: data to I/O port at JC (normally console number 1).
2F	Y11 (SIO-CHB)	Input: status of channel B. Output: commands to CH B.

Bit Assignment for the I/O Ports

PORT	BIT	DESCRIPTION
00-03 (DMA)		(Not applicable).
04-07 (FD1797)		(See the Western Digital data sheet).
08 (PIO-CHA)	7	Floppy disk controller interrupt input, positive true.
	6	Floppy drive side select output, 0=side 0, 1=side 1.
	5	Floppy drive select output, 0=Drive 1, 1=Drive 2.
	4	Floppy disk drive recording density output (DDEN), 0=single, 1=double.
	3	Two-sided diskette (TS), input from floppy disk drive. 0=single, 1=two-sided.
	2	Configuration bit, unassigned.
	1	Configuration bit, indicates presence of a second hard disk. 1=not present, 0=present.
	0	Configuration bit, indicates presence of a hard disk at drive 1. 1=not present, 0=present.
09 (PIO-CHB)	7	UN4, MSB of DMA memory bank select nibble.
	6	UN3, LSB of the above.
	5	WPRT, write protect bit. When set to a 1 this bit prevents writes into the common memory space.
	4	UN2, MSB of CPU memory bank select nibble.
	3	UN1, LSB of the above.
	2	MM1, LSB of memory mapping nibble.
	1	MM2, MSB of the above.
0	HDINT, hard disk controller interrupt input.	
0C (CTC-CH0)	In	2Mhz.
	Out	Baud rate for channel B of the SIO that outputs to JC (console number 1).
0D (CTC-CH1)	In	2Mhz.
	Out	Baud rate for channels A of the SIOs that output to to JB and JD (consoles number 2 and 3).
0E (CTC-CH2)	In	2Mhz.
	Out	Baud rate for channel B of the SIO that outputs to JA (printer).
0F (CTC-CH3)	In	2Mhz.
	Out	(none, used for real time clock).

10 (PIO-CHA)	7	(Unnamed) normally an input from printer to PIO
	6	SELECT, "
	5	BUSY, "
	4	PAPER EMPTY, "
	3	FAULT, "
	2	CNTL, normally an output to the printer.
	1	INPUT PRIME, "
	0	DATA STROBE, "
11 (PIO-CHB)	7	DATA 7, normally an output to the printer.
	6	DATA 6, "
	5	DATA 5, "
	4	DATA 4, "
	3	DATA 3, "
	2	DATA 2, "
	1	DATA 1, "
	0	DATA 0, "
14-17 (IPL)		(Not applicable).
1C (SIO-CHA)		(Not applicable).
1E (SIO-CHB)		(Not applicable).
20-23 (Hard disk)		(See the HARD DISK interface specification).
28 (SIO-CHA)		(Not applicable).
2A (SIO-CHB)		(Not applicable).
2C (SIO-CHA)		(Not applicable).
2E (SIO-CHB)		(Not applicable).

**Interrupt Priority Daisy Chain**

Highest priority	Y0	00	(DMA)
	Y2	08	(PIO, floppy disk interrupt)
		09	(PIO, hard disk interrupt)
	Y4	10	(PIO, user's parallel port)
		11	"
	Y3	0C	(CTC, baud rates)
		0D	"
		0E	"
		0F	(CTC, timer)
	Y7	1C	(SIO, console 3)
		1E	(SIO, printer)
	Y11	2C	(SIO, console 2)
Lowest priority		2E	(SIO, console 1)

**Mass Storage Devices**

FLOPPY DISK DRIVE SPECIFICATION SUMMARY FLEXIBLE DISK DRIVE  
(CONTROL DATA 9409T 5 1/4")

Performance Specifications

Capacity:

Unformatted Double Density

Per Disk	1 Megabyte
Per Track	6.25 Kilobytes

Altos Format (CP/M, MP/M)

Per Disk	737 Kilobytes
# of Cylinders	80
# of Head/Cyl.	2
# of Sectors/track	9
Sector Size	512 Bytes
Block Size	4 Kilobytes
# of Files	180

Altos Format (OASIS)

Per Disk	655 Kilobytes
# of Cylinders	80
# of Head/Cyl.	2
# of Sectors/track	16
Sector Size	256 Bytes
Default Directory Size	240 Files

Transfer Rate 250 Kilobytes/sec.

Latency (average) 100 msec.

Access Time

Track to Track	6 msec.
Average	132 msec.
Head Load Time	50 msec.
Settle Time	15 msec.

Functional Specifications

Disk Diameter	5 1/4"
Rotational Speed	300 RPM
Track Density	96 tpi
Total Tracks	160 (80 per side)
Encoding Method	MFM
Index Holes	1

Error Rates

Soft Read Errors	1 per 10 <sup>9</sup>
Hard Read Errors	1 per 10 <sup>12</sup>
Seek Errors	1 per 10 <sup>6</sup>

HARD DISK DRIVE SPECIFICATION SUMMARY (WINCHESTER TYPE FIXED DISK) SEAGATE TECHNOLOGY (ST506 MICROWINCHESTER)

Performance Specifications

Capacity:

Unformatted

Per Drive (Mbytes)	6.38
Per Surface (Mbytes)	1.59
Per Track (kbytes)	10.416

Formatted

Per Drive (Mbytes)	5.3
Per Surface (Mbytes)	1.25
Per Track (kbytes)	8.192
Per Sector (bytes)	256
Sectors/track	32

Logical drive formats for CP/M and MP/M:

Capacity (Mbytes)	5.3
Number of Logical Devices	1
Block Size	4 Kilobytes
# of Cylinders	152*
# of Head/Cylinder	4
# of Sectors/Track	17
Sector Size	512 Bytes
# of files	1275

Logical drive formats for OASIS:

Capacity (Mbytes)	5.3
Number of Logical Devices	1
# of Cylinders (Data)	152*
# of Heads	4
# of Sectors/Track	34
# of Bytes/Sector	256
Default Directory Size	1984 Files

\* There are 153 cylinders, the first cylinder is reserved for system use for alternate sector assignments.

Transfer rate	5.0 Megabits/sec.
Access Time	
Track to Track (ms)	3
Average (ms)	170
Maximum (ms)	500
Settling Time (ms)	15
Average latency (ms)	8.33

Functional Specifications

Disk diameter	5 1/4"
Rotational Speed (rpm)	3600 RPM
Recording Density (bpi)	7690
Track Density (tpi)	255
Number of surfaces	4
Number of Disks	2
Number of R/W heads	4
Number of Cylinders	153
Number of Tracks	612

Error Rates

Soft Read Errors	1 per $10^{10}$ bits read
Hard Read Errors	1 per $10^{12}$ bits read
Seek Errors	1 per $10^6$ seeks

GENERAL PHYSICAL SPECIFICATIONS

Environmental Requirements

	Operating	Shipping	Storage
Temperature (host ambient -F)	40 to 115	-40 to 144	-40 to 144
Relative humidity (range F)	20 to 80%		
Maximum wet bulb	78 F non-condensing		

AC Power Requirements:

Series 5-15D

100/115 VAC Installations =	1.4 Amps. Maximum
	1.0 Amps. Nominal
200/230 VAC Installations =	0.7 Amps. maximum
	0.5 Amps. nominal

Series 5-5D

100/115 VAC Installations = 2.0 Amps. Maximum  
 1.31 Amps. Nominal  
 200/230 VAC Installations = 1.0 Amps. maximum  
 0.65 Amps. nominal

Physical Dimensions:

Height (all) 6.25 inches  
 Width (all) 13.5 inches  
 Length (all) 17.0 inches

Weight:

	Series 5-5D	Series 5-15D
System	24.5 lbs.	26.5 lbs.
Shipping	36 lbs.	36 lbs.

**Jumpers on the CPU Board (11073)**

Jumpers are used on the CPU board for several reasons: 1) to indicate the system configuration (1, 2 and 3), 2) to assist in testing or debugging the board itself (4 and 42), 3) to reconfigure the operation of the serial ports (6 through 40), 4) to allow the floppy disk controller to operate with either 5.25 inch or 8 inch drives (A through L) or 5) to allow a smaller boot PROM (2716) to be used (J).

SYSTEM CONFIGURATION JUMPERS

Slide-on jumpers at 1, 2, 3 of 7D are used to indicate the system configuration. Logic level is a 1 without jumper a 0 with a jumper. (See page 7-5 for assignment.)

DEBUGGING AIDS JUMPERS

The slide-on jumpers at 4 of 11D and 39 of 11T when removed place the data buffers in a high impedance state to assist in testing. Shipped with the jumpers in place.

The slide-on jumper at 42 of 10C when installed prevents parity errors from controlling the NMI input to the CPU. Used to assist in debugging memory. Shipped with the jumper removed.

SERIAL PORT CONFIGURATION JUMPERS

Network Port Enabling Jumpers

The system is shipped with the connector at JD configured for RS 232C operation. This requires a 1488 at location 1V, a 1489 at location 2V, locations 4U and 4V vacant, jumpers at 6, 8, 10, 11, 13, 15 and 20, with the remaining jumper slots open.



JD can be reconfigured for network operation by removing the devices at locations 1V and 2V, installing an 26LS31 at 4V, installing a 26LS32 at 4V removing all the above jumpers and installing them at 6, 7, 9, 12, 14, 16, 17, 18, 19, 21, 24, 22 and 23.

#### RTS/CTS Loop Enabling Jumpers

JC (console #1) can be configured to operate with the RTS/CTS loop operational by jumpering 40 to B and 41 to A. Normally shipped with this loop defeated, 40 to A and 41 to B.

JD (console #2) can be configured to operate with the RTS/CTS loop operational by removing jumpers 6 and 8 and installing them at 5 and 7.

JB (console #3) can be configured to operate with the RTS/CTS loop operational by jumpering 34 to B and 33 to A. Normally shipped with this loop defeated, 34 to A and 33 to B.

JA (printer) can be configured to operate with the RTS/CTS loop operational by jumpering 38 to A and 37 to B. Normally shipped with this loop defeated, 38 to B and 37 to A.

#### Optional On-Board Baud Rate Generator Jumpers

Console number 1 and/or the printer can be operated at baud rates other than can be derived from the on-board CTC. This is done by adding a DIP packaged oscillator at 11U and changing the jumpers at 31 and/or 32 to the A position. These are normally shipped with the jumpers in the B position.

**APPENDIX A**

**MATRIX MAPS**

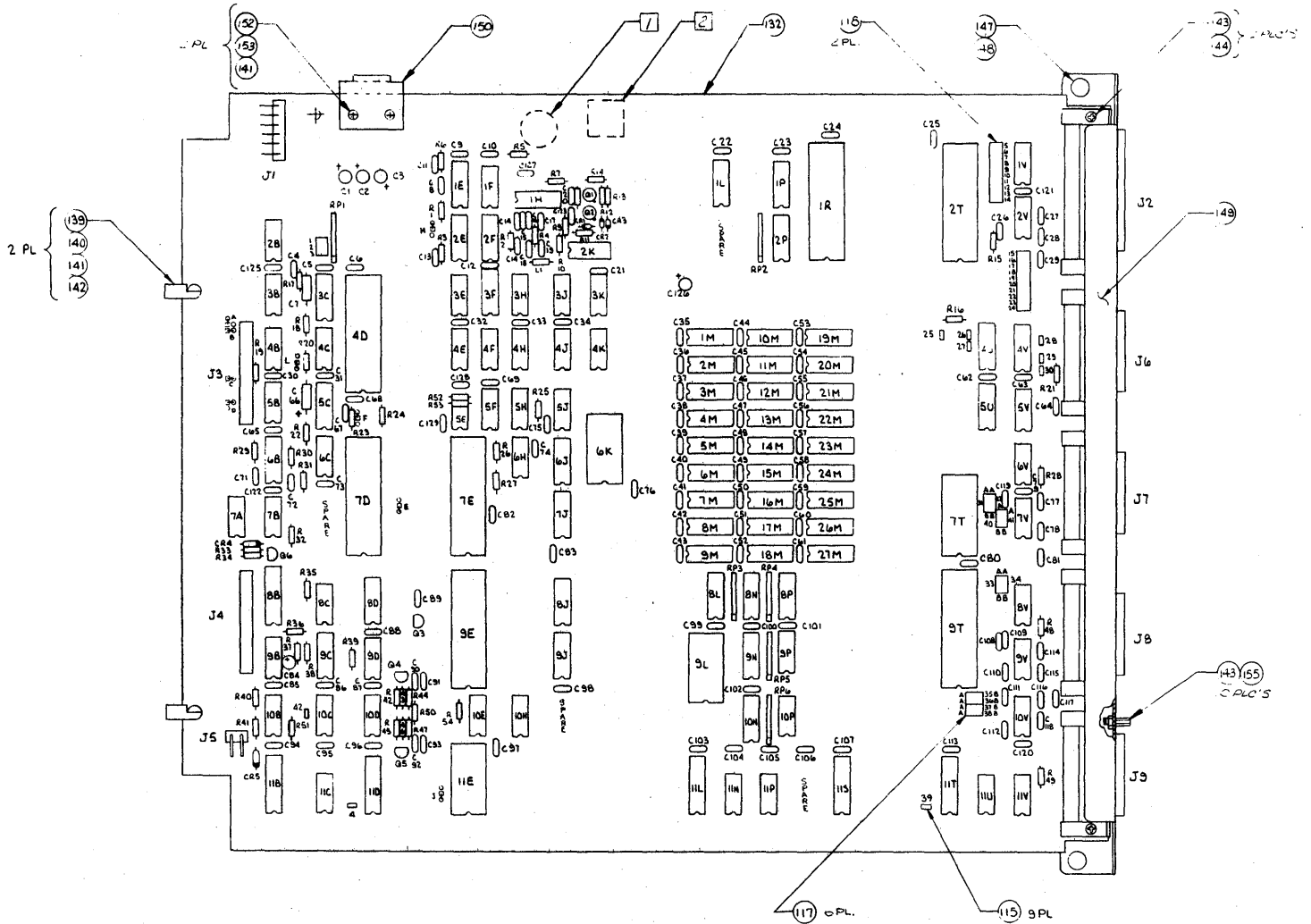


Figure A-1. Z80 Mini Computer PCB Matrix Map

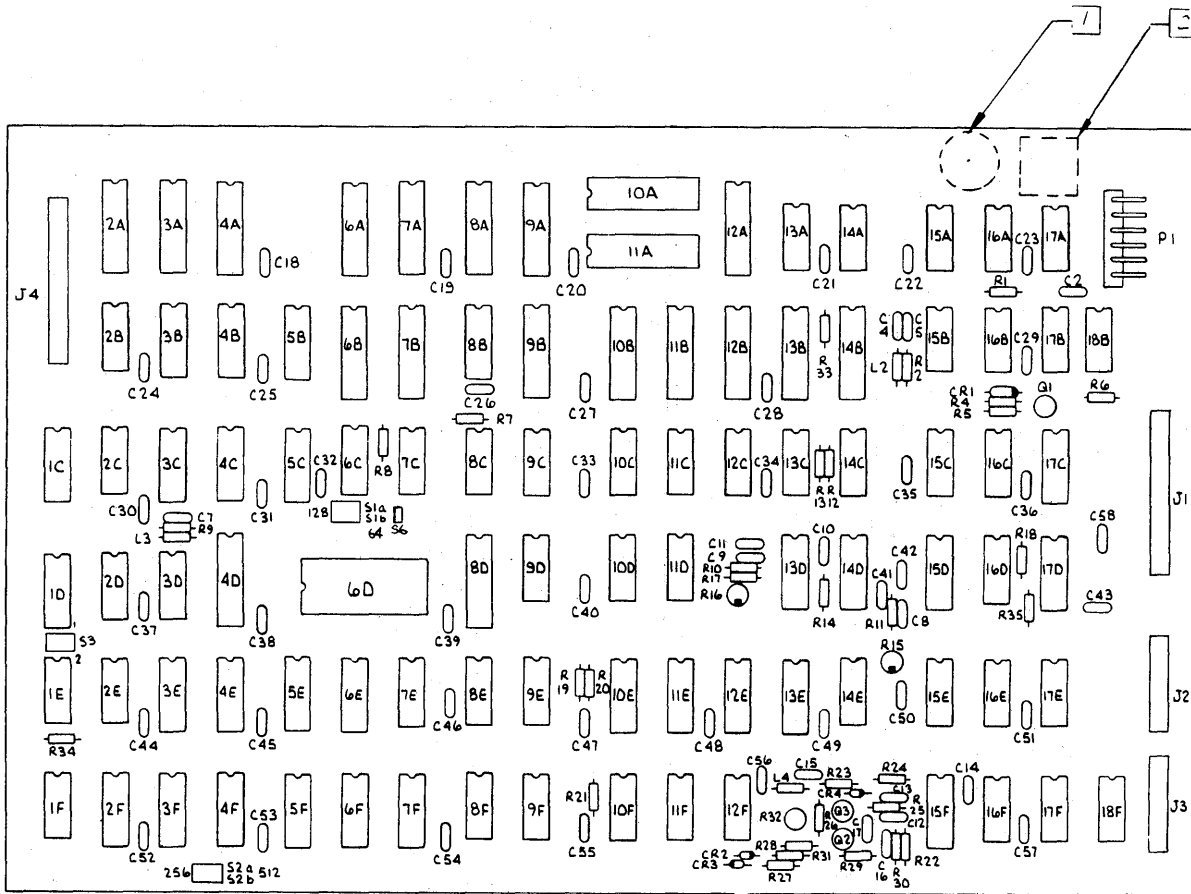
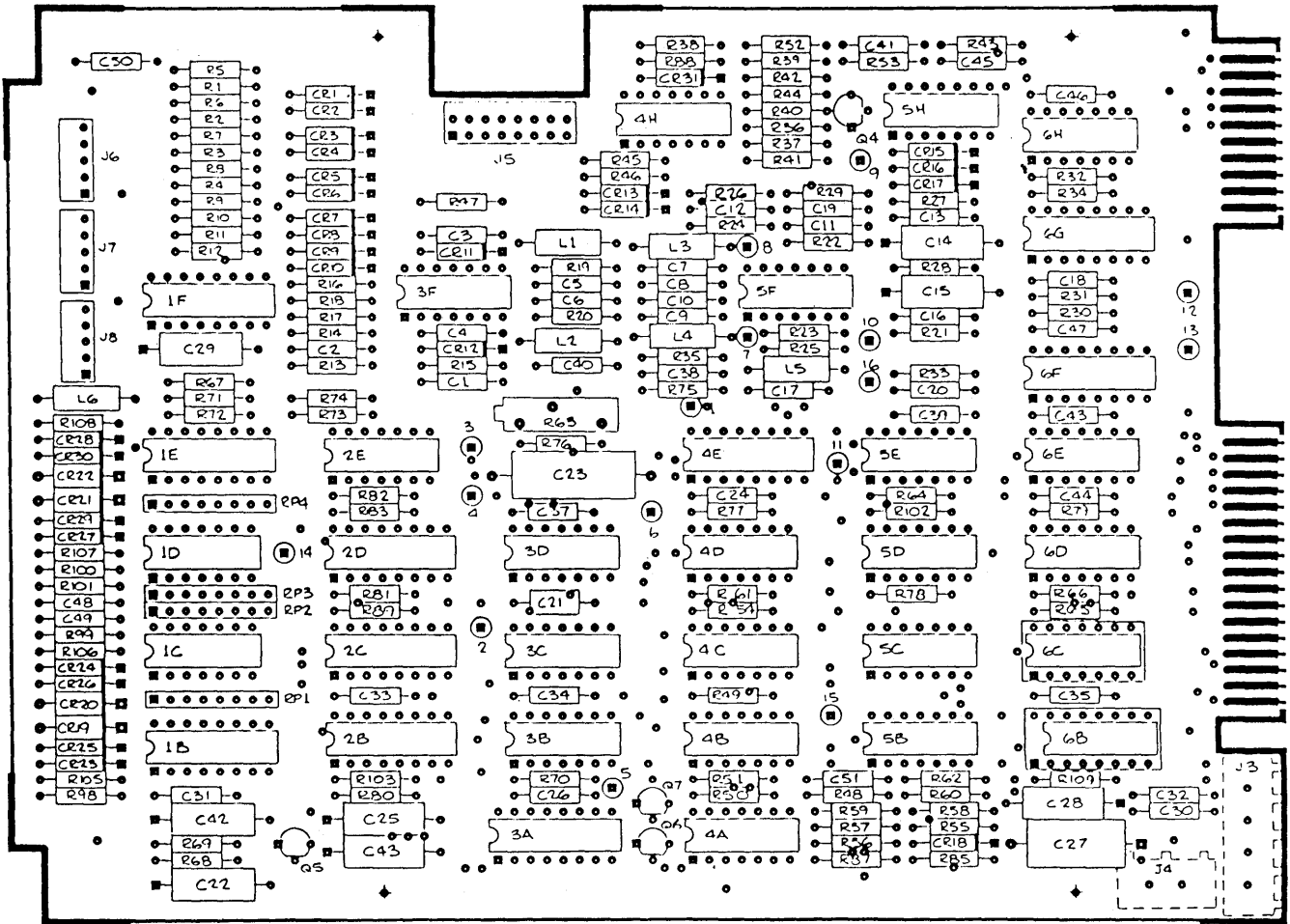
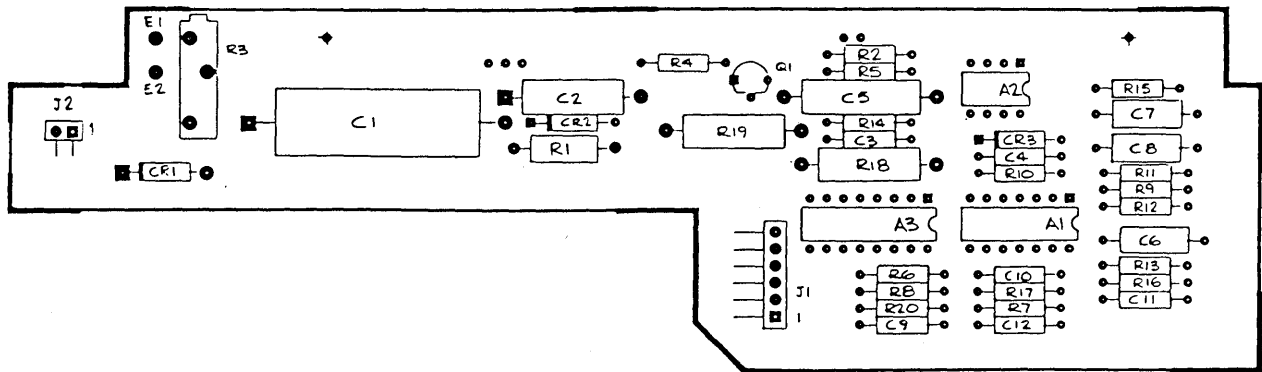


Figure A-2. 5-1/4 Inch Hard Disk Controller PCB Matrix Map

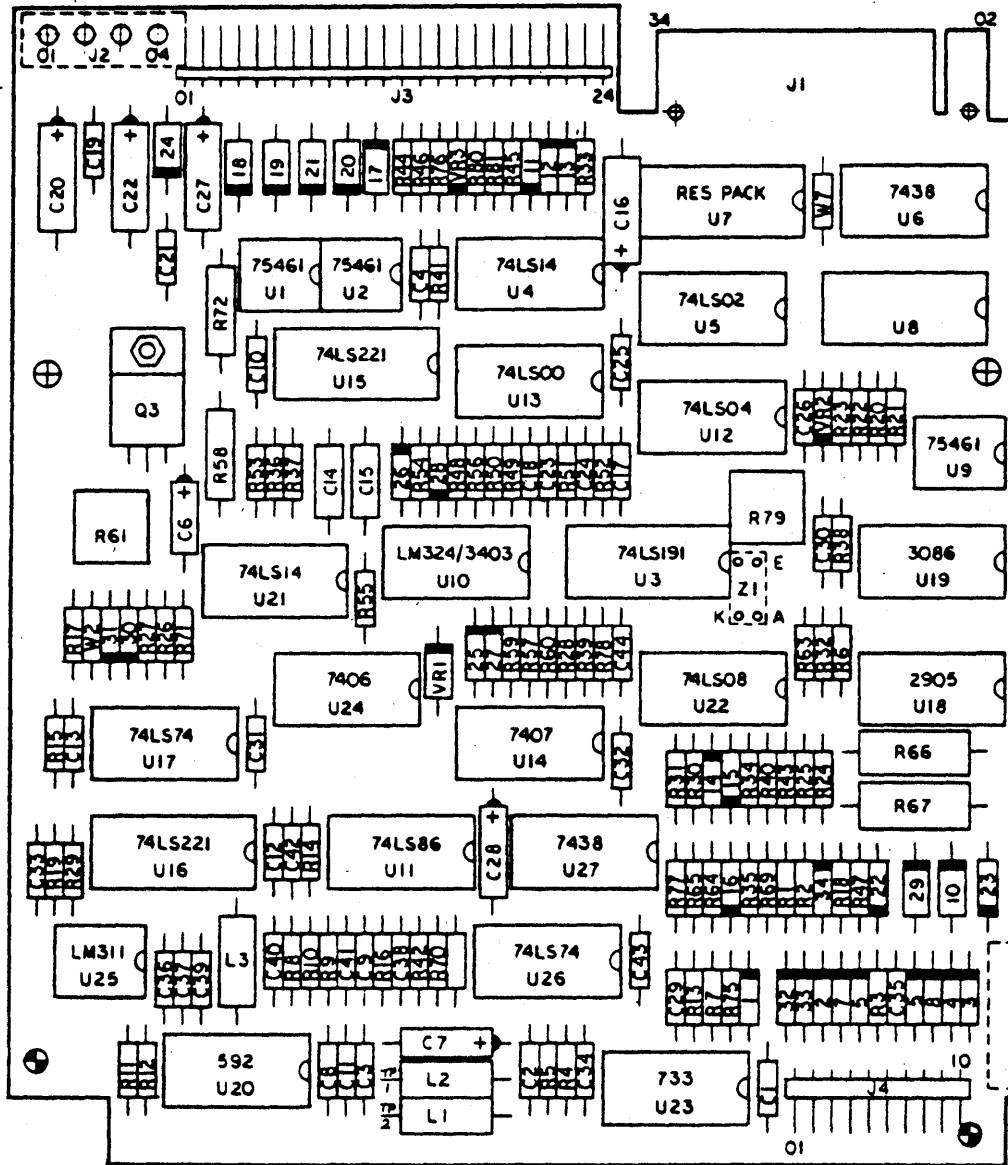


MAIN CONTROL P.C.B. P/N 20040



MOTOR CONTROL P.C.B. P/N 20003

Figure A-3. Seagate Hard Disk Drive PCB Matrix Map



TRANSISTORS

Q3 - T1P120

DIODES

CR1, CR2, CR3, CR4, CR5, CR6, CR7, CR8,  
 CR11, CR12, CR13, CR14, CR15, CR16,  
 CR22, CR23, CR25, CR26, CR27  
 CR28, CR30, CR31, CR32, CR33, CR34

1N914B

CR9, CR10, CR17, CR18, CR19, CR20,  
 CR21, CR24, CR29

1N4001

VOLTAGE REGULATORS

VR1, VR3 - DIODE ZENER 7.5 V  
 VR2 - VOLT REG 5% 2.4 V

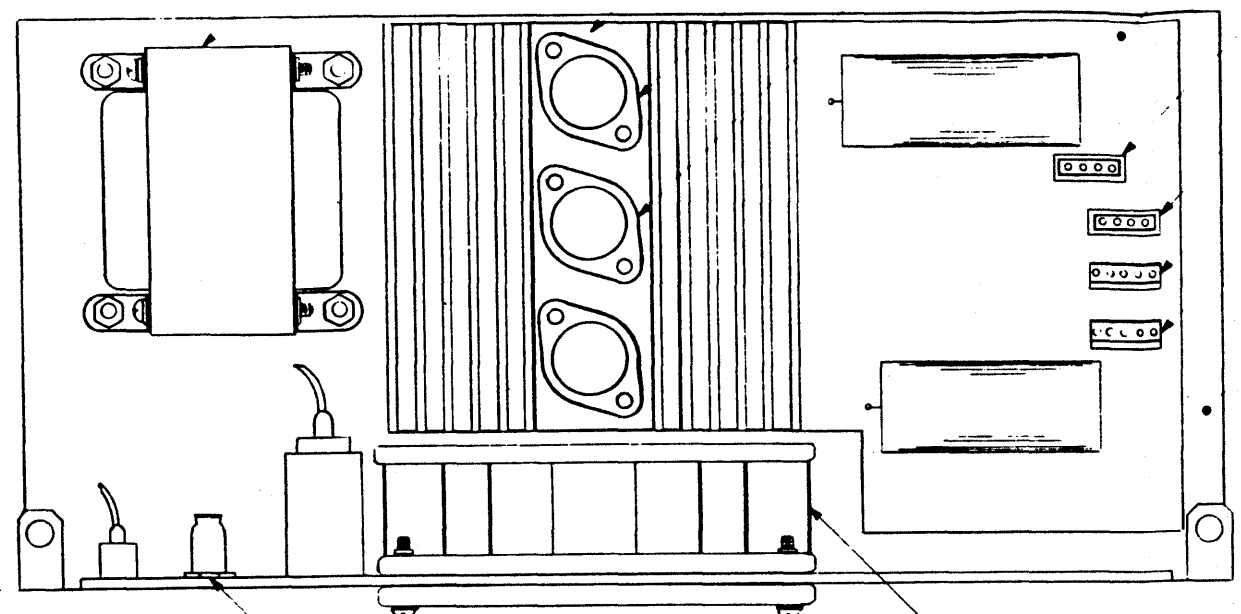
GG235

Figure A-4. CDC Floppy Disk Drive PCB Matrix Map

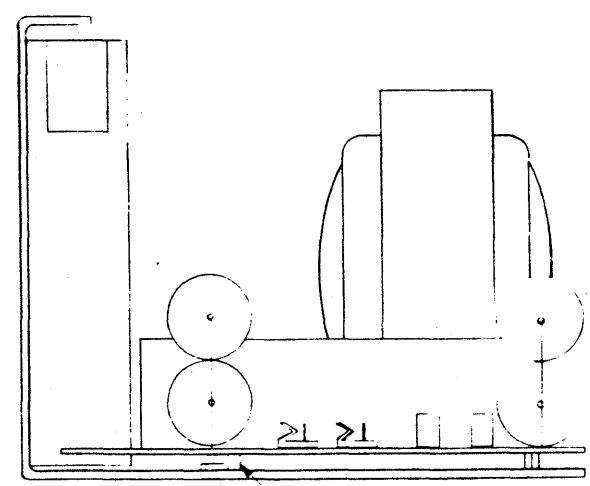
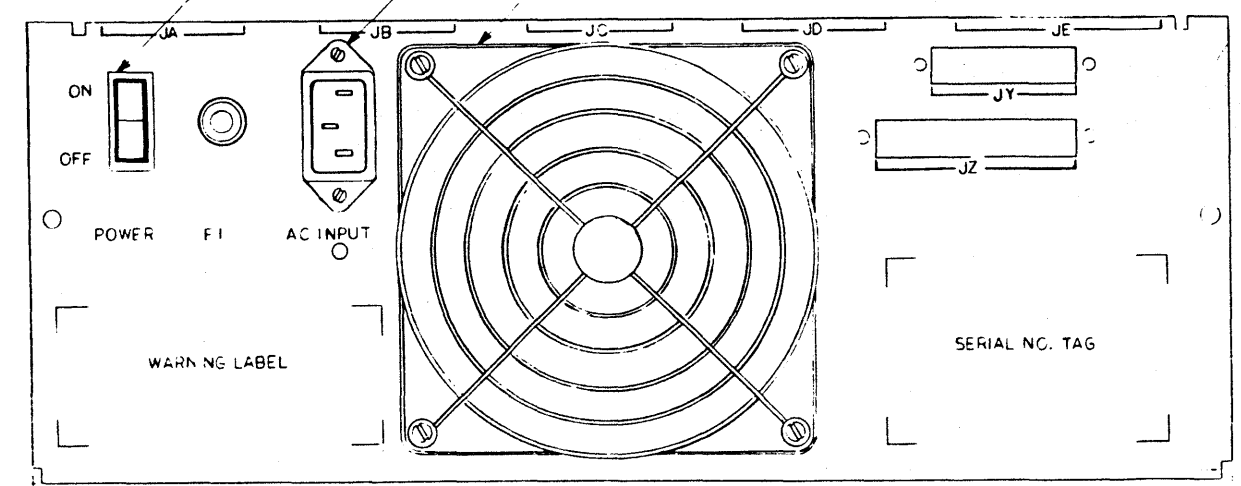
**APPENDIX B**

**SCHEMATICS**

REV. NO.		REV.	DATE	APPROVED
500-100-1		Δ		
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
A		ELECTRICAL		



TO FILE  
 TO PCB  
 TO DRIVE  
 TO DRIVE

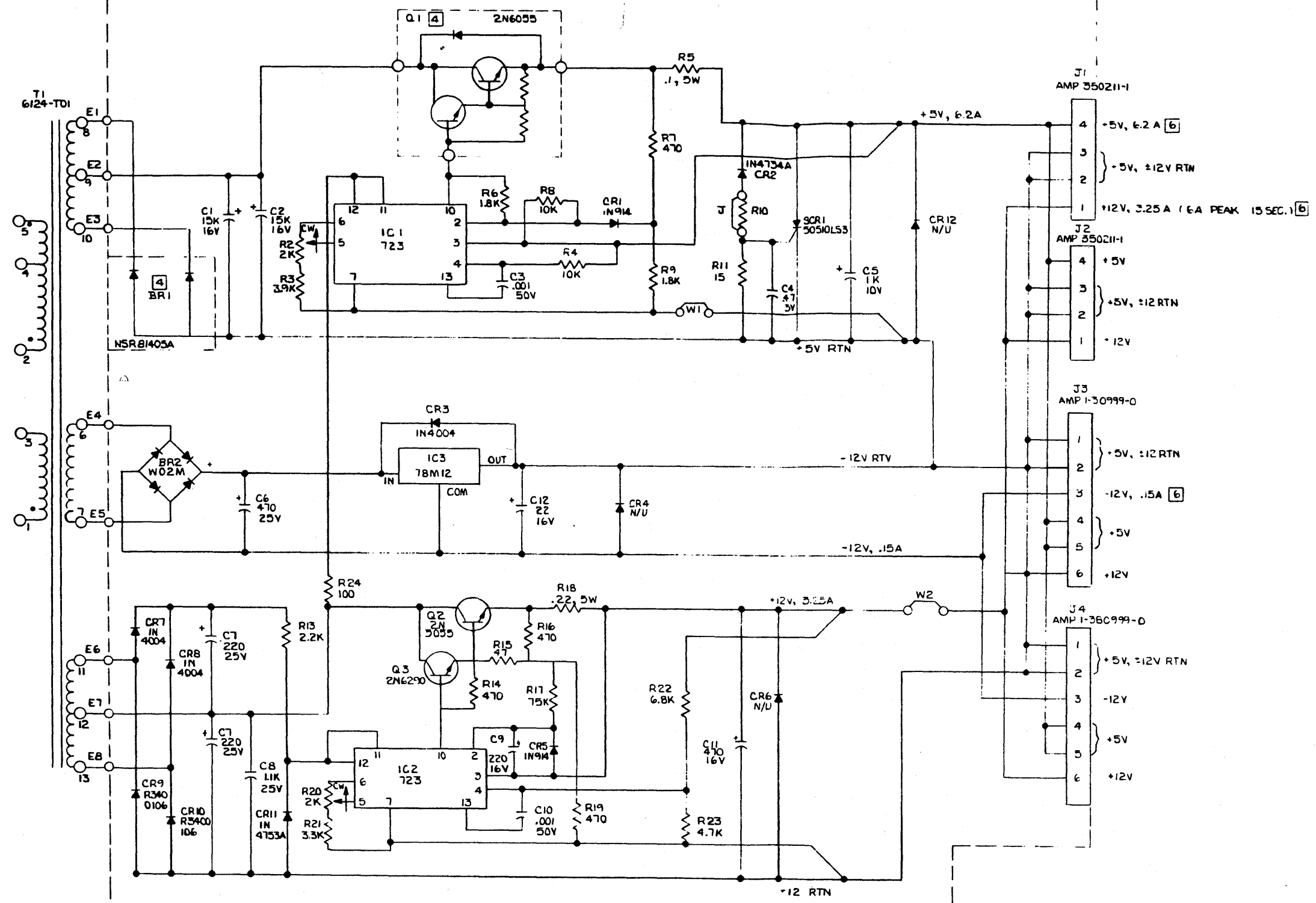


NOTES: UNLESS OTHERWISE SPECIFIED  
 1. FOR SPECIFICATION OF ASSEMBLED POWER SUPPLY SEE XENDEC PARTS LIST NO. 612B-BC1 REFERENCE BELOW  
 2. FOR SCHEMATIC SEE SHEET 2.

REF	QTY	P/N	DESCRIPTION	ITEM
REF		612B-P04	XENDEC P/N CHASSIS SILKSCREEN	22
REF		612B-A02	XENDEC P/N REG BOARD ASSY	21
REF		612B-IND1	XENDEC P/N WIRE LIST PWR SUPPLY	20
1		612B-T01	XENDEC P/N TRANSFORMER	19
1		1-208140-0	XENDEC P/N BRIDGE	18
1		6-400002-1	XENDEC P/N SWITCH	17
6		1-620001-1	XENDEC P/N PIN	16
1		1-610606-0	XENDEC P/N CONNECTOR	15
6		1-620002-1	XENDEC P/N PIN	14
1		1-610706-1	XENDEC P/N CONNECTOR	13
1		1-7000-0	XENDEC P/N FUSE HOLDER	12
1		1-800200-0	XENDEC P/N FUSE 2A	11
1		1-750002-0	XENDEC P/N FILTER / CORCOM	10
2		2-54040-1	XENDEC P/N SPACER BRASS 8-32 x 1/4	9
3		2-54122-1	XENDEC P/N SPACER M/F 8-32 x 1/2	8
1		1-70002-0	XENDEC P/N FAN / ROTRON	7
1		2-203771-0	XENDEC P/N TRANSISTOR	6
1		2-206055-0	XENDEC P/N TRANSISTOR	5
1		1-700004-0	XENDEC P/N FAN CORD 12"	4
1		1-700006-0	XENDEC P/N FINGERGUARD/ROTRON	3
1			XENDEC P/N HEATSINK	2
1		310-11297-001	ALTOS P/N CHASSIS	1

DASH NO		NUMBER	QTY	FINISH	QUALITY ASSUR
		NEXT ASSEMBLY			
DO NOT SCALE DRAWING REMOVE ALL BURRS AND SHARP EDGES DIMENSIONS ARE IN INCHES AND APPLY OVER ALL DIMENSIONS EXCEPT PRINT SURFACE DIMENSIONS TOLERANCE DIMENSIONAL H & I 0.0005" ± 0.0005" 0.001" ± 0.001" 0.002" ± 0.002" 0.005" ± 0.005" 0.010" ± 0.010" 0.015" ± 0.015" 0.020" ± 0.020" 0.030" ± 0.030" 0.050" ± 0.050" 0.100" ± 0.100" 0.150" ± 0.150" 0.200" ± 0.200" 0.300" ± 0.300" 0.500" ± 0.500" 1.000" ± 0.005" BEND RADIUS					
DRAWN		DATE	<b>ALTOS</b> COMPUTER SYSTEMS TITLE ASM, POWER SUPPLY SERIALS - 5 SCALE SIZE PART NUMBER <b>430-11069-001</b> REV <b>A</b>		
CHECKED		DATE	SHEET 1 OF 2		
ENGINEER		DATE			
MANUFACTURING		DATE			





**JUMPER CHART**

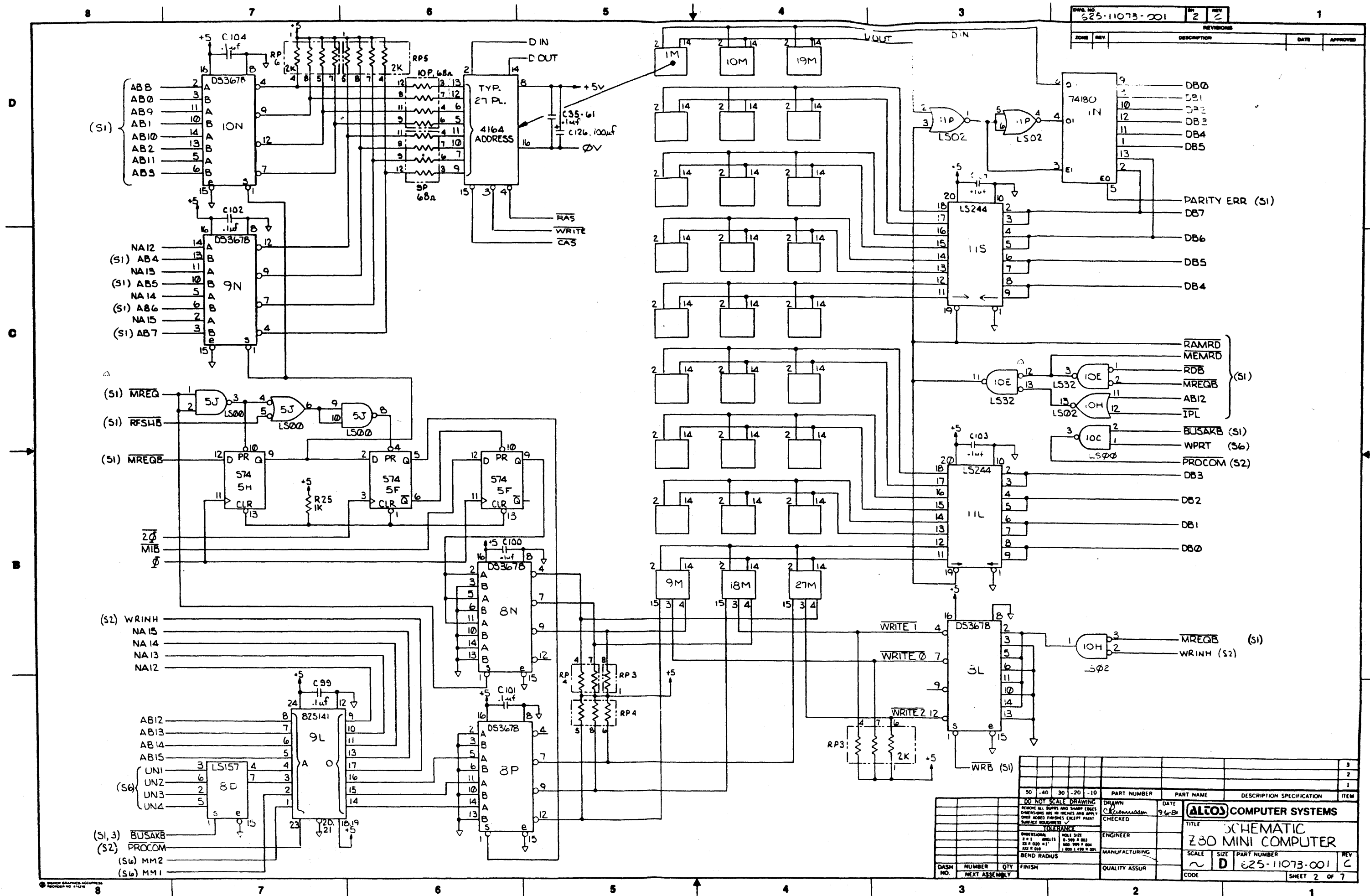
AC	JUMPER	APPLY AC
100	1-2, 3-4	1, 3
115	1-2, 3-4	1, 4
215	2-3	1, 5
230	2-3	1, 4

- NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE VALUE IN OHMS, ± 2%, 1/2 W.
  2. ALL CAPACITANCE VALUE IN MICROFARADS.
  3. COMPONENTS MOUNTED ON CHASSIS
  4. COMPONENTS MOUNTED ON HEATSINK.
  5. REF. DOCUMENTS: XENTEC PART NO. 6124-B01, B02.
  6. TOTAL CURRENT SUPPLIED BY ALL CONNECTORS.

DO NOT SCALE DRAWING		DATE	12-21-62
DRAWN	CHECKED	ALTO'S COMPUTER SYSTEMS	
TITLE		ASM POWER SUPPLY (SCHEMATICS) SERIES 5	
SCALE		SIZE	PART NUMBER
DASH NO.		D	430-11069-001
NUMBER		QTY	REV
NEXT ASSEMBLY			A
FRUSH		QUALITY ASSUR	CODE
		SHEET 2 OF 2	



ZONE	REV	DESCRIPTION	DATE	APPROVED



DASH NO.	NUMBER	QTY	FINISH	MANUFACTURING	QUALITY ASSUR	ITEM
						3
						2
						1

PART NUMBER	PART NAME	DESCRIPTION	SPECIFICATION	ITEM

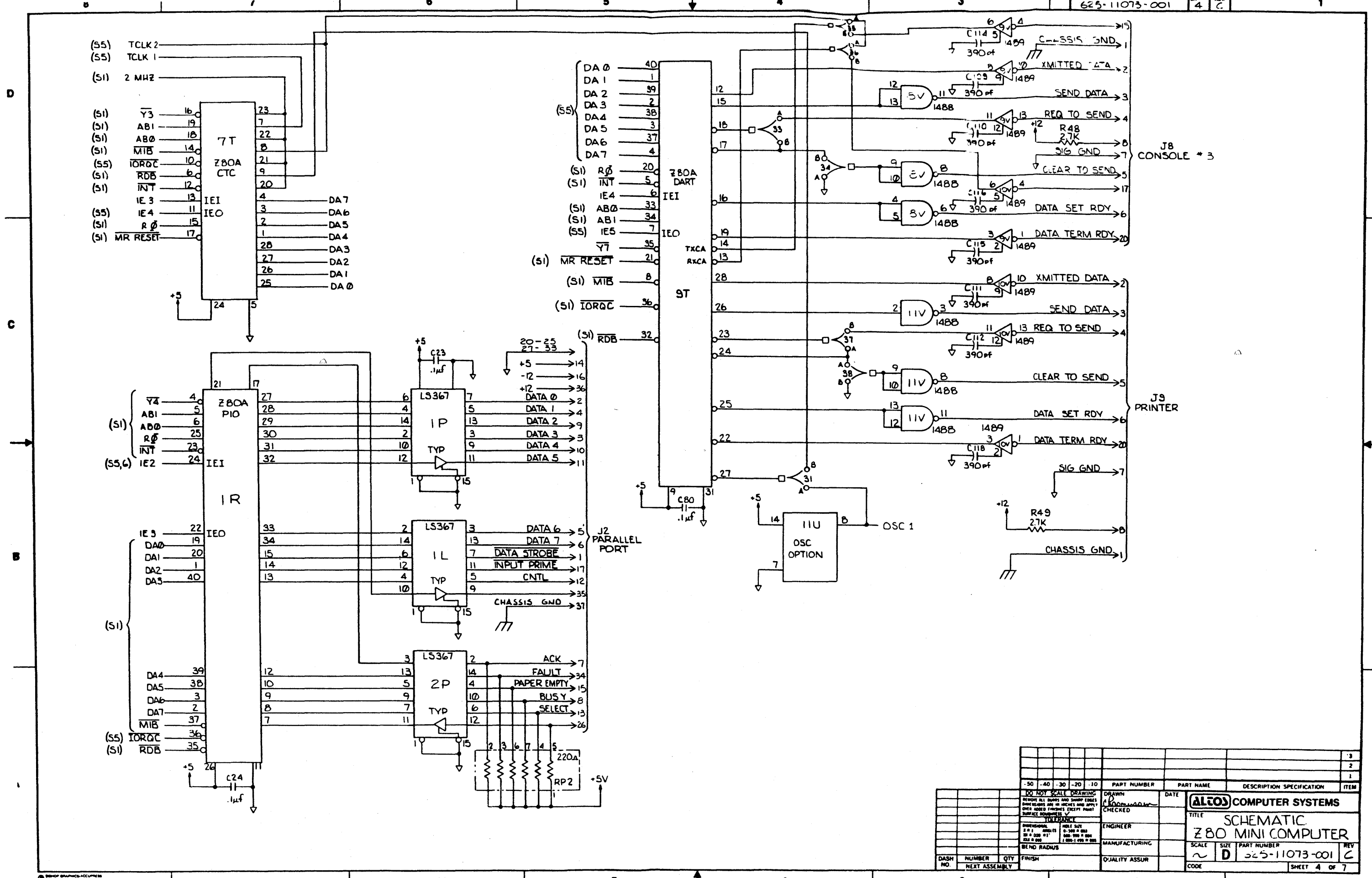
  

DO NOT SCALE DRAWING		DRAWN		DATE	
REMOVE ALL DIMENSIONS AND SHARP EDGES		C. J. [Signature]		9-6-81	
OVER DIMENSIONS AND IN THE CASES APPLY		CHECKED			
DIMENSIONAL TOLERANCE		ENGINEER			
HOLE SIZE		MANUFACTURING			
BEND RADIUS		QUALITY ASSUR			

ALTO'S COMPUTER SYSTEMS			
TITLE: SCHEMATIC			
Z80 MINI COMPUTER			
SCALE	SIZE	PART NUMBER	REV
~	D	25-11073-001	C
CODE			SHEET 2 OF 7

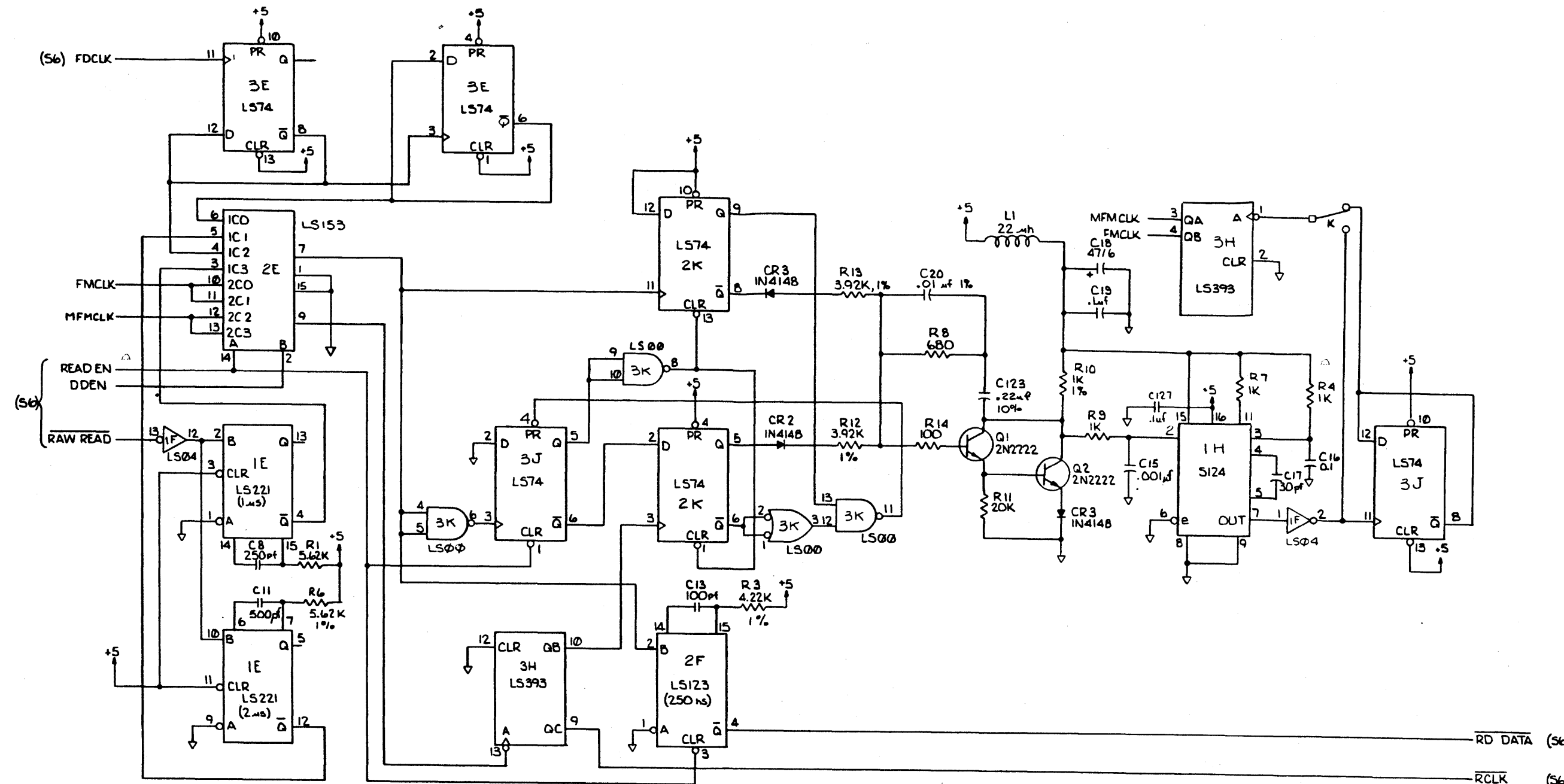




DO NOT SCALE DRAWING		DRAWN		DATE	
REMOVE ALL DIMENSIONS AND DIMENSIONS		CHECKED			
OVER ADDED DIMENSIONS EXCEPT POINT		CHECKED			
SURFACE FINISHES		TOLERANCE			
DIMENSIONAL		ANGLE SIZE			
1:10 ± 0.0015		0-500 ± 0.001			
50 ± 0.001		500-1000 ± 0.001			
100 ± 0.001		1000-10000 ± 0.001			
BEND RADIUS		ENGINEER			
DASH NO.		MANUFACTURING			
NUMBER		QUALITY ASSUR			
NEXT ASSEMBLY		FINISH			
		SCALE		REV	
		SIZE		PART NUMBER	
		D		625-11073-001	
		CODE		SHEET 4 OF 7	







REV		DESCRIPTION	DATE	APPROVED

DASH NO.	NUMBER	QTY	FINISH	NEXT ASSEMBLY

REV	PART NUMBER	PART NAME	DESCRIPTION SPECIFICATION	ITEM

<b>DO NOT SCALE DRAWING</b> REMOVE ALL DIMS AND SHARP EDGES OVER ADDED FINISHES EXCEPT POINT SURFACE DIMENSIONS / TOLERANCE		DRAWN CHECKED ENGINEER MANUFACTURING QUALITY ASSUR	DATE 9-6-81 TITLE <b>ALTO'S COMPUTER SYSTEMS</b> SCHEMATIC Z80 MINI COMPUTER SCALE SIZE PART NUMBER 625-11073-001 REV C SHEET 7 OF 7
--	--	--	--



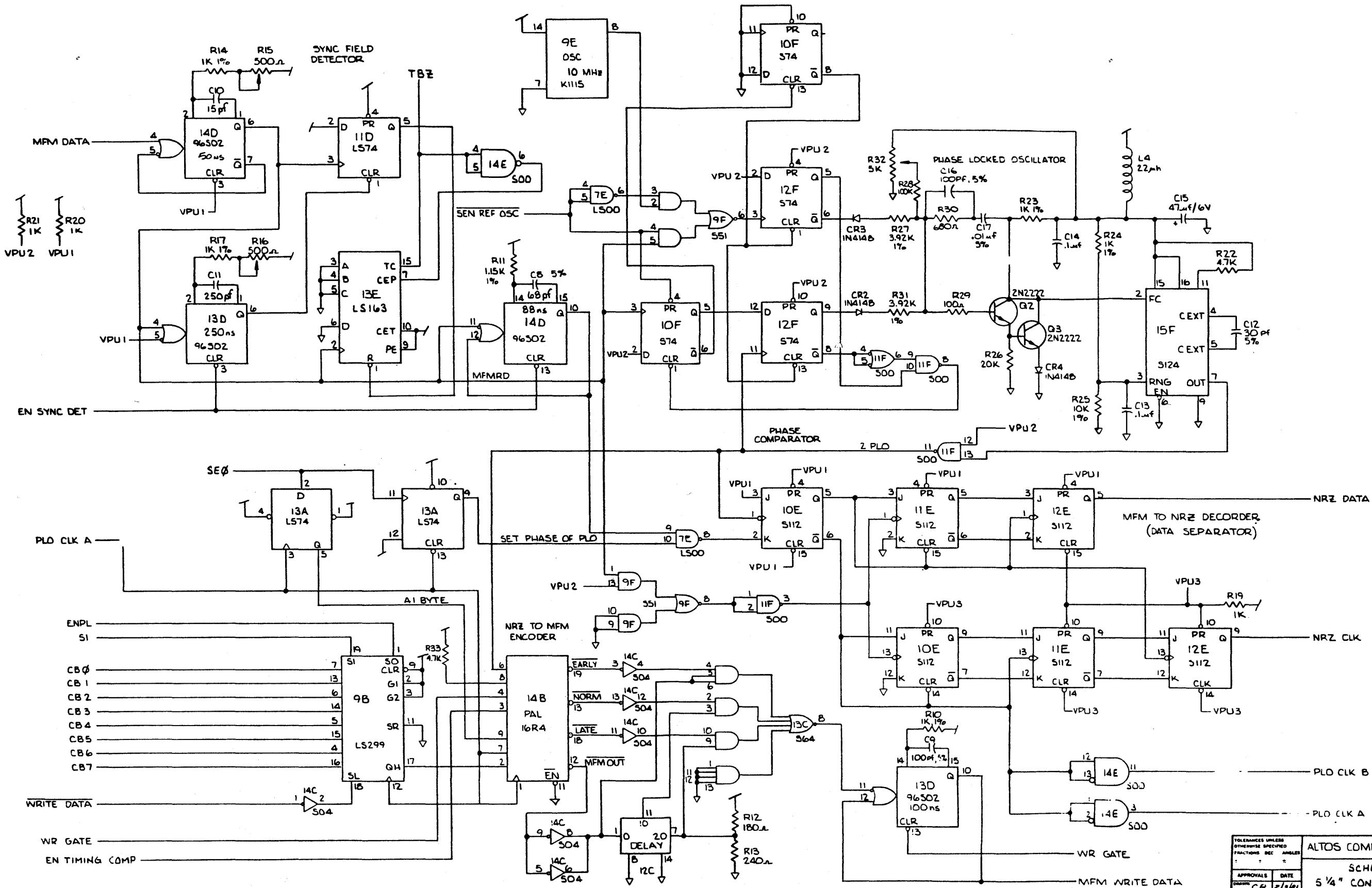




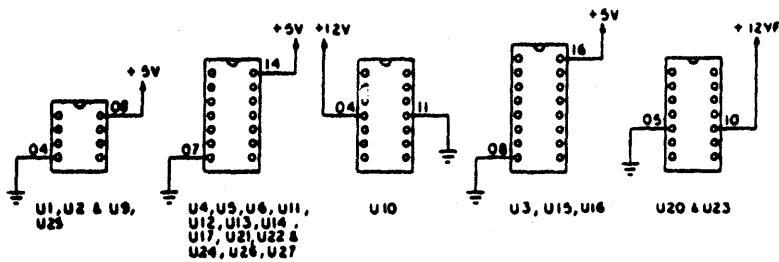
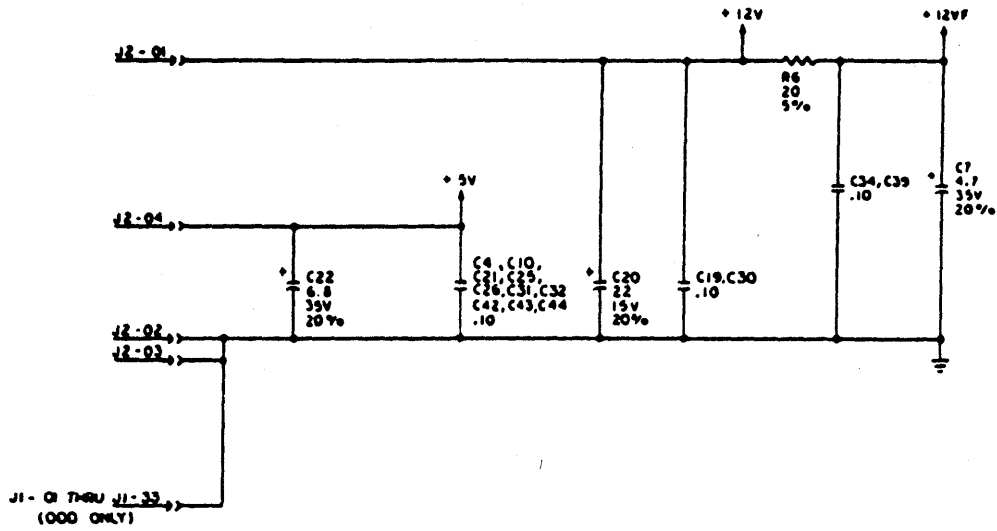




REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

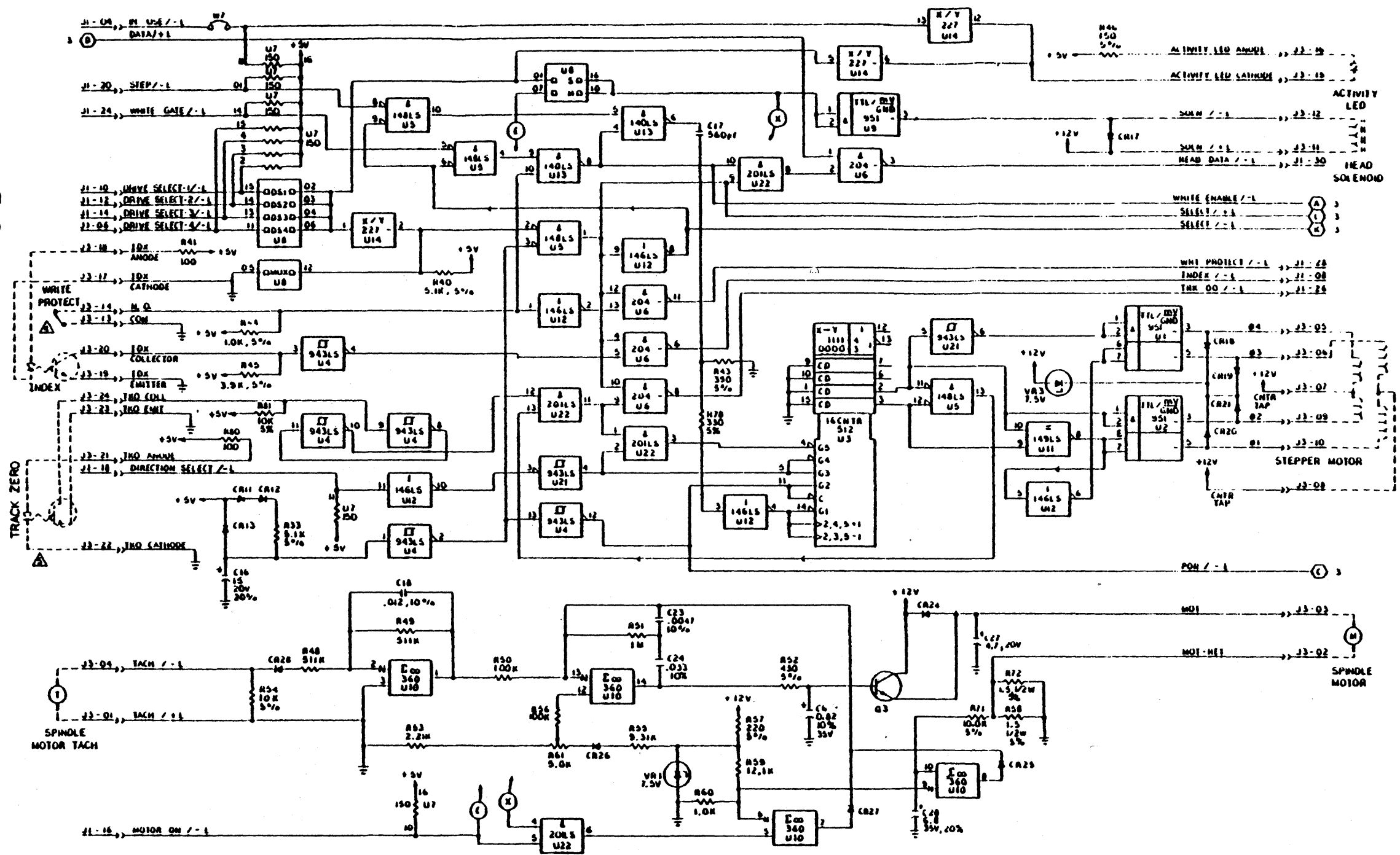


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES		ALDOS COMPUTER SYSTEMS	
APPROVALS	DATE	SCHEMATIC, 5 1/4" CONTROLLER PCB.	
DRAWN CR	5/3/81	SCALE	SIZE D DRAWING NO. 625-11099-001
CHECKED	1-21-82	DO NOT SCALE DRAWING	SHEET 5 of 5



NOTES:

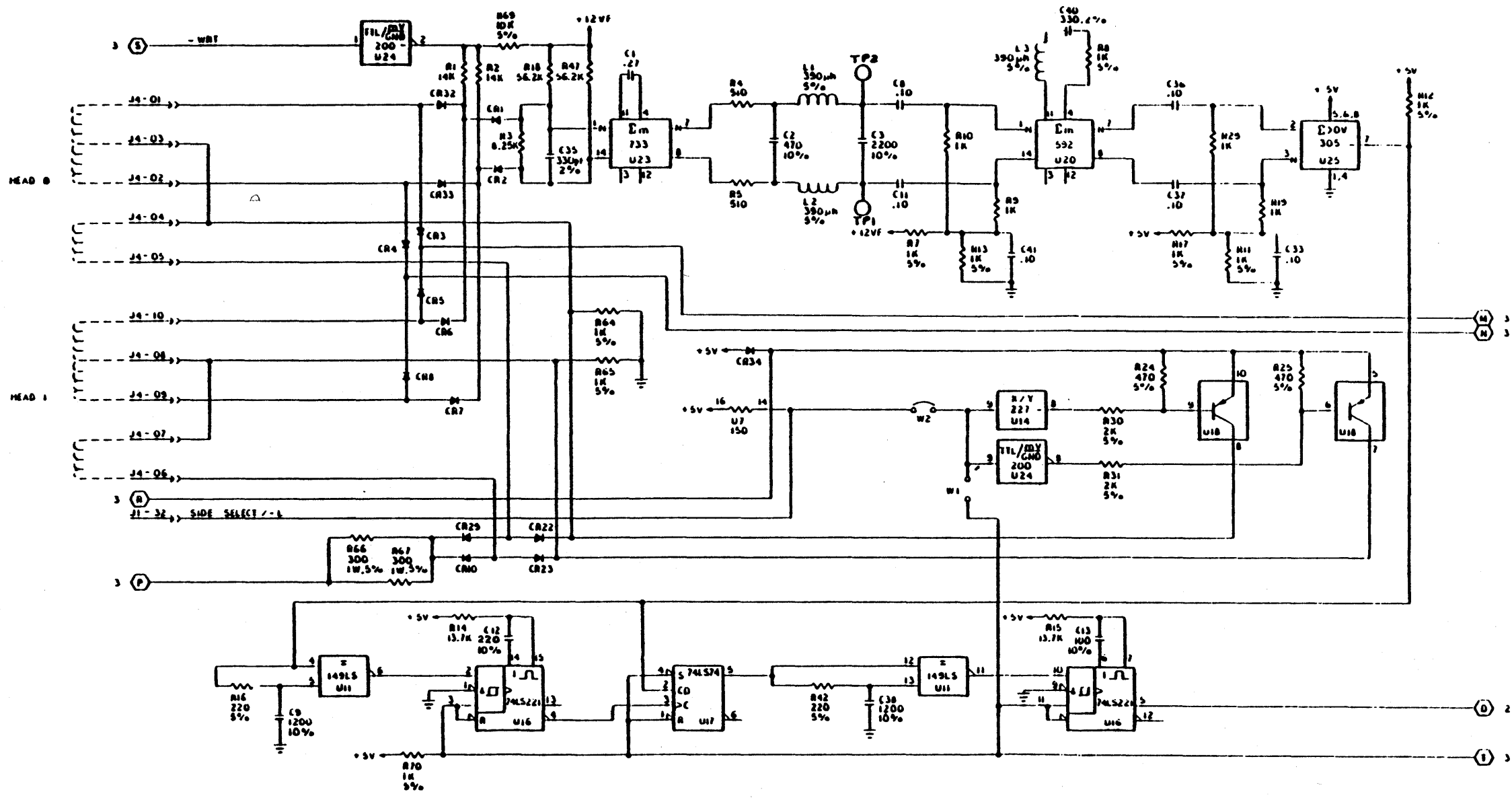
1. RESISTOR VALUES ARE IN OHMS, 1/4W, ±1%
2. CAPACITANCE VALUES ARE IN MICROFARADS
3. DRAWING INTERPRETATION PER 45A228599
- △ 4. WRITE PROTECT SWITCH SHOWN IN THE WRITE PROTECTED POSITION: DISKETTE INSERTED AND WRITE PROTECT SLOT COVERED.
- △ 5. OPTICAL TRACK ZERO SWITCH: CARRIAGE FLAG INTERRUPTS LIGHT BEAM AT TRACK ZERO POSITION



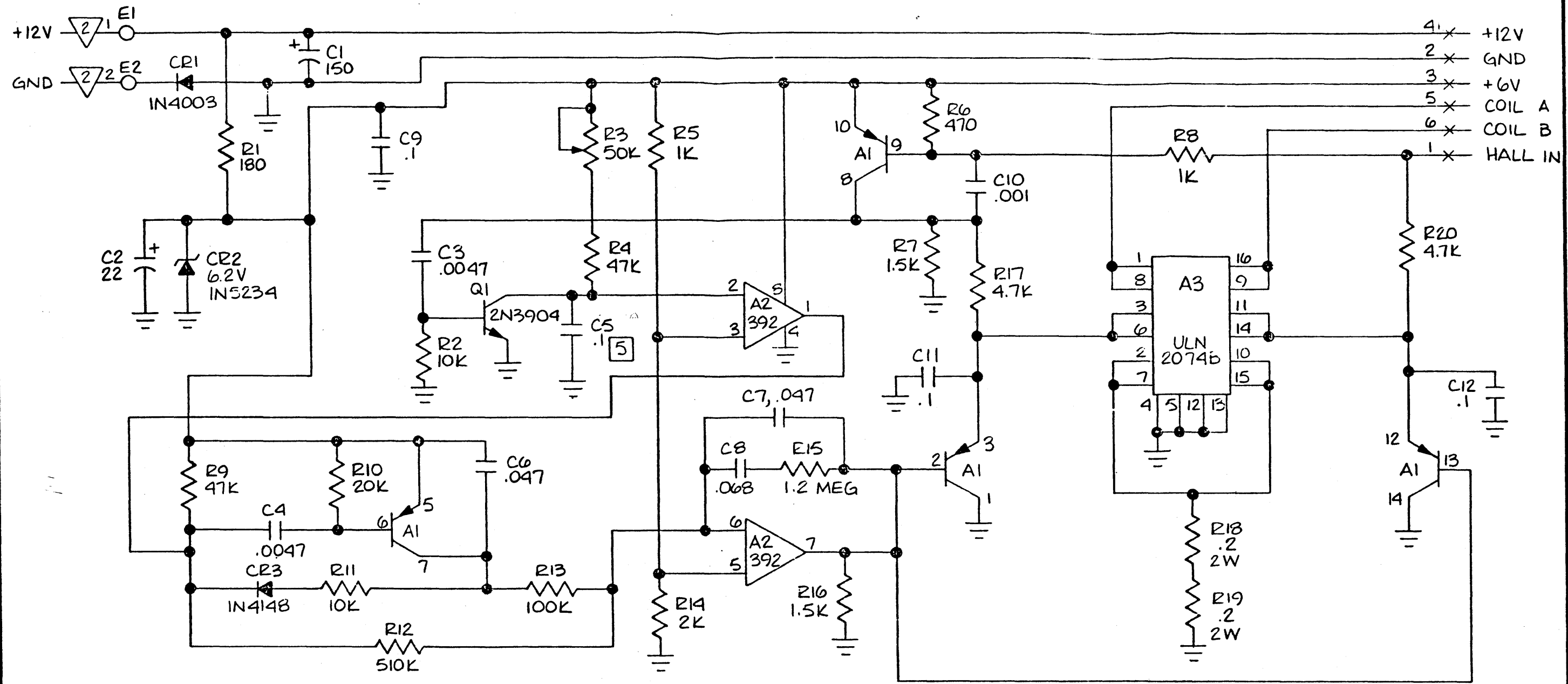
CDC Floppy Disk Drive Schematic





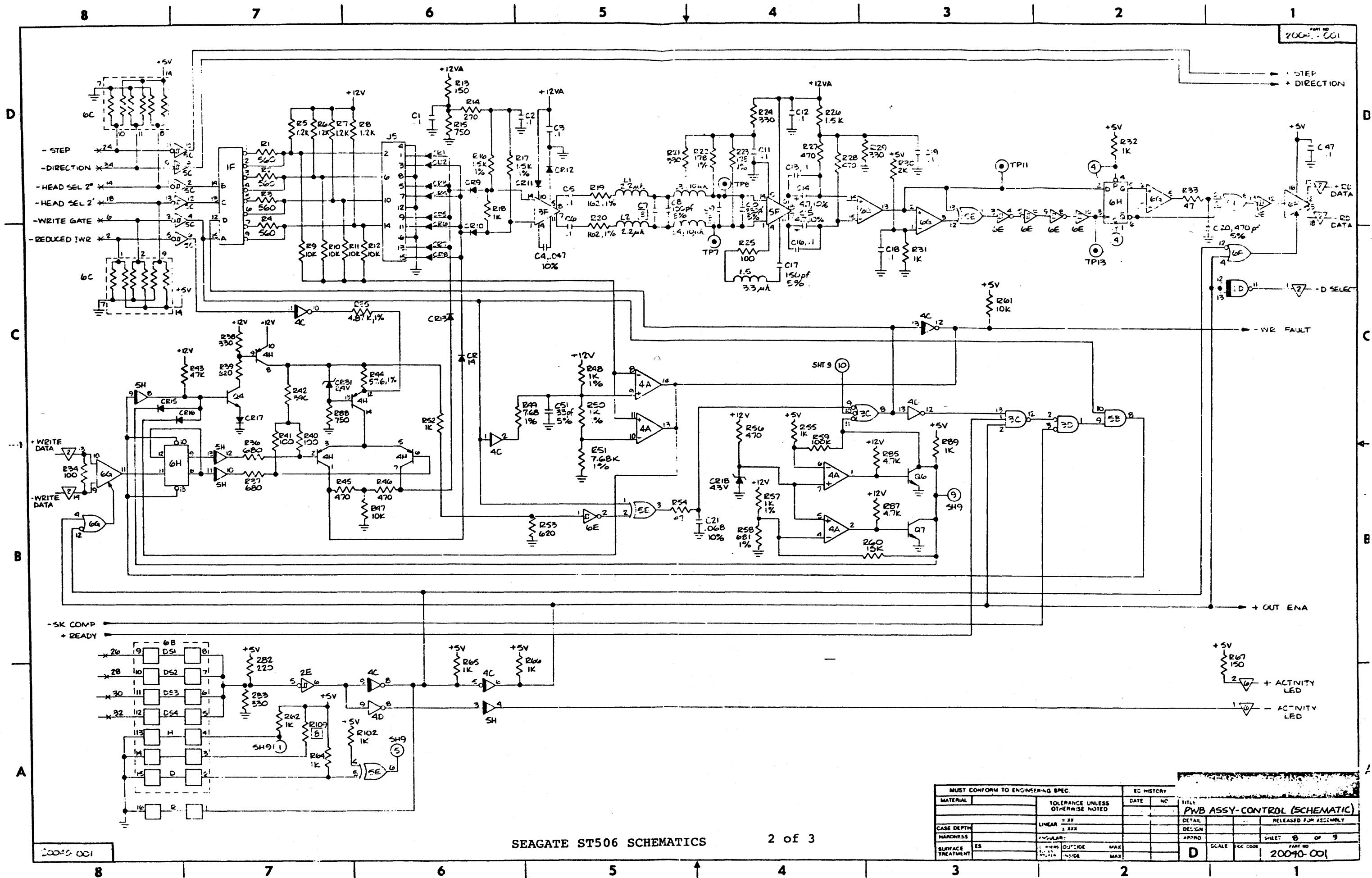


CDC Floppy Disk Drive Schematic



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5%
  2. ALL CAPACITORS ARE IN MICROFARADS, 10%.
  3. X INDICATES J1
  4. Z INDICATES J2
  5. C5 - POLYCARBONATE, 50V, ± 10%

MUST CONFORM TO ENGINEERING SPEC. 30130-001				EC HISTORY			
MATERIAL:		TOLERANCE UNLESS OTHERWISE NOTED		DATE	NO.	TITLE	
				1/8/81	0001	PWD ASSY - MTR UNTEL (SCHEMATIC)	
HARDNESS		LINEAR ±.XX ±.XXX		2/20/81	0002	DETAIL	RELEASED FOR ASSEMBLY
				3/19/81	0001	DESIGN	
SURFACE TREATMENT ES		ANGULAR ±		4/20/81	0002	APPRO	SHEET 13 OF 10
				CORNERS EDGES BROKEN		OUTSIDE	MAX
				INSIDE	MAX		



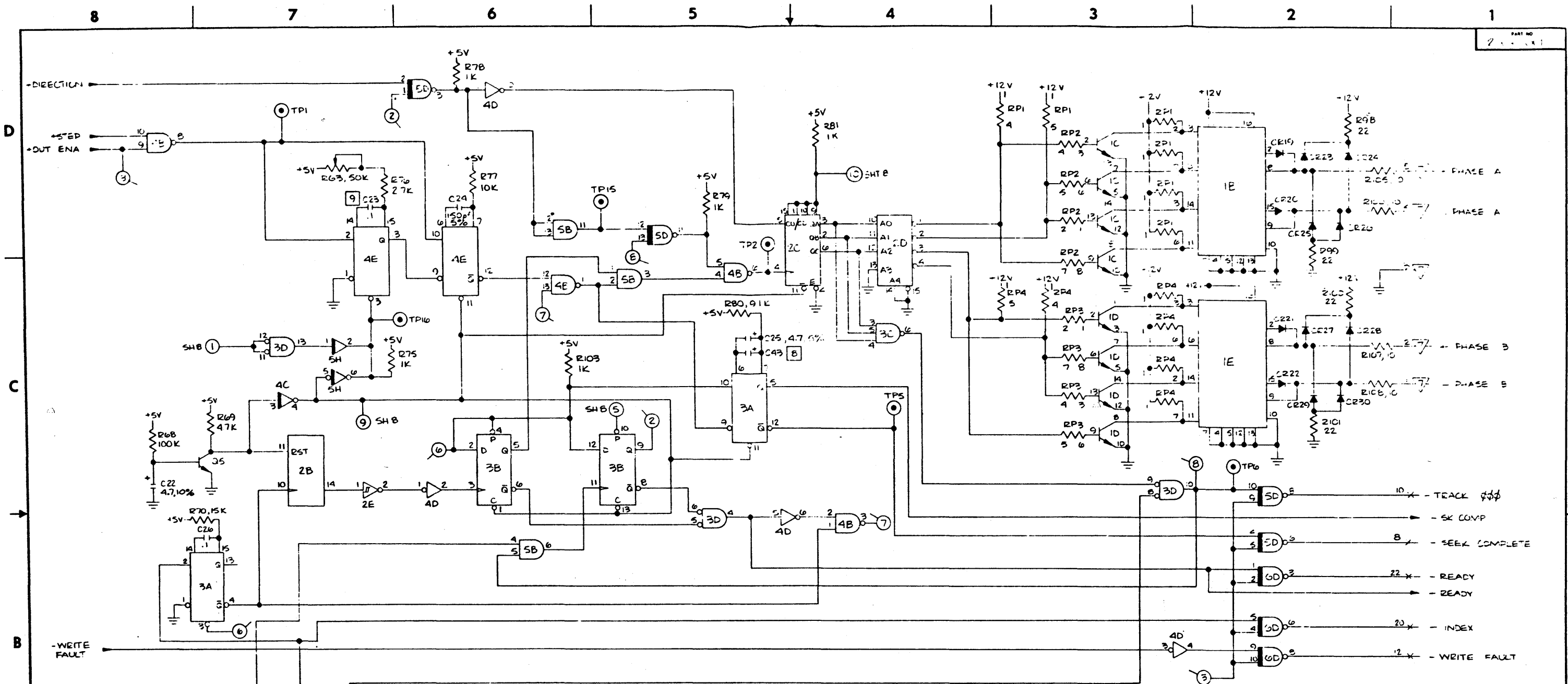
PART NO 20040-001

20040-001

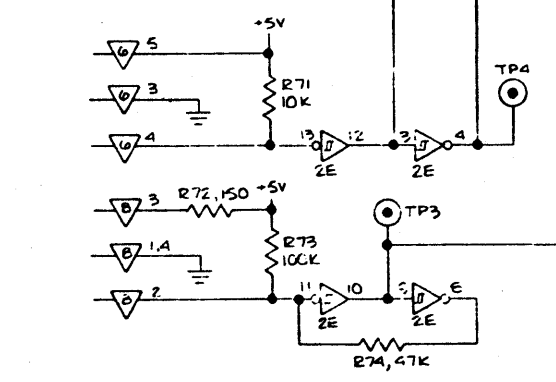
SEAGATE ST506 SCHEMATICS

2 of 3

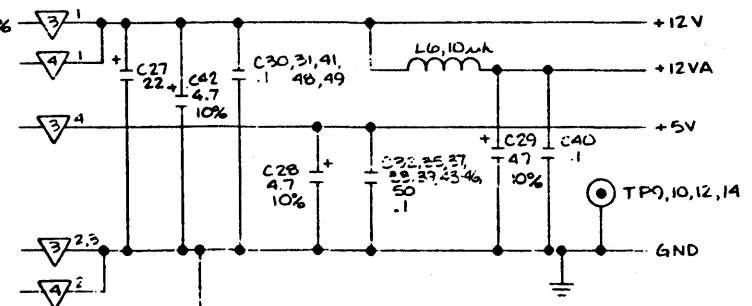
MUST CONFORM TO ENGINEERING SPEC		EC HISTORICAL		TITLE	
MATERIAL		DATE	NO	PWB ASSY-CONTROL (SCHEMATIC)	
TOLERANCE UNLESS OTHERWISE NOTED				DETAIL	RELEASED FOR ASSEMBLY
CASE DEPTH	LINEAR = .XX			DESIGN	
HARDNESS	ANGULAR = .XXX			APPRO	
SURFACE TREATMENT	ES	INSIDE	MAX	SCALE	SHEET: 6 OF 9
		OUTSIDE	MAX	EC CODE	PART NO 20040-001



-WRITE FAULT



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. RESISTANCE VALUES ARE IN OHMS, 1/8 W, 5%.
  2. ALL 1% RESISTORS ARE 1/8 W.
  3. CAPACITANCE VALUES ARE IN MICROSECONDS, +80-20%.
  4. DIODES ARE IN 1A4E.
  5. \* INDICATES CONNECTOR J1
  6. ▽ INDICATES CONNECTOR J2 THRU J8.
  7. ○ INDICATES TEST POINT PINS.
  8. □ PART NOT INSTALLED
  9. C23 - POLYCARBONATE, 50V, ±10%



IC LOCATION & VOLTAGE CHART

TYPE	LOCATION	-5V GND	TYPE	LOCATION	-12V	+2VA	+5V GND
TPQ 3904	IC 10	-	7436	5D, 6D			1A, 7
4020	2B	5	2074	1E, 1E	10E		10E
6920-1	2D	5	74191	2C			10E
7408	5B	4	7400	4B	14	7	
74123	3A	5	7402	3D			4, 7
74574	6H, 3B	-	74LS14	5C, 11E			4, 7
7406	4C	4	7407	5-			14, 7
74LS221	4E	5	7404	4D			14, 7
7445	1F	5	NE542	3F, 2F			5, 10
20LS32	6E	5	20LS3	6F			10, 8
74586	5E	4	7410	3C			10, 7
7410	3C	4					10, 7
CONV	6H	-					

REF DES

LAST USED	NOT USED
R100	690-97E-30-04
C231	236
C25	100
C27	100

MUST CONFORM TO ENGINEERING SPEC

MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	DATE	NO	REVISION

EC HISTORY

DATE	NO	REVISION

RELEASED FOR ASSEMBLY

SCALE: 1:1

DATE: 1974

BY: [Signature]

20040-001

**APPENDIX C**

**SHIPPING DAMAGE AND SYSTEM REPAIR PROCEDURES**

If your system was damaged in shipment....

NOTE: THIS INFORMATION WAS STILL BEING DEVELOPED AT  
REVISION D. PRINTING TIME.

**APPENDIX D****INSTRUCTIONS FOR PINNING SERIES 5 PRINTED CIRCUIT BOARDS**

The following lists define how the systems should be pinned. The pinning of the PCB's may be changed at a later time to accommodate a particular requirement (i.e., network or bisync operation), refer to schematics in Appendix B for details, and matrix map for position.

**SERIES 5-5D**

Floppy disk drive, Control Data Corporation (CDC) 9490T:

A 150 ohm line terminator should be installed in position XX. Jumpers should be cut at the shunt module positions 1, 3, 4, 5, and 6. (2, 7 and 8 are not cut).

Or Shugart SA460:

A 220/330 ohm line terminator should be installed at U3. Jumpers should be in positions DS1 and SS, all others are left open.

**NOTE**

**The Shugart is a second-source drive for the CDC 9409T and is interchangeable.**

Hard Disk Drive, Segate ST506:

A 220/330 ohm line terminator should be installed at XX. At 6C, the jumper block should be in pins 2-8, leaving pin 1 open. Jumpers at pin 5, 6, and 7 should be cut (2, 3, 4, and 8 are not cut).

**5 1/4" Hard Disk Controller Board (11097):**

S1a and S1b should be jumpered to 64 (for Seagate ST506).  
 S2a and S2b should be jumpered to 512 (bytes per sector).  
 S3 should be jumpered to position 2 (for Z80 systems).

**CPU Board (11071):**

1, 2 and 42 should be open. Jumper should be placed at 3.  
 Jumper should be in position 4, 6, 8, 10, 11, 13, 15, 20 and  
 39. Pins 5, 7, 9, 12, 14, 16-19, and 21-30 should be open.  
 Sockets at 4U and 4V are empty. This initializes the system  
 for RS 232 operation rather than networking.

There should be jumper 31 to B, 32 to B, 34 to A, 35 to A,  
 36 to A, 37 to A, 38 to B, 40 to A, and 41 to B in position.  
 This disables the RTS/CTS loops in the RS 232 circuits.

**SERIES 5-15D**

**Right-hand side of floppy disk drive, CDC 9509T (Drive 1):**

Jumpers should be cut at the shunt module positions 1, 3, 4,  
 5, and 6 (2, 7, and 8 are not cut).

**Or Shugart SA460 (Drive 1):**

Jumpers only in positions DS1 and SS, leave all others are  
 open.

**Left-hand side of floppy disk drive, CDC 9409T (Drive 2):**

A 150/ ohm line terminator should be installed at XX.  
 Jumpers at the shunt module positions 1, 2, 4, 5, and 6 (3,  
 7, and 8 are not cut).

**Or Shugart SA460 (Drive 2):**

A 220/330 ohm line terminators should be installed at U3.  
 Jumpers in positions DS2 and SS, leave all others are open.

**CPU Board (11071):**

Jumper position 1, 2, 3, and 42 are open. Jumpers at 4 and  
 39. Jumpers are installed in positions 6, 8, 10, 11, 13, 15  
 and 20. Leave pins 5, 7, 9, 12, 14, 16-19, and 21-30 open.

Jumpers should be in position 31 to B, 32 to B, 33 to B, 34  
 to A, 35 to A, 36 to A, 37 to A, 38 to B, 40 to A and 41 to  
 B.



**COMPUTER SYSTEMS**

## **PRELIMINARY**

**SERIES 5 COMPUTER SYSTEM**

**SUPPLEMENT 3. EXECUTING DIAGNOSTIC PROGRAMS**

**REVISION D**

**FEBRUARY 26, 1982**

### **DISCLAIMER**

**THIS IS A PRELIMINARY PUBLICATION OF THE ALLOS SERIES-5 COMPUTER SYSTEM DOCUMENTATION AND IS PRESENTED FOR INFORMATION PURPOSES ONLY; IT WILL BE CHANGED WITHOUT NOTICE.**

**THE INFORMATION CONTAINED HEREIN REPRESENTS THE MOST CURRENT INFORMATION AVAILABLE AT THE TIME OF PRINTING, HOWEVER, THE INFORMATION HAS NOT BEEN THOROUGHLY REVIEWED NOR HAS IT BEEN APPROVED IN ITS PRESENT FORM. ALLOS COMPUTER SYSTEMS, ASSUMES NO LIABILITY WHATEVER RELATED TO USE OF INFORMATION PRESENTED IN THIS PUBLICATION.**

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ACS Manual Part Number: 690-11715

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**ALTOS SERIES 5 COMPUTER SYSTEM**

**SUPPLEMENT 3. EXECUTING THE ALTOS DIAGNOSTIC  
EXECUTIVE PROGRAM (ADX)**

**GENERAL INFORMATION**

This supplement provides instructions for executing diagnostic programs to prepare your system for installing the operating system and the selected application programs.

This supplement also presents the ADX program diskette loading procedure, and reviews ADX program functions.

**KNOWN SYSTEM DEFICIENCIES**

At the time this preliminary manual was printed, the following system deficiencies were known:

1. There is no way to change baud rates or use a parallel printer with ADX. Use only 9600 baud terminals and serial printers.
2. There is no Direct Memory Access (DMA) or memory write-protect test.
3. The system will hang (possibly with a memory parity error) if "9" is entered to exit from HARD5. Reboot the system to exit from HARD5.
4. HRDINIT5 does not return to the ADX menu. Reboot the system to exit from HRDINIT5.
5. The self-test will run spontaneously sometimes when the system is booted after running ADX.
6. COPY and BOOTCOPY do not yet verify the data on the destination disk.

**ADX PROGRAM FUNCTIONS**

The ADX master diskette that came with the system contains a group of command programs that test Series 5 computer system components, format diskettes, and copy programs. These programs comprise the ALTOS Diagnostic Executive program (ADX). The ADX program must be run the first time the computer system is powered up, and every time a new component is added to the system.

**WARNING**

You should make a backup copy of this diskette before proceeding to test system components. To insure protection of your master diskette, you should make at least two copies. One copy, the ADX system diskette, is for daily use. The other, the back-up master, is only for making additional copies for daily use. You should never use your Altos master diskette for daily operations. It should be stored away from your computer area in a secure location to prevent accidental use.

The utilities and tests comprising the ADX program are grouped into three categories, described in this section. Each program prompts you for every operation you need to perform. The programs perform these following functions:

1. They format diskettes and copy diskette utilities.
2. They test computer memory, printer, terminal, and floppy drives.
3. They test hard disk functions.

**Loading and Running the ADX Program**

Follow the power up procedures listed in Section 1 of this manual. Your system should be unpacked. System components should be cabled together. You should see a display prompting you to insert a floppy diskette into the floppy drive after you turn on your system.

Place your ADX diskette with the label facing up into the RH floppy disk drive. Close the door of the disk drive unit, and the diagnostics program loads automatically. After loading the diagnostics diskette, your terminal screens the following display.

Altos ADX 3.0  
 ALTOS DIAGNOSTIC MONITOR VERSION 3.0

```
***D I A G N O S T I C   C O M M A N D   D I R E C T O R Y***
      MFORMAT      BOOTCOPY      PRNTEST      MEMTEST
      MFT          COPY          HRDINIT5     HARDS5
```

REQUEST:

You must always load ADX programs into the RH drive. Note that default logical Drive A will always be a floppy disk drive. It is possible to pin the floppy disk drive in many ways, but you must still load the operating system disk into logical drive A. Normally (standard factory configuration) logical drive A is the right-hand side drive as you face the front.

### Making Back-up Copies of the ADX Diskette

For all Series 5 Computers:

Have at least two new blank 5 1/4" floppy diskettes. The disk drive vendor for all Series 5 models has qualified VERBATIM model number MP557-01-18242 Data Life 5 1/4" diskettes. These diskettes are 5 1/4", 96 track per inch, double density, double sided, soft sector diskettes.

With the ADX Master diskette loaded and with the Diagnostic Command Directory menu displayed, type "MFORMAT" after the "REQUEST" prompt. The terminal will display the following MFORMAT prompts:

```
ALTOS 5 1/4 INCH FLOPPY FORMAT FACILITY
Insert diskette to be formatted in available drive
Remove system disk if necessary
Enter drive letter to continue      A/B?
```

Type A for the right hand side drive or B for the left hand side floppy disk drive (Series 5-15D only). The system will respond by counting the diskette cylinders as they are actually formatted with the following prompt:

```
Cylinder XX      (where XX is a cylinder number from 0 to 79)
```

After completing the format for cylinder 79 the utility will finish and prompt you for repeating the format task, in the following manner:

```
Would you like to format another diskette?  Y/N
```

At this point remove the diskette from the disk drive and label it "ADX Backup Master" and set it aside.

**WARNING**

Use only felt tip pens when writing on a floppy diskette. The use of a pencil or a ball point pen can cause indentations on the surface of the diskette which will cause media related errors during use. Preferably prepare and write on your label before you place it on the diskette.

To make the ADX System Diskette, the one to be used in daily use, insert the second blank diskette and type "Y" to the prompt. The original prompt will be repeated, respond in the same manner as you did before. Upon completion remove diskette and label it properly.

Respond with a "N" to the "Would you like to format another diskette? " Y/N" prompt to exit the MFORMAT utility. In response to the next prompt displayed:

System disk in drive A  
Enter to continue.....

Insert the ADX Master diskette and depress the return key on the keyboard of your terminal " [RETURN] ". This return you back to Diagnostic Command Directory.

For Series 5-15D system perform the following steps to actually make the copy:

Type "COPY" after the "REQUEST" prompt. The terminal will display the following prompt:

Altos 5-1/4 inch disk copy program  
Insert source in drive A  
Insert object in drive B  
Type return

Make sure that the ADX Master diskette is in the right hand side drive (drive A). Insert the formatted diskette labeled "ADX Backup Master" in the left hand side drive (drive B) and then depress the return key on the keyboard of your terminal "[RETURN]"

When copy is finished, it returns back to the Diagnostic Command Directory. Remove the diskette. Repeat the COPY operation for the second diskette.

## NOTE

At this point store the original ADX Master diskette in a safe place away from the system work area. DO NOT USE THIS DISKETTE EXCEPT TO CREATE ADDITIONAL ADX BACKUP MASTERS, AND ONLY USE THE ADX BACKUP MASTERS TO CREATE ADX SYSTEM DISKETTES! The backup procedure for Series 5-15D systems is now complete.

For Series 5-5D systems perform the following steps to actually make the copy:

## WARNING

A copy can be made of the ADX Master diskette only if you have a CP/M or MP/M operating system with a Series 5-5D system. CP/M or MP/M is required to make the backup copy. If you have the OASIS operating system only, you cannot make a copy of the ADX Master at this time, so use the ADX Master with caution and only after reading the instruction completely. This will be corrected at a later date, contact your distributor.

Type "HRDINIT5" to initialize the hard disk. Answer "Y" to the "Do you want to continue" prompt. HRDINIT5 takes about 5 minutes to complete. The Diagnostic Command Directory will be displayed when HRDINIT5 is finished.

Type "BOOTCOPY" after the "REQUEST" prompt. The terminal will display the following prompt:

Altos 5-1/4 inch boot copy program  
Insert diskette to be read from and type CR

Depress the return key. The following prompt will then be displayed:

Insert diskette to be written to and type CR

Remove the ADX Master diskette from the right hand side drive (drive A) insert the formatted diskette labeled "ADX Backup Master." Then depress the return key on the keyboard of your terminal "[RETURN]"

When BOOTCOPY is finished, remove the diskette and insert either a CP/M or MP/M operating system diskette. Depress the System Reset push button switch to load the operating system. The final system prompt after "booting" will be:

A>

for CP/M or:

ØA>

for MP/M.

You need to copy all files from your CP/M or MP/M Master diskette to the hard disk logical drive B:, to do this type:

PIP B:=A:\*. \*[v] [RETURN]

after the A> or ØA> prompt. When the transfer is complete, log-on to logical drive B by typing B:[RETURN] after the A> or ØA> prompt; example for CP/M:

A>B: [RETURN]

or for MP/M

ØA>B: [RETURN]

Remove the CP/M or MP/M master diskette from the floppy disk drive and insert the ADX Master diskette.

To complete the copy function perform the next steps, in response to the system prompts:

B>PIP B:=A:\*.DIA[v]

This will transfer all diagnostic files (MFORMAT.DIA, BOOTCOPY.DIA, PRNTEST.DIA, MEMTEST.DIA, HARDS5.DIA, COPY.DIA, HRDINIT5.DIA) from the ADX Master diskette to the hard disk. Upon completion, remove the ADX Master diskette from the floppy disk drive and replace it with the previously formatted and boot copied "ADX Backup Master" diskette. Next, transfer all diagnostic files back to the floppy diskette, again using PIP:

B>PIP A:=B:\*.DIA[v]

Upon completion you will have completed the backup. At this point, remove the diskette from the drive and label it ADX System Master. Repeat this procedure to make the copy of your "ADX System" Diskette. Do not use your ADX Master, set it aside and use the ADX Backup master in it's place.

#### NOTE

At this point store the original ADX Master diskette in a safe place away from the system work area. **DO NOT USE THIS DISKETTE EXCEPT TO CREATE ADDITIONAL ADX BACKUP MASTERS, AND ONLY USE THE ADX BACKUP MASTERS TO CREATE ADX SYSTEM DISKETTES!** The backup procedure for Series 5-5D systems is now complete.

**NOTE**

After making your ADX backup remove all Diagnostic files from the hard disk by typing after the system prompt:

B>ERA \*.DIA

Do not attempt to execute the ADX utility program from the CP/M or MP/M operating systems.

**ADX PROGRAM TESTING ORDER**

You should run ADX test programs in the following order to test and initialize system components. Refer to the next subsection for test program descriptions and operating procedures.

1. Run MEMTEST to test computer system RAM.
2. Run PRNTEST to test the printer interface.
3. Run MFT to test computer system floppy disk drives.
4. Run HARDS5 to test the computer system hard disk, if your Series 5 system has a hard disk.

The ADX program may include other programs depending upon how your system is configured.

**DIAGNOSTICS PROGRAM REVIEW**

This section describes each utility comprising the ADX diagnostic program, under these three section headings.

1. System set up, diskette format and diskette copy programs.
2. Floppy disk drive testing programs.
3. Hard disk drive testing programs.

The ADX program may include other programs depending upon how your system is configured.

**DISKETTE FORMAT AND DISKETTE COPY UTILITY PROGRAMS****The MFORMAT Utility (Mini FORMAT)**

The MFORMAT utility program either formats or reformats diskettes. This program erases all data stored on an old diskette.



The disk drive vendor for all Series 5 models has qualified VERBATIM model number MP557-01-18242 Data Life 5 1/4" diskettes. These diskettes are 5 1/4", 96 track per inch, double density, double sided, soft sector diskettes.

Follow this procedure to execute MFORMAT.

1. Insert the diagnostic diskette in the diskette drive. Press [SYSTEM.RESET]. The ADX Diagnostic menu will display on the terminal screen. Type "MFORMAT" after the "REQUEST" prompt. The terminal will display the following MFORMAT prompting message.

```
ALTOS 5 1/4 INCH FLOPPY FORMAT FACILITY
Insert diskette to be formatted in available drive
Remove system disk if necessary
Enter drive letter to continue      A/B?
```

Insert the blank disk into desired drive and close the loading door. Type A for the right hand side drive or B for the left hand side floppy disk drive (Series 5-15D only). The system will respond by counting the diskette cylinders as they are actually formatted with the following prompt:

Cylinder XX (where XX is a cylinder number from 0 to 79)

After completing the format for cylinder 79 the utility will finish and prompt you for repeating the format task, in the following manner:

Would you like to format another diskette? Y/N

At this point remove the formatted diskette from the disk drive, label it, enter "Y" for Yes if you wish to repeat or "N" to return back to the ADX Diagnostic menu.

### **The BOOTCOPY Utility**

The BOOTCOPY program is designed for the Series 5-5D and the Series 5-10 computer systems. This utility will also work on the Series 5-15. It copies the autoboot system tracks (0 and 1) from a source disk, to any object disk that has already been formatted.

The following procedure prompts you to load a diagnostics diskette in drive A; then exchange the diagnostics diskette for a source diskette; then finally exchange the source diskette for the blank formatted diskette.

Follow the procedure below to execute the BOOTCOPY program.

1. Format a blank diskette using the MFORMAT program. This newly formatted diskette is the object diskette. To perform the

BOOTCOPY program, you will need the diagnostic disk, a source disk, and the object disk.

2. Insert the ADX diagnostic diskette in the diskette drive. Press [SYSTEM.RESET]. The ADX Diagnostic menu will display on the terminal screen. Type "BOOTCOPY" after the "REQUEST" prompt. The terminal will display the following prompt:

```
Altos 5-1/4 inch boot copy program
Insert diskette to be read from in drive A:  and type CR
Insert diskette to be written to in drive A:  and type CR
```

Insert the diskette and press RETURN.

Do you want to repeat, (Y/N)

After completion of the boot copy you will return back to the ADX Diagnostic menu, if you reply "N."

#### NOTE

At this point the object disk contains bootcopy tracks 0 and 1. It does not contain data. Use the PIP procedure outlined in the operating system section to copy or transfer program or data files from source disks to object disks.

#### Using the COPY Utility

The COPY performs a sector by sector copy of a CP/M or MP/M 5-1/4" diskette. This utility requires two floppy disk drives, therefore it can only be used on the Series 5-15D computer system.

The COPY utility requires a "source" and a previously formatted "object" disk to be copied.

Follow this procedure to execute the COPY utility program.

Load the ADX Diagnostic diskette into logical drive A. Press [SYSTEM.RESET]. The ADX Diagnostic menu will display on the terminal screen. Type "COPY" after the "REQUEST" prompt. The terminal will display the following prompt:

```
Altos 5-1/4 inch disk copy program
Insert diskette to be read from in drive A
Insert diskette to be written to in drive B
Type return
```

Insert the diskette you wish to copy in the right hand side drive (drive A). Insert the formatted "object" diskette in the left hand side drive (drive B) and then depress the return key on the keyboard of your terminal "[RETURN]".

After completing the copy, the utility will finish and prompt you for repeating the copy task. Remove the "source" and "object" diskettes. Type "Y" for Yes to repeat copying or type "N" to return back the Diagnostic Command Directory. This copy utility copies all areas on the disk, the AUTOBOOT portion as well as the data/program area.

#### **Documentation for HRDINIT5**

This program is provided on the diagnostic diskette. The program will not run under CP/M or MP/M.

The program should be run only once, unless the disk has been reformatted. Since the program will erase all files on the hard disk, back up all files to floppy disk, if required.

The program when run from a diagnostic diskette will initialize 5-1/4" hard disks. In the process of initialization the program builds bad sector information table, this table is written on the last sector of the first track of a particular disk drive. Up to two drives are supported.

Alternate sectors are allocated to bad sectors, the number of alternate sectors available is a function of the size of the drive involved. A fixed number of tracks in the beginning of the disk drive are reserved for use for alternate sectors.

#### **Procedure for Running HRDINIT5**

- 1) Boot from the diagnostic disk.
- 2) Request HRDINIT5 when the diagnostic directory is displayed.
- 3) Reply "Y." Do you want to continue?
- 4) If there is a request for a second drive, reply with appropriate number, after the system disk has been initialized.
- 5) Reboot the system.

#### **FLOPPY DISK DRIVE TESTING PROGRAMS**

These tests will not normally need to be run unless problems with the floppy diskette drives, printer, memory or the CPU PCB are encountered.

##### **Mini Floppy Test (MFT)**

The ADX MFT test program package tests the computer's floppy disk drive system. It consists of 7 tests. Run various test programs in this package if you suspect that you have a hardware-driven problem with your system.

**Running MFT**

You will need one formatted blank diskette for Series 5-5D (two for Series 5-15D) to use MFT. Using known good diskettes, format the diskettes on the drive to be tested using MFORMAT. Then run MFT function test C (listed on the MFT main menu) for at least 400 passes, if possible. There should be fewer than one error per pass.

If the number of errors per pass is greater than one, terminate the test and try new and different floppy diskette, to insure that you do not have defective media.

To run this test, insert the ADX copy diskette into logical drive A and depress the reset pushbutton. The diskette will boot up automatically, and display the Diagnostic Commands Directory. First, type MFORMAT after the REQUEST: prompt to format a blank diskette. Return to the Diagnostic commands directory after formatting a diskette, and type MFT after the REQUEST: prompt.

The MFT Main menu displays in a few moments. It prompts you to choose which floppy disk drive function to be tested. The most useful choice to make in most field situations is option c, RELIABILITY TEST, but other tests on the menu may also be chosen. The Reliability test should be run overnight, if possible; most other tests on the menu will take less time. All tests display screen prompts to guide you clearly through simple operating procedures.

Type S on the keyboard to generate a summary error display at any time during any function test you select in this program.

Type [ESC] to abort any function test at any time.

\*\*\*\*\*ALTOS 5.25 INCH FLOPPY TEST FACILITY \*\*\*\*\*

- a) Continuously write a sector
- b) Continuously read a sector
- c) Reliability test
- d) Continuously write then read one track
- e) Motor start timing test
- f) Exit program.

**Displaying Errors**

All MFT function tests seek, find, and report errors in the floppy disk system. Error information can be displayed in two different tables: The ERROR SUMMARY TABLE and the ERROR DISPLAY TABLE.

Type the letter S to call the error summary table. It can be called at any time from any function test on the MFT main menu. The error summary table tallies errors as an individual test

accumulates them. The summary table will not interrupt the test you are running.

Here is a list of error code definitions and suggested problem sources for the Error Summary Table.

1. CRC -- Cyclic Redundancy Check. This Error type shows that you are probably losing data integrity between the controller and the floppy diskette.
2. RNF -- Record Not Found. The sector address holding test data cannot be located.
3. SKV -- Seek/verify error. Unable to verify track number after seeking.
4. CMP -- Compare error. Loosing data integrity between the Floppy Disk Controller and Volatile memory.

The following screen displays, with a prompt for you to select the error display table.

ERRORS

	Drive A				Drive B			
	CRC	RNF	SKV	CMP	CRC	RNF	SKV	CMP
SOFT	0	0	0	0	0	0	0	0
HARD	0	0	0	0	0	0	0	0

Do you wish to display errors (Y/N)

The error display table is selected by answering Y (yes) to the prompt that appears at the bottom of the error summary table. It shows error types and the physical locations of errors on the diskette. It is best called toward the end of a test.

SOFT ERRORS	DRIVE	SIDE	TRACK	SECTOR	ERROR	PASS	OCCURRENCES
	1	0	23	4	CMP	0	2

**Continuously Write a Sector**

Enter A to select this first test. It prompts you first to enter the Drive, cylinder, head and sector number to be written to, and then to insert a formatted test diskette into the drive to be tested.

**Continuously Read a Sector**

Enter B to select this test. It prompts you first to enter the drive, cylinder, head and sector number to be read from, and then displays the contents of the sector.

**Reliability Test**

Enter C to select this test. Test accuracy increases greatly with the number of passes it has time to make over the test diskette. It should run for a few hours on a normal system; when setting up a system or locating major hardware/software interface problems, this test should be allowed to run overnight.

It first prompts you to select a drive number, and then to insert a formatted test diskette in the drive number selected. Next, it displays the Reliability Test Screen and begins to conduct a read/write error test. It displays errors in a table similar to the Error Display table.

**Continuously Write then Read One Track**

Type D to select this test. It first prompts you to select drive, cylinder and head numbers, and then to insert a formatted test diskette in the drive number selected. It displays errors in a table similar to the Error Display table.

**Motor Start Timing Test**

Enter E to select this test. This test prompts you to place a formatted diskette in drive A. The test turns the motor on and off constantly to verify that it is operating correctly. Press ESCAPE key to terminate the test.

**EXIT Program**

All function programs return to the MFT main menu when finished. Exit MFT by selecting option f., exit program.

**Printer Test (PRNTEST)**

Select PRNTEST after the REQUEST: prompt from the diagnostic command directory. This command causes the following characters to be displayed on the terminal and to be printed on the printer when the printer is connected.

PRINTER TEST X.X

```
!"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_
`abcdefghijklmno
pqrstuvwxyz{|}~
```

**Memory Test (MEMTEST)**

MEMTEST command allows the user to test all but a small portion of system RAM for possible errors. Since the program itself occupies some memory, that portion cannot be tested.

Follow this procedure to run MEMTEST.

1. Insert the diagnostic diskette into drive A.
2. Boot up the system. You will see the diagnostic menu.
3. Type MEMTEST at the REQUEST: prompt to select MEMTEST.

The screen will display the following.

```
ALTOS BOOT MEMORY TEST VERSION X.XX
```

```
VALID TEST MEMORY RANGE (HEX)
```

```
COMMON AREA C000 - FFFF
```

```
BANKS 0-2: 0000 - BFFF; BANK 3: 4000 - BFFF
```

```
SELECT MEMORY BANK TO BE TESTED
```

```
TEST ALL BANKS? (YES=Y: NO=N)
```

```
USER DEFINED TEST PATTERN (Y OR N)
```

```
DEFINE PATTERN:
```

```
TEST ALL MEMORY? (YES=Y,NO=N)
```

```
# OF PASSES TO RUN:
```

```
HALT ON FIRST ERROR? (YES=Y,NO=N)
```

```
SPECIFY MAXIMUM # OF ERRORS ALLOWED:
```

```
RUN ALL FIVE TESTS (YES=Y,NO=N)
```

You will be prompted 4 times to select a memory bank. If you wish to elect only one memory bank, select bank, 0,1,2, or 3, and press [RETURN]. Also press [RETURN] to bypass subsequent memory bank select options. You will now receive the following screen display.

```
STARTING ADDRESS (HEX)?
```

```
ENDING ADDRESS (HEX)?
```

Refer to matrix maps for memory address selections. Memory test range is given in the screen display above. Select the starting and ending addresses and press [RETURN] after each selection.

Memory testing will now begin. The screen will display this prompt as it tests.

```
12345  PASSES -      1      ERRORS -      0
12345  PASSES -      2      ERRORS -      0
```

ALL DONE, WAITING FOR CONSOLE INPUT....  
 TYPE L TO GET A LIST OF VALID COMMANDS

TYPE C TO GET CURRENT CONTROL WORD  
 TYPE L TO GET LIST OF ALL COMMANDS  
 TYPE S TO PRINT TEST SUMMARY  
 TYPE R TO RESTART THE TEST  
 TYPE P TO RESTART WITHOUT CHANGING ANY PARAMETERS  
 TYPE H TO HALT TESTING

If you wish to stop the test without terminating it, and see the results, press S (SUMMARY) on the keyboard and the results will be displayed. Press R (RESTART) on the keyboard if you wish to terminate the test, see the results, and select another memory bank.

Press [SYSTEM.RESET] to return to the diagnostic menu.

Replace any defective memory chips with 64Kx1 dynamic RAM 200 nanosecond access time. The chip you select must support a refresh cycle by performing a RAS only cycle at each of 128 row addresses every 2 milliseconds or 128 cycles. Chips that require 256 refresh cycles cannot be used. 64K RAM chips from Okidata and Motorola have been qualified for use in a Series 5 computer.

## HARD DISK TESTS AND FUNCTIONS

### Hard Disk Test (HARDS5)

HARDS5 tests computer system hard disks. It consists of 9 tests. To run this test, load the ADX diskette and type HARDS5 after the REQUEST: prompt. The screen displays the following status message.

```
*** Hard Disk (5") Test Facility vX.X ***
Specify Configuration of HARD DISK to be tested.
Default Configuration is:
Drive Number      :    1
Cylinders per Drive :  153
Number of Heads   :    4
Sector Size       :  512
Press RETURN to bypass a selection.
Enter Drive Number      ("1" or "2")      <CR>
```

Respond by specifying the conditions under which you will run the hard disk tests or functions. The following prompts will appear.

```
Enter cylinders per drive ("1" = 153; "2" = 306) <CR>
Enter Number of Heads      ("2", "4", "6", or "8") <CR>
Enter Sector Size          ("1" = 256; "2" = 512) <CR>
```



\*\*\* Hard Disk (5 1/4") Test Facility vX.X \*\*\*

1. Format Disk Drive
2. Verify Addresses for all sectors on Disk
3. Seek Test with optional Verify
4. Write entire Disk
5. Read entire Disk
6. Set Flag Byte for a Specific Sector
7. Hard Disk Read/Write Error Test
8. Miscellaneous Functions
9. Terminate Test.

Select required function by number:

### Format Disk Drive

This function formats each sector on the hard disk drive. This function will erase flag byte indications of bad sectors (obtained from the Seagate error map provided with each computer) and all data. Sectors previously marked as bad will now be marked as valid. Unless these sectors are re-marked as bad sectors, data written on these bad sectors will be lost.

```
*****
*   WARNING: THIS HARDTEST FUNCTION   *
*   CHANGES DATA ON THE HARD DISK   *
*   AND MAY CAUSE LOSS OF USER DATA  *
*****
```

Once you have selected test 1 and pressed return, the screen will display the following.

```
*** DO NOT RUN THIS TEST WITHOUT PERMISSION FROM -ALTOS- CUSTOMER
SERVICE *** CALL 408 946 6700
Do you want to continue?
```

This function will destroy user data. Password entry is used as a safeguard to protect the system and the data it stores. You can obtain this password from your distributor or from ALTOS customer service. (Contact your distributor first.)

Before a password is given to you, an attempt will be made to determine whether a format of the hard disk is necessary.

Type your password after the question mark if you wish to continue. If you enter N and press [RETURN], you will return to the hard test selection menu.

Enter your password and press [RETURN]. The screen will display the following.

```
*** THIS TEST WILL ERASE FILES ON THE HARD DISK. ***
Do you want to continue? (Y or N):
```

Type Y and press [RETURN] to continue. The format process will begin and you will see a count from 0 to 152 appear on the screen as each cylinder is formatted. The program returns to the hard disk menu when formatting is completed, and you will be prompted to make a new selection.

REMEMBER: You have formatted the disk, but you have not flagged any bad sectors, nor have you allocated dummy files to those bad sectors. This should be done before any attempt is made to transfer user data to the hard disk.

### **Verify Addresses for All Sectors on Disk**

This test checks addresses on the hard disk. It does not erase user data. It reads every sector on the hard disk and checks the first three bytes. These bytes contain the cylinder, head/drive and sector numbers.

Type 2 [RETURN] to select this test. The screen will display the following.

Press any Key when "ready" to Start this test.

You will see a count displayed at the bottom left corner of the screen as the tracks are checked. Any bad sectors encountered which have been flagged as bad will cause a BAD SECTOR display. Any bad sectors encountered which have not been flagged earlier as bad will possibly cause a CRC error display. Once complete, the screen will display the hard disk test menu again.

You will be prompted to select which hard disk test or function you wish to perform.

### **Seek Test with Optional Verify**

This test seeks between two operator specified cylinders and verifies the addresses at head 0, sector 0, of each specified cylinder.

Type 3 [RETURN] to select this test. The screen displays this prompt.

Press any key when ready to start this test.

The program then prompts you to specify a low cylinder and a high cylinder to set the test boundary. For maximum boundary limit, select cylinder 0 and cylinder 152. For minimum boundary, specify cylinder 0 and cylinder 1. Specify any appropriate low/high cylinder combination.

The program then prompts you to set the verification flag on the test loop. To the operator it doesn't appear to make any difference whether Y or N is selected, the cylinder numbers will be displayed as the seek is performed, but if Y is selected the

logic of the system reads data for each cylinder. With Verification selected a BAD SECTOR display will be generated if any bad sector that has been flagged is encountered. If the head 0 and sector 0 address of the specified cylinder has not been previously flagged as a bad sector, and the I.D. block for that sector is bad, a RECORD NOT FOUND display will be generated. The system may not be performing the seek operation properly. To verify that SEEK is performing properly, select another cylinder.

### Write Entire Disk

This function writes a two-byte character to the data block for each track of the disk. This character can be selected by the operator.

Type 4 [RETURN] to select this test. Answer Y at this warning prompt to continue.

WARNING: THIS HARDTEST FUNCTION  
CHANGES DATA ON THE HARD DISK  
AND MAY CAUSE LOSS OF USER DATA  
Do you wish to continue? (Y or N)

The test asks if you want to specify a write-pattern. Enter Y [RETURN] to specify a pattern. You will be prompted to select the pattern you wish to use.

If you have no specific pattern, enter n [RETURN]. The system will then write its own character, E5H, on the disk. You will see the count, track by track, as it writes to the disk.

The final error display can vary depending upon these four write situations.

1. Writing to a flagged bad sector will cause a BAD SECTOR display.
2. Writing to an unflagged bad sector may cause a CRC error display if the ID block and CRC bytes are also bad.
3. Writing to an unflagged bad sector with a bad ID block will generate a RECORD NOT FOUND display regardless of the condition of the CRC portion of that ID block.
4. A bad sector with a bad data block by a good ID block will not generate an error display. A READ test will detect this error condition.

### Read Entire Disk

This function reads each sector of each track of the hard disk. The test uses a memory buffer area. The program writes FFH hex into the memory buffer before beginning the read process. As each sector is read into this buffer, the contents of that sector will

be written over the FFH hex number that is located there.

FFH hex is again written to the memory buffer, and the next sector writes over FFH a second time. This "flushing" of the memory buffer is done to ensure that the contents of each sector are read accurately.

Type 5 [RETURN] to select this test. This menu of display options screens.

Hard Disk read display Options are:

1. DO NOT Display data if any error,
2. Display data only if a STATUS error,
3. Display data only if a COMPARE error,
4. Display data if a STATUS or COMPARE error.

Select option by number:

#### Option Descriptions

1. Option #1 runs the test but does not display on the contents of the data block any status or compare errors.
2. Option #2 will cause the hard disk controller to send back status errors when the controller is unable to locate and properly identify a sector. The data block is passed unchecked but the program will check the CRC portion of the data block for CRC error. This option displays the contents of any error sector found, along with an error message.
3. Option #3 allows the operator to select a one or a two byte character for comparison for the test. It will display the following prompt.

Patterns can be specified by entering:

- \*1 - for 256 byte pattern (hex 00 .... FF)
- one or two byte pattern - enter pattern in binary, octal, decimal or hex

Select pattern:

You should select the same read bytes that you used to perform a write test (HARDS5 test #3). This option uses the CPU to compare the contents of the data block against the operator-selected pattern.

A compare error generates an error message along with the contents of the bad sector. Since the data block does have a CRC area associated with it, the sector CRC is also checked. It is possible (but unlikely) that the data could be compared favorably, but the CRC bits be found in error. If this occurs, a CRC ERROR display message will display.

4. Option #4 also allows you to select read-bytes. This option displays both status and compare errors, as well as the contents of the sector found in error.

#### Set Flag Byte for a Specific Sector

This function may be done in one of two ways:

1. You can use error map data provided by Seagate.
2. You can select the cylinder, head, and sector to be flagged.

Type 6 [RETURN] to select this test. The program displays this warning.

\*\*\* THIS TEST WILL ERASE FILES ON THE HARD DISK. \*\*\*  
Do you want to continue? (Y or N):

Press any key when ready to start this test.

The program then displays this option menu.

Hard Disk "Flag Bad Sector" Options are:

1. Disk Error Map
2. Cylinder, Head, Sector

Make your selection and press [RETURN]. If you select option #1, you will be prompted to enter TRK, HD, byte count and length in bits. Type your selection and press [RETURN].

```
Select option by number: 1
Enter CYL:                60
Enter HD:                 2
Enter SECTOR Number:     4
Enter BYTE Number:       300
Bad sector Range : cylinder = 60 head = 2 sector(s) = 12
```

Do you want to continue this test? (Y or N):

If you type Y at the prompt, the program will continue to prompt you for the next bad sector to be flagged, until all bad sectors have been flagged. If you enter N [RETURN], the program will return you to the hard disk menu.

#### NOTE

This function sets flags for bad sectors but it does not allocate alternate sectors to those sectors which you have flagged. Run HRDINIT5 to allocate alternate sectors.

**Hard Disk Read/Write Error Test**

In this test, an error is considered to be a "soft" error when one unsuccessful attempt has been made to read data. A RECAL is made between each attempt. If the READ is successful on the second or third attempt, then the program declares a soft error. The program tolerates a certain number of soft errors.

The program declares a "hard" error after it has made three unsuccessful attempts to read data. The hard error is declared, flagged, and allocated. Sectors containing hard errors should be mapped by using either this test; test #7; or by using the combination of tests #6 and #8.

This test provides two functions:

1. It fully tests all aspects of the disk by writing and reading a variety of data patterns to the entire disk. The display will show all hard errors (bad sectors) and CRC errors.
2. Once the first function is terminated, the user is given the opportunity to allocate dummy files to those bad sectors which were flagged during the first portion of the test.

Press [ESC] to terminate the test. The program will go back and erase the entire disk and automatically flag those sectors which is identified as being bad.

Type 7 [RETURN] to select test #7. The display will inform you that the test will erase files on the hard disk and ask if you want to continue (Y or N). Type Y [RETURN]. The display will then prompt you to press any key when you are ready to start the test.

WARNING; THIS HARDTEST FUNCTION  
CHANGES DATA ON THE HARD DISK  
AND MAY CAUSE LOSS OF USER DATA  
Do you want to continue? (Y or N)

This Error Test Menu displays next.

Hard Disk reliability display Options:

1. Continuous display on terminal.
2. Display error summary at the end of each pass.
3. Display error summary only at the end of the test.

Select option by number

Use Option #1 with the ADM31 and Televideo 912 terminals, and other terminals with similar type cursor control.

Use Option #2 with any terminal.

Use Option #3 when no terminal is attached to the computer system or when the terminal is to be removed during test.

This prompt displays after you have selected your option.

Do you want to display data if a CRC error? (Y or N):

Do you want to write specific patterns? (Y or N):

A "Y" response to the last prompt will generate this pattern prompting menu. Type the pattern you want to write onto the disk and press [RETURN]. The program will shift to the next pattern on the menu. Press [RETURN] alone to accept the pattern showing for the pattern option.

The screen will fill with the display which is used for this test. You will also hear the hard disk chirp as the heads seek the patterns on the disk.

Pattern #1 revisited: E5E5H  
 Pattern #2 revisited: 5555H  
 Pattern #3 revisited: AAAAH  
 Pattern #4 revisited: FFFFH

Press any key when ready to continue this test.

The program displays all patterns, and separates hard errors and soft errors into individual categories. If you have bad sectors on your hard disk you will be able to see the computer record the bad sectors as it encounters them. The counter also increments as it writes from track to track.

This test can take several hours to complete. Set up the test to run overnight, if possible. Press [ESC] to terminate the test. The test will complete its current pass, and stop. It will ask if you wish to print out the test results.

Pass count:  
 Pattern:  
 Cylinder:

#### Soft Errors

Chars: E5E5H	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: 5555H	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: AAAAH	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: FFFFH	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0

#### Hard Errors

Chars: E5E5H	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: 5555H	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: AAAAH	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0
Chars: FFFFH	CMP Err	0	CRC Err	0	RNF Err	0	BAD SEC	0

Finishing Current Pass

Do You want to print (LP) the errors? (YES=Y,NO=N)

The program will display a soft error table that summarizes the entire test. Press any key on the keyboard to generate a hard error display.

### Miscellaneous Functions

At present this selection provides three unique functions:

1. You may alter the way displays are provided on other hard disk tests. Type 1 [RETURN] and the screen will display this prompt.

Do you want the disk error status message displayed? (Y or N)

2. You may display a sector on the screen in ASCII, on the right side of the screen, and in HEX on the left side. Type 2 [RETURN] and the screen will display this menu.

\* DISPLAY HARD DISK SECTOR \*

Enter Cylinder Number: (Select and press return)

Enter Head Number: (Select and press return)

Enter Sector Number: (Select and press return)

Type 4 [RETURN] to terminate this test. The display will return to the hard disk test menu.





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# **Preliminary Series 5 Computer System Supplement 4. Installing The OASIS Operating System**

**Revision C.1  
February 17, 1982**

**Disclaimer**

This is a preliminary publication of the ALTOS Series-5 Computer System Documentation and is presented for information purposes only; it will be changed without notice.

The information contained herein represents the most current information available at the time of printing, however, the information has not been thoroughly reviewed nor has it been approved in its present form. ALTOS Computer Systems assumes no liability whatever related to use of information presented in this publication.

**NOTE**

This revision replaces but does not  
obsolete previous revisions  
of this document.

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## SERIES 5 COMPUTER SYSTEM

## SUPPLEMENT 4. INSTALLING THE OASIS OPERATING SYSTEM

## INTRODUCTION

This version of OASIS supports the Series 5 computers.

There are single-user and multi-user versions of this release that are marked as follows:

OASIS Multi 5.532M - two diskettes for multi-user OASIS 5.5  
OASIS Single 5.532S - two diskettes for single-user OASIS 5.5

The first diskette contains the SYSTEM.NUCLEUS file and all utility commands. The second diskette contains 24 of the terminal class files plus some other miscellaneous files that are described below. (System diskette number two.)

A second hard disk in an external unit can also be connected to the main unit.

Within OASIS, the floppy disks are device numbers 1 and 2 and have names FLOPPY1 and FLOPPY2. The hard disk units are device numbers three through eight, and have names HARD1 through HARD6. (Currently only HARD1 and HARD4 are used. The others are reserved for larger capacity hard disks that might be available later). Listed below are the device numbers and names and their corresponding physical and logical drive designations:

Device Number	Device Name
1	FLOPPY1
2	FLOPPY2
3	HARD1
4	HARD2
5	HARD3

6	HARD4
7	HARD5
8	HARD6

The specifications for the hard disk are as follows:

Formatted capacity 5.3 Megabytes  
Number of cylinders 152  
Number of heads 4  
Number of sectors per track 34  
Number of bytes per sector 256  
Default directory size 984 files

(There are actually 153 cylinders on the disk. The first cylinder is used for spare sectors, and for system information.)

(The physical sector size is 512 bytes and there are 17 per track. OASIS puts two 256-byte sectors into each physical sector.)

Specifications for the floppy diskettes:

Formatted capacity 655 kilobytes  
Number of cylinders 80  
Number of heads (i.e., sides) 2  
Number of sectors per track 16  
Number of bytes per sector 256  
Default directory size 240 files

The directory size is specified by using the SIZE option on INITDISK. The default value listed above is also the maximum value allowed. None of the other values listed above can be changed.

Some of the restrictions of the OASIS operating system are listed below:

- a. OASIS boots from only the first hard disk or the right hand floppy.
- b. The devices attached to SIO3(JD) and SIO4(JB) must have the same baud rate.

#### **HARD DISK FORMATTING AND INITIALIZATION**

Provided below are procedures to initialize the hard disks.

Figure S4-1 is a sample Seagate Error Map that provides the information needed to respond to the prompts for the Series 5 and the ADD-5. The Seagate Error Map is provided with the system. It is located in a plastic envelope on the hard disk inside the Series 5 computer.

### Initialize the Series 5-5D Computer Hard Disk

Insert the OASIS operating system disk in the floppy drive and boot from the floppy drive.

After you log on with the time and date you will see the screen prompt >. Attach the hard disk as follows:

```
>ATTACH A HARD1
```

Format the hard disk and spare the bad sectors for your system as follows:

```
>INITDISK A (FORMAT)
>INITDISK A (SPARE)
```

```
Are you using byte/bit count or sectors [B|S]?      B
```

Enter information from Media Defect Report.

```
Cylinder number:      n
Head number:          n
Sector number:        n
Byte number:          n
```

Enter the information provided on the Seagate Error Map as per the example in Figure 1-1.

To copy files from the floppy disk to the hard disk perform COPYFILE:

```
>COPYFILE * * S = = A (NOQUERY)
```

Press the reset button and allow the computer to boot from the hard disk.

After you log on with time and date, insert the second floppy disk (disk 2 of 2) and perform ATTACH:

```
>ATTACH G FLOPPY1
```

Copy the files from the second diskette to the hard disk as follows:

```
>COPYFILE * * G = = S (NOQUERY)
```

### Adding another Hard Disk

If you are adding another hard disk to your computer, follow the before outlined procedure to initialize and format the additional disk.

Follow the installation instructions provided with your ADD Kit.

Be sure that the first physical hard disk is formatted and initialized as outlined above.

Allow the computer to boot from the hard disk.

Perform ATTACH operation for the second hard disk:

```
>ATTACH D HARD4
```

Format and initialize the disk as follows:

```
>INITDISK D (FORMAT)
>INITDISK D (SPARE)
```

Enter the information provided in the Seagate Error Map.

## SYSTEM DISKETTE NUMBER 2

The OASIS operating system is delivered on two floppy diskettes. The first diskette contains the SYSTEM.NUCLEUS file and all utility commands. The second diskette contains 24 of the terminal class files plus some other miscellaneous files that are described below.

The terminal class files are SYSTEM.CLASSn, where n is a number from 1 through 33 that represents the class code. See the next page for a description of the terminals supported by the class codes. (Class codes 16 through 19 are reserved for use by the SCRIPT command. There are no SYSTEM.CLASS16-19 files. See OASIS Reference Manual for details.)

Class codes 5, 12, 13, 23, and 33 apply to terminals that cannot be used on Altos computers and hence they are not used.

The other files on the second system diskette are the following:

ASM.EXEC	EXEC program that performs assembly and link.
CLASS.MACLIB	Macros that are needed to create additional terminal class files.
SYSTEM.EXEC2	EXEC scratch file for partition 2.
SYSTEM.EXEC3	EXEC scratch file for partition 3.
SYSTEM.EXEC4	EXEC scratch file for partition 4.

## CODE TERMINAL

1	Beehive Bl00
2	ADDS 580 Envoy
3	Lear Siegler ADM 3A

4 Soroq IQ 120  
5  
6 Hazeltine 1500  
7 Televideo TV1912/920  
8 Perkin Elmer FOX  
9 Perkin Elmer BANTOM  
10 Heath H19 (ANSI)  
11 Infoton 100  
12  
13  
14 Elbitt  
15 ADDS Regent 20  
16  
17  
18  
19  
20 Informer 304  
21 Data Media  
22 IBM 3101 (Uses ESC, ESC for system control)  
23  
24 Intertube  
25 Volker-Craig VC404  
26 Teleray 1000 Series  
27 Tektronix 40  
28 Visual 200  
29 Heath H19 (Heath Mode)  
30 Zentec Zepher  
31 Televideo TVI950 (Uses ESC, ESC for system control)  
32 Hazeltine Modular One  
33

### INITDISK COMMAND

The INITDISK command allows you to initialize a disk for use by OASIS. This description only covers the initializing of the hard disk. For other information about INITDISK, see the OASIS Reference Manual.

INITDISK should be executed twice in order to correctly initialize the hard disk. The first INITDISK will perform the format operation and the second will allow the entering of spare information.

Formatting the hard disk will erase the spare information on the drive. The following warning will be displayed to remind the operator of this:

```
SPARE INFORMATION FOR ALL UNITS ON THE DISK WILL BE ERASED
Do you wish to continue? (Y/N)
```

INITDISK will abort if N is entered.



## NOTE

**It takes about 10 minutes to format the hard disk.**

The cylinder numbers that are displayed by INITDISK as it is formatting a disk are real cylinder numbers on the hard disk (i.e., numbers from 0 through 152). But beware that other commands (such as VERIFY) display logical cylinder numbers (i.e., numbers starting at 0 for the first cylinder number on the logical unit.)

**SECTOR SPARING**

The INITDISK command provides sector sparing either automatically or on command. Whenever the hard disk is formatted, the INITDISK program checks for any bad sectors (sectors that cannot be written or read reliably). When a bad sector is found, it is spared to the first physical track on the disk. (This track is guaranteed by the disk manufacturer to be error free for the life of the disk drive).

Alternately, spare sectoring may be done by specifying the specific sector that is to be spared. This mode is invoked by executing the INITDISK command with option SPARE specified.

When using this method of sector sparing for a new disk drive, you should have the media defect report from Seagate available. This report is a form that the disk manufacturer uses to inform you of the sectors that it has found to be questionable. This report is sealed in an envelope inside of the machine.

If you want to enter sector numbers (as shown in OASIS error messages), enter S. If you want to enter byte information from the Seagate Media Report, enter B. When you have entered the last entry, type a RETURN only in response to the track number prompt.

The sector sparing information hard disk must be re-entered whenever the disk is reformatted. The operator is reminded of this by the following message when the first logical unit is formatted:

SPARE INFORMATION FOR ALL UNITS ON THE DISK WILL BE ERASED  
Do you wish to continue? (Y/N)

Spares can be added with INITDISK if additional bad sectors are encountered while the system is running. However, individual spares cannot be deleted; the only way to delete spares is to reformat the first logical drive and re-enter the desired spares.

If it is anticipated that the spare information will have to be entered fairly frequently (as might be the case on the test floor), the spare information can be included in an EXEC program.

However, EXEC thinks that lines that begin with a number have line numbers on them. So, when creating the EXEC program either put line numbers on the statements or put some leading blanks on line that have numbers on them. The following EXEC program enters the spares for the media defect report shown in Figure 1-1.

```
&BEGSTACK
```

```
B
```

```
73
```

```
2
```

```
25
```

```
200
```

```
7
```

```
1
```

```
0
```

```
184
```

```
73
```

```
2
```

```
25
```

```
199
```

```
&END
```

```
INITDISK A (SPARE)
```

### BACKING UP THE DISTRIBUTION OASIS DISKETTES

One of the first things you should do when you receive your OASIS diskettes is to make a duplicate copy of them.

Actually, if you are going to be using a floppy disk as your system disk, what you should do is to make a duplicate copy of the distribution diskette and then use that copy for your everyday use and put the original one away in a safe place.

While making a duplicate copy may sound like a trivial task, it sometimes is not because of your hardware configuration. For example, if you have only one floppy disk drive on the system, it is not possible to simply copy from one floppy disk drive to another floppy disk drive. Thus, find your hardware configuration below and follow the procedure for making a duplicate copy of the distribution diskette.

In the following paragraphs, the phrase "distribution diskette #1" refers to the first system diskette, (i.e., the one that is labeled "DISK 1 of 2"). Likewise, distribution diskette #2 refers to the one that is labeled "Disk 2 of 2".

#### Series 5-15D (Two Floppy Drives)

- a. Boot system from distribution diskette #1.
- b. Insert a blank diskette into second drive (i.e., the left

hand drive) and attach it as follows:

>ATTACH A FLOPPY2

- c. Initialize the blank diskette as follows:

>INITDISK A (FORMAT)

When you are asked to enter a label name, type in the same volume name that is printed on the label of your distribution diskette #1.

- d. copy the distribution diskette #1 to the blank diskette as follows:

>BACKUP S A

Type Y in response to both of the messages that appear.

- e. When the copy operation is almost finished, the following message will appear:

Disk S(1) is write protected

Type I before removing the two diskettes.

- f. Put a label on the new diskette and put the distribution diskette #1 in a safe place. Use the new diskette as your system disk.

- g. Now you should make a duplicate copy of the distribution diskette #2. Initialize another blank diskette as follows:

>INITDISK A (FORMAT)

When you are asked to enter a label name, type in the same volume name that is printed on the label of the original distribution diskette #2.

- h. Copy the distribution diskette #2 to the blank diskette as follows:

>BACKUP S A

Type Y in response to both of the messages that appear.

- i. When the copy operation is almost finished, the following message will appear:

Disk S(1) is write protected

Type I before removing the two diskettes.

- j. Put a label on the new diskette and put the distribution diskette #2 in a safe place.

**Series 5-5D (One Hard Disk and One Floppy Disk)**

- a. Initialize the hard disk as outline elsewhere in this manual.
- b. Boot from the hard disk by pressing the reset button. Enter time and date. Insert distribution diskette #1 into floppy and attach it as follows:

```
>ATTACH A FLOPPY1
```

- c. Enter the following command:

```
>FILELIST A (EXEC FTYPE)
```

This puts a list of file names on a file name SELECTED.EXEC.

- d. Insert blank diskette into floppy drive and initialize it as follows:

```
>INITDISK A (FORMAT)
```

When you are asked to enter a label name, type in the same volume name that is printed on the label of your distribution diskette #1.

- e. Copy the system to the blank diskette as follows:

```
>COPYFILE SYSTEM NUCLEUS S = = A  
>SELECTED COPYFILE S = = A (NOQUERY)
```

- f. Put a label on the new diskette and put both diskettes in a safe place.
- g. Insert distribution diskette #2 into floppy drive.
- h. Enter the following command:

```
>FILELIST A (EXEC FTYPE)
```

This puts a list of file names on a file named SELECTED.EXEC.

- i. Insert a blank diskette into floppy drive and initialize it as follows:

```
>INITDISK A (FORMAT)
```

- j. Copy the files to the blank diskette as follows:

```
>SELECTED COPYFILE S = = A (NOQUERY)
```

- k. Put a label on the new diskette and put both diskettes in a safe place.

MODEL NO : 506  
 SERIAL NO : 30246

PASSED DRIVE  
 SYS 3: 27

TEST DCU: 2  
 DATE: 11/5/81

TEST	RESULT	PASS/FAIL ERROR CODE
SELECT		PASS
TRACK ZERO		PASS
START TIME:		
+12V NOM	5.6 SECS	PASS
+12V LOW	9.6 SECS	PASS
+12V HIGH	6.3 SECS	PASS
ROTATIONAL SPEED:		
+12V NOM	3609.2 RPM	PASS
+12V LOW	3607.5 RPM	PASS
+12V HIGH	3609.6 RPM	PASS
STOP TIME	7.4 SECS	PASS
START TIME, REV VOLTS	7.4 SECS	PASS
STEP TIME TO SK ERROR		
+12V NOM	2.7 MS	PASS
+12V LOW	2.7 MS	PASS
+12V HIGH	2.7 MS	PASS
TIME TO SEEK COMPLETE	13.5 MS	PASS
HEAD SETTling TIME		PASS
ISV		PASS
FULL CYLINDER		PASS
INC SEEK TEST		PASS
DEC SEEK TEST		PASS
OUTSIDE WINDOW MARGIN		
LATE EDGE	36.0 NS	
EARLY EDGE	36.0 NS	
TOTAL	72.0 NS	PASS
INSIDE WINDOW MARGIN		
LATE EDGE	24.0 NS	
EARLY EDGE	24.0 NS	
TOTAL	48.0 NS	PASS
LONG TERM READ ERRORS		
SOFT	1.	PASS
HARD	2.	PASS
RANDOM R/W ERRORS		
SOFT	0.	PASS
HARD	1.	PASS
SHIPPING	0.	PASS
HARD ERROR MAP\		
CYL HD SEC BYTE		
73 2 25 200		
7 1 0 184		
73 2 25 199		

Figure S4-1. Seagate Error Map Example



---

# **Preliminary Series 5 Computer System Supplement 6. Upgrade Kit -5 (UK-5) Installation Procedures**

**First Release  
June 22, 1982**

#### **Disclaimer**

This is a preliminary publication of the Altos Series-5 Computer System Documentation and is presented for information purposes only; it will be changed without notice.

The information contained herein represents the most current information available at the time of printing, however, the information has not been thoroughly reviewed nor has it been approved in its present form. Altos Computer Systems assumes no liability whatever related to use of information presented in this publication.

INSTALLATION PROCEDURES  
Series 5 UK-5 Upgrade Kit

This manual provides instructions for incorporating a UK-5 Upgrade Kit into a Series 5 -5D and -15D Computer System.

Manual Part No: 690-11899-001

First Release

June 22, 1982

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**NOTE**

**After you have completed this installation, store this procedure in the binder along with your Series 5 Computer System User Manual.**

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**SUPPLEMENT #6. UPGRADE KIT (UK-5) INSTALLATION PROCEDURES****GENERAL INFORMATION**

These procedures apply only to the Altos Computer System UK-5 Upgrade Kit. This kit includes one 5-1/4 inch Hard Disk Unit (HDU), one Hard Disk Controller (HDC) board, and one hardware kit for a Series 5 Computer System. The UK-5 provides an additional five megabytes of formatted hard disk storage.

**Conventions**

Altos Computer Systems manufactures equipment designed for 115 VAC 60 Hz and 230 VAC 50 Hz. The 115 VAC 60 Hz systems are designated with an A and the 230 VAC 50 Hz systems are designated with an E.

**Terms Used In This Procedure**

This manual uses the abbreviations listed below.

- UK-5 - Refers to the UK-5 Upgrade Kit and includes everything contained in the shipping container. Components are listed specifically in KIT DESCRIPTION.
- HDU - Hard Disk Unit
- HDC - Hard Disk Controller Board
- CPU - Central Processing Unit
- PCB - Printed Circuit Board
- Mbyte - Megabyte (One million bytes of storage)

**KIT DESCRIPTION**

This Upgrade Kit (UK-5) provides all the components necessary to incorporate one 5-1/4 inch Hard Disk Drive Unit (HDU) into an Altos Series 5-5D or 5-15D Computer System and one Hard Disk Drive Controller (HDC) Board into a Series 5-15D Computer System. All part numbers used are Altos part numbers.

Part No: 530-11260-XXX

where XXX is: 001 = 115 VAC  
002 = 230 VAC

**NOTE**

Not all of the parts included in the UK-5 kit are required for the Series 5-15D. Those parts not used should be set aside as spares.

**Verify Components (Both Series 5-5D and 5-15D)**

Unpack the Upgrade Kit and verify that it includes the components listed below.

1. One copy of this Installation Procedure.

Part No: 690-11889-001

2. One UK-5 Chassis.

Part No: 310-11095-001

3. One 72-inch, 25-pin external interconnect cable. This is used to connect the host computer rear panel to the Upgrade Kit chassis rear panel (JY to JY).

Part No: 510-11443-001

4. One 72-inch, 37-pin external interconnect cable. This is used to connect the host computer rear panel to the Upgrade Kit chassis rear panel (JZ to JZ).

Part No: 510-11444-001

5. One power cord. This is used to connect the Upgrade Kit chassis to the power source.

Part No: 230-10223-001

6. One Fuse Holder (cap with fuse - part of fuse assembly). This is used in the Upgrade Kit chassis.

Part No: 140-10269-001

- a. One 125-Volt, 2-ampere fuse.

Part No: 140-10454-001

-or-

- b. One 250-Volt, 1-ampere fuse.

Part No: 140-10804-001

7. One two-position shunt. This is to be installed on the CPU board.

Part No: 115-10477-001 SHUNT, 2 POS

#### Verify Components (Series 5-15D Only)

The below listed parts are used only when the UK-5 is incorporated into a Series 5-15D Computer System.

1. One HDC board, as shown in Figure 1.

Part No: 615-11097-001

2. One 5.5-inch, 34-pin internal interface ribbon cable. This is used to connect the CPU board to the HDC board.

Part No: 510-11403-001

3. One 5.5-inch, 37-pin ribbon cable to rear panel, 34-pin end to HDC board. This is used to connect the HDC board to the computer inside rear panel.

Part No: 510-11144-001

4. One 8.5-inch, 25-pin ribbon cable to rear panel, 20-pin end to HDC board. This is used to connect the HDC board to the computer inside rear panel.

Part No: 510-11144-001

5. One DC power cable, HDC to power supply (six conductors).

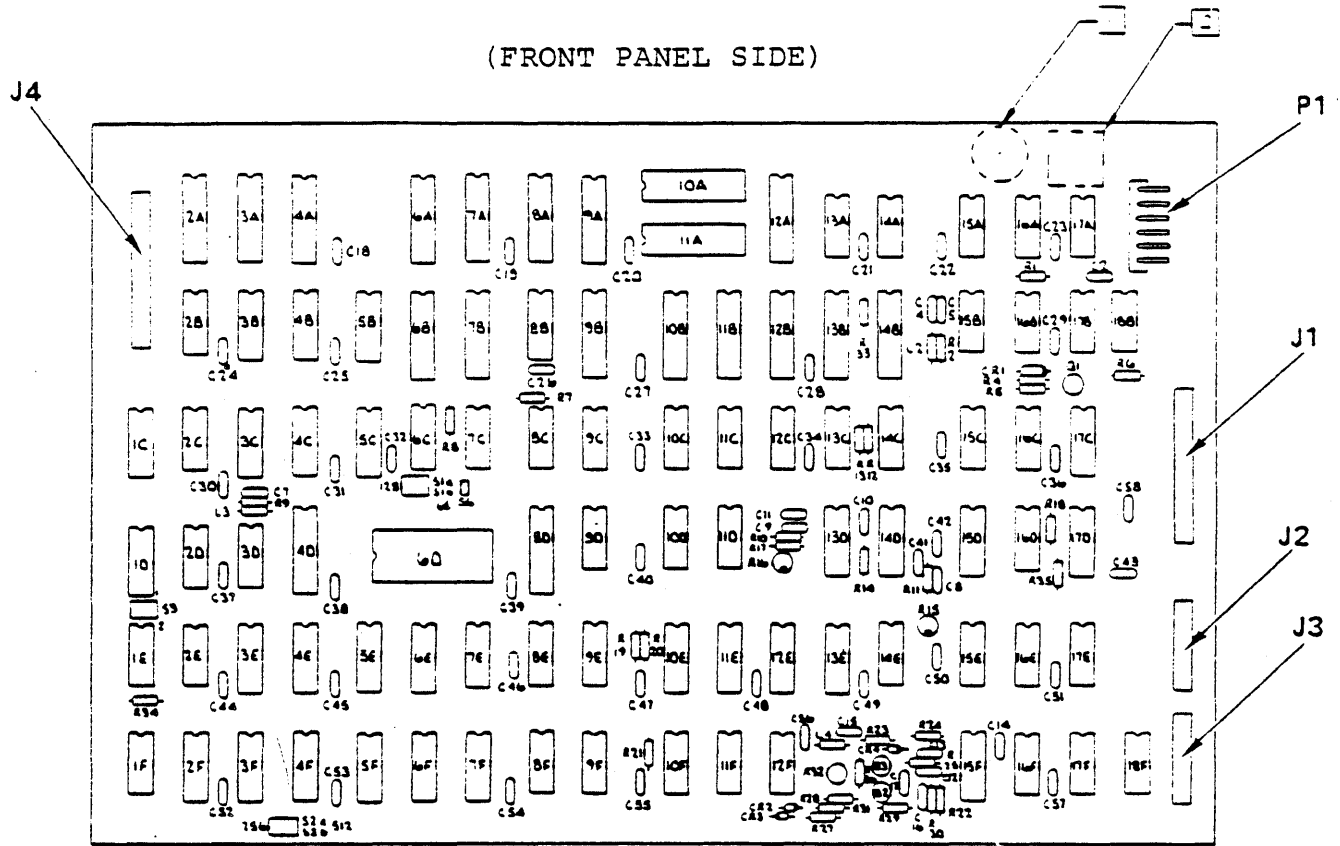


Figure 1. 5-1/4 Inch Hard Disk Controller Board Matrix Map

## 6. Attaching Hardware Kit, Series 5.

Part No: 540-11309-001

- a. Four spacers, #4 Hex M/F THD (Part No: 320-10369-001).
- b. Four nuts, #4 KEP (Part No: 320-10368-001).
- c. Four supports Circuit Board (Part No: 210-12203-001).
- d. Bag, Plastic 3" X 5" Zip Top to hold parts. (Part No: 700-10906-001).
- e. One shunt, 2 POS (Part No: 115-10477-001).
- f. Two clamps, Flat 3" (Part No: 210-11141-001).

**TOOLS REQUIRED**

The below listed tools are required to incorporate the hard disk into the computer system.

1. A 3/16-inch nutdriver. This is used for the nuts attaching the cable connectors to the computer inside rear panel.
2. Phillips-head screwdriver.
3. Needle-nosed pliers.
4. Other common hand tools, as required.

**UNPACKING THE UPGRADE KIT**

Unpack the Upgrade Kit as outlined below.

- Step 1. Turn the shipping container right side up. Carefully cut the binding tape and open the container.

**CAUTION**

Use reasonable care when opening the shipping container. Sharp or pointed instruments may pierce the protective cover and scratch the finish of the Upgrade Kit housing, or damage the other parts of the kit (cables, etc.).

- Step 2. Note the method of packing, and remove the kit components. Remove documents, store pertinent papers in a safe place for future reference, and remove cardboard tray. As the kit is unpacked, check the contents with those listed under KIT DESCRIPTION.
- Step 3. Gently tip the container on its side and slide out the Upgrade Kit Chassis along with the foam packing pieces. Remove and save the plastic cover and packing materials. Place the housing assembly on a suitable work surface and replace the foam pieces in the container.
- Step 4. Store the shipping container and the packing materials in a safe place for future shipment.

**SERIES 5-5D UPGRADE KIT (UK-5) INSTALLATION PROCEDURES**

To install the upgrade kit for the Series 5-5D, perform the below outlined steps.

- Step 1. Power off the terminal, printer, etc.
- Step 2. Disconnect host computer system power. Remove cord from wall, then computer.
- Step 3. Remove all cables (terminal, printer, etc.) from the computer.
- Step 4. With the computer resting on its side, remove the four (external) screws that hold the cover and the one (external) screw that holds the front panel.
- Step 5. Rotate the computer to its normal upright position (on the four rubber feet).
- Step 6. Grasp the sides of the cover at the rear, spread slightly outward, and remove it from the computer.
- Step 7. Remove the three top (internal) screws that hold the front panel (bottom screws were removed with the cover screws).
- Step 8. Disconnect the reset switch at the CPU board.
- Step 9. Remove the front cover.
- Step 10. Release the two NY latches (Figure 2) holding the hinged PC board in place and lift up the PC board.

**CAUTION**

**Do not allow board to drop or twist.**



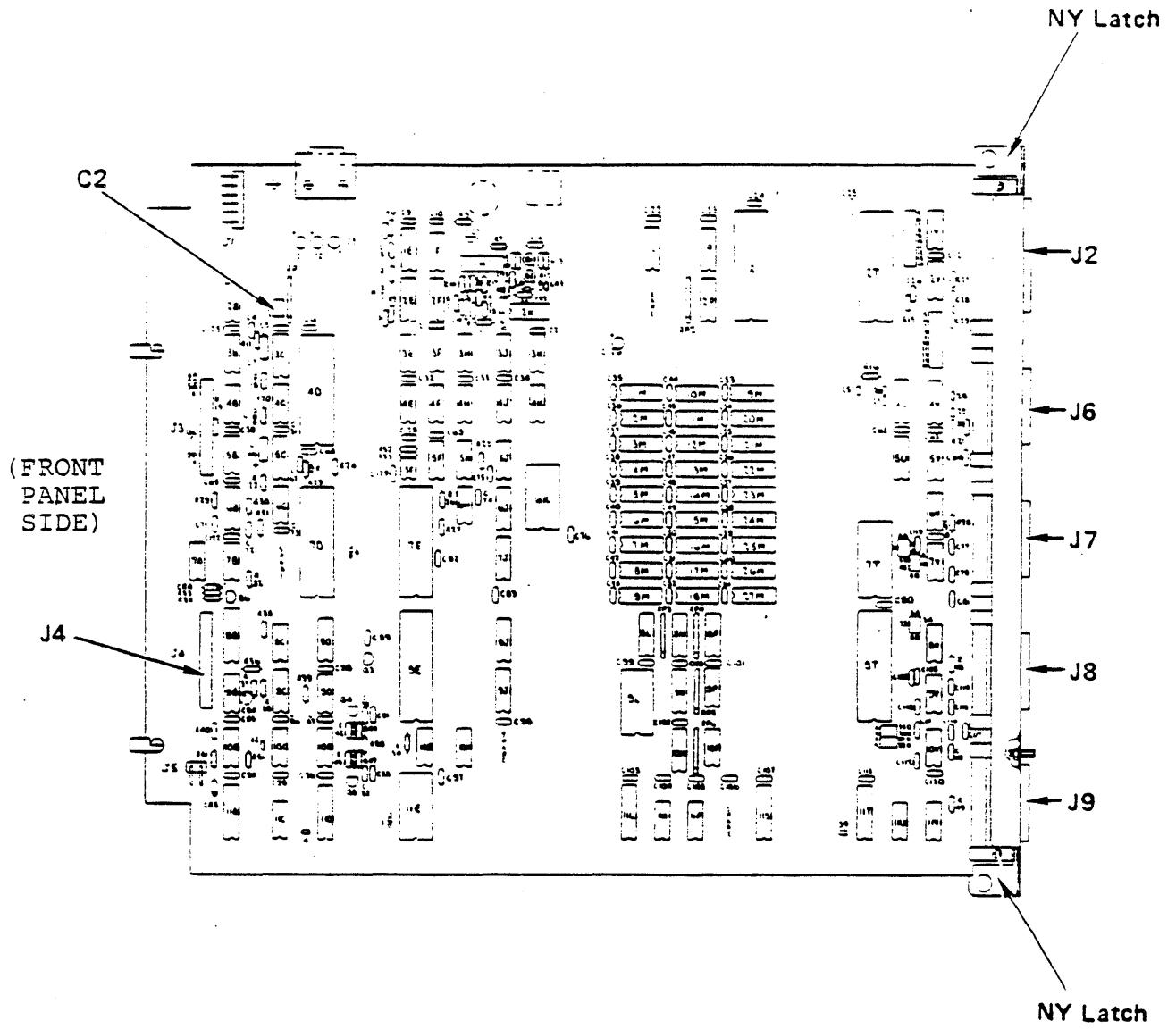


Figure 2. CPU Board Matrix Map

- Step 11. At the hard disk drive, disconnect the two I/O cables and the DC power cable.
- Step 12. Lower the hinged PC board, engage the two NY latches.
- Step 13. With the computer resting on its side (floppy disk side), remove the four hard disk mounting screws located on the bottom. Set these aside.
- Step 14. Remove (slide out) the hard disk drive from the front of the computer.
- Step 15. Remove the terminator, located at position 6C, on the hard disk drive logic board. (Figure 3).
- Step 16. Reinstall (slide in) the hard disk drive.
- Step 17. At the hard disk drive, connect the two I/O cables and the DC power cable.

**CAUTION**

**Reinstall cables exactly as removed (correct polarity).**

- Step 18. Close the hinged PC board and engage the NY latches. Snap down the latches.
- Step 19. Secure the hard disk drive with the four mounting screws. Insert one of the screws into an upper hole and rotate the unit until the other three holes are aligned. Then, insert the remaining screws. Tighten all screws.
- Step 20. Rotate the computer to its normal upright position (on the four rubber feet).
- Step 21. Install jumper (two-position shunt) provided in the number two position at C2 (Figure 2) on the CPU board.  
  
Part No: 115-10477-001 SHUNT, 2 POS
- Step 22. Connect Reset switch from the front panel to the CPU board.
- Step 23. Reinstall the front panel with the three (internal) screws (the bottom screw is to be installed with the cover).
- Step 24. Pick up the unit, hold it securely, and proceed to shake it out for loose parts.

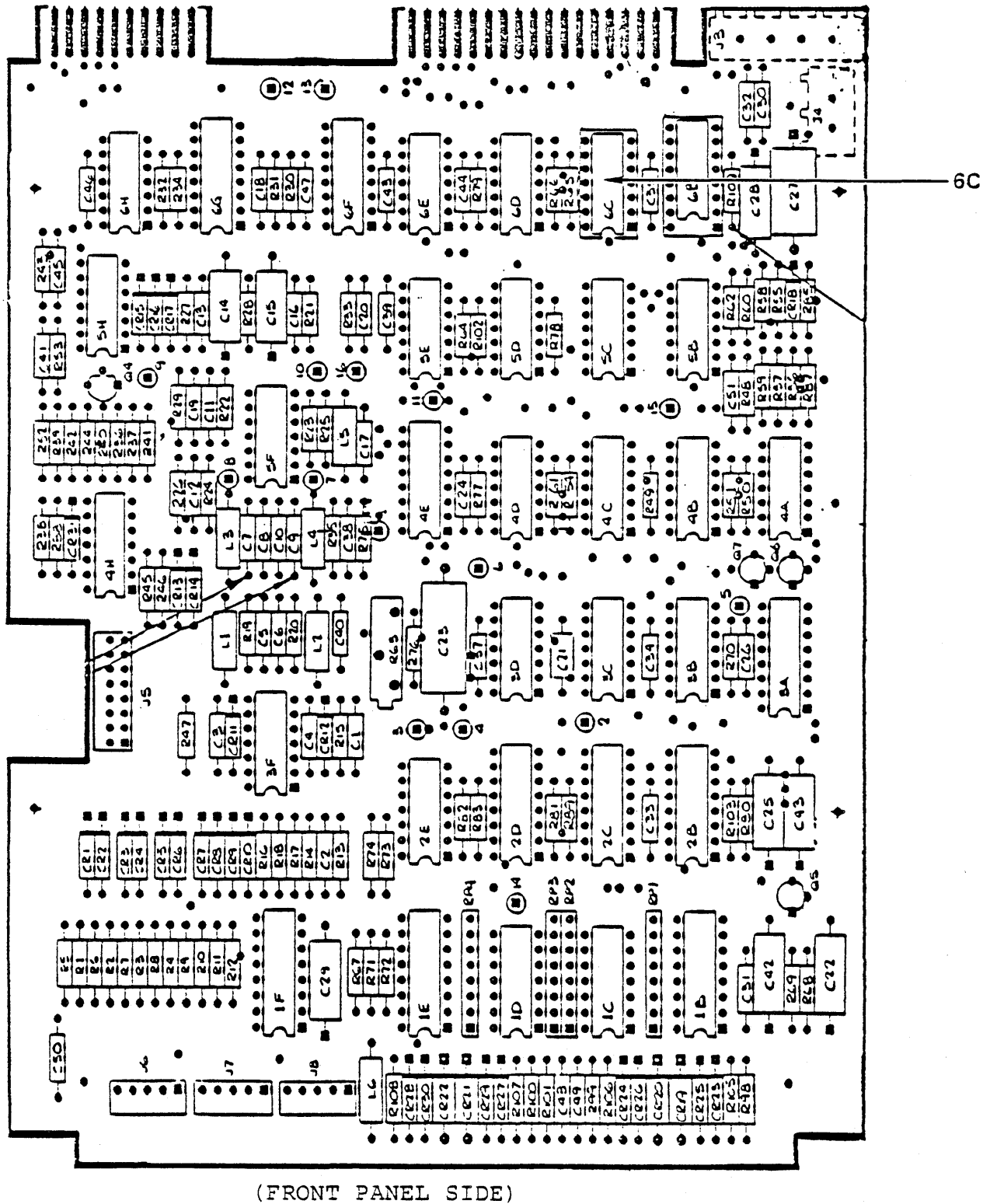


Figure 3. Hard Disk Drive Logic Board

- Step 25. Place the computer in the normal upright position (on the four rubber feet).
- Step 26. Reinstall the cover. Grasp the sides of the cover at the rear, spread slightly outward, and lower it carefully on to the computer.
- Step 27. With the computer resting on its side, reinstall the four (external) screws for the cover and the one (external) screw for the front panel.
- Step 28. Rotate the computer to its normal upright position (on the four rubber feet).
- Step 29. Connect the external 25-pin interconnect cable to JY on both units.

Part No: 510-11443-001 ASM Cable 25 P Interconnect

- Step 30. Connect the external 37-pin interconnect cable to JZ on both units.

Part No: 510-11444-001 ASM Cable 37 P Interconnect

- Step 31. Reconnect all cables (power, terminal, printer, etc.).
- Step 32. Perform diagnostics for this upgrade (see Diagnostics Supplement for Series 5).

**NOTE**

**Disk must be initialized according to operating system being used.**

**System cannot be booted if secondary drive is off.**

Suggested tests are outlined below.

HARDS5 Select Test #3 (Seek Test) selects 0-152 (153 cylinders). Allow test to run approximately thirty seconds.

NOTE

If any errors occur, call the Dealer/Distributor.

HARDS5 Select Test #2 (Verify Addresses for all sectors on disk).

NOTE

If any errors occur, check Media Defects Report.

**SERIES 5-15D UPGRADE KIT (UK-5) INSTALLATION PROCEDURES**

To install the upgrade kit for the Series 5-15D, perform the below outlined steps.

- Step 1. Disconnect host computer system power.
- Step 2. Remove all cables (power, terminal, printer, etc.) from the computer.
- Step 3. With the computer resting on its side, remove the four screws holding the cover.
- Step 4. Rotate the computer to its normal upright position (on the four rubber feet).
- Step 5. Grasp the sides of the cover at the rear, spread slightly outward, and remove it from the computer.
- Step 6. Release the two NY latches holding the hinged PC board in place and list up the PC board.

**CAUTION**

**Do not allow board to drop or twist.**

- Step 7. Install the four standoffs (circuit board supports) on the tray. Press into four holes on tray.

Part No: 210-12203-001 SUPPORT, CIRCUIT BOARD

- Step 8. Secure the existing floppy disk to CPU board cable, front and rear, with the two three-inch flat clamps provided.

Part No: 210-11141-001 CLAMP FLAT 3 INCH

- Step 9. Install (snap on) the controller PC board on the standoffs. Make sure that the J4 connector is positioned opposite the reset switch on the front panel.

- Step 10. Fold the 37-pin interface cable (CPU to controller) at a 90 degree angle, as shown below.

Part No: 510-11103-001 ASM, CABLE CPU/J4 CONTR

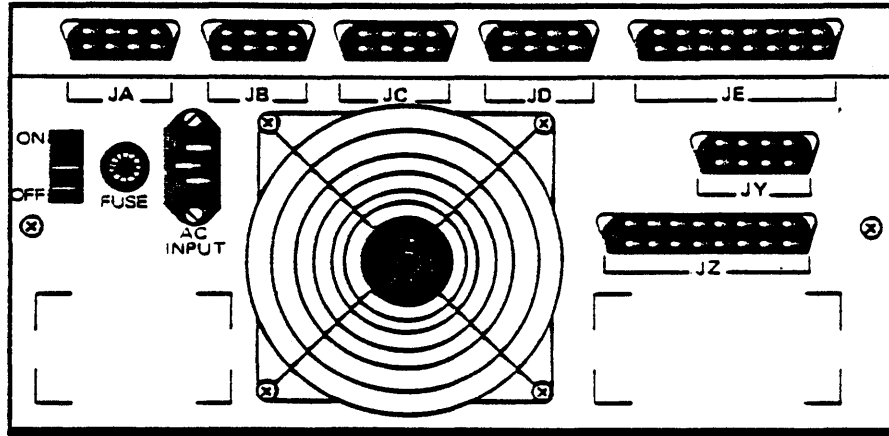
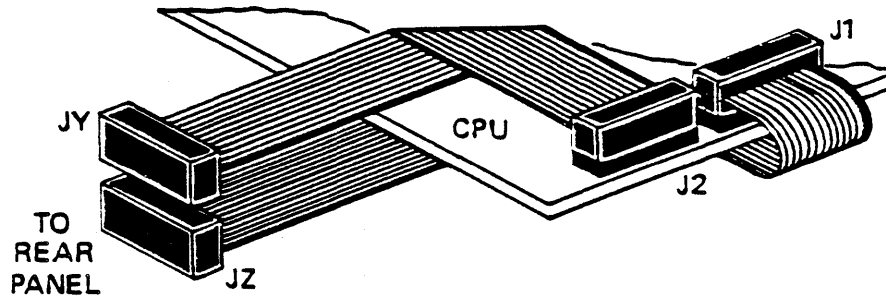


Figure 4. Series 5 Typical Rear Panel

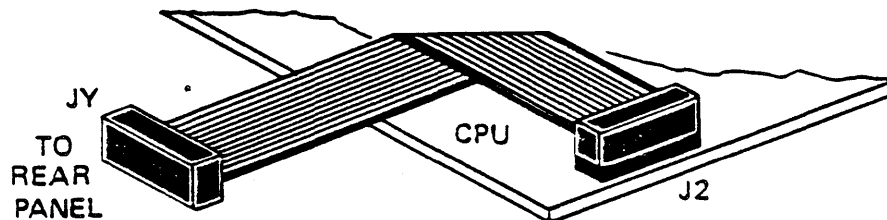
Step 15. Fold the hard disk controller cable 90 degrees, as shown below, thread it under the tray, and connect the other end of the cable to J1 (red stripe to pin 1) on the controller PC board.



Step 16. Install the hard disk controller cable connector in the slot labeled JY (Figure 3), using the hardware provided, making sure that the wide portion is towards the top (nut to inside, MF screw to outside).

Part No: 510-11106-001 ASM, CABLE CONTR J3- REAR PANEL

Step 17. Fold the hard disk controller cable 90 degrees, as shown below, and connect the other end to J2 on the PC board.



Step 18. Lower the hinged PC board and engage the NY latches. Snap down the latches.

Step 19. Install the jumper (two-position shunt) provided in the number three position at C2 (Figure 2) on the PC board.

Part No: 115-10477-001 SHUNT, 2 POS

Step 20. Pick up the unit, hold it securely, and proceed to shake it out for loose parts.

Step 21. Place the computer in a normal upright position (on the four rubber feet).

Step 22. Reinstall the cover. Grasp the sides of the cover at the rear, spread slightly outward, and lower it carefully on to the computer.

Step 23. With the computer resting on its side, reinstall



the four (external) screws for the cover and the one (external) screw for the front panel.

Step 24. Connect the external 25-pin interconnect cable to JY on both units.

Part No: 510-11443-001 ASM CABLE 25 P INTERCONNECT

Step 25. Connect the external 37-pin interconnect cable to JZ on both units.

Part No: 510-11444-001 ASM CABLE 37 P INTERCONNECT

Step 26. Reconnect all cables (power, terminal, printer, etc.).

Step 27. Perform diagnostics for this upgrade (see Diagnostics Supplement for Series 5).

**NOTE**

**Disk must be initialized according to operating system being used.**

**System cannot be booted if secondary drive is off.**

Suggested tests are outlined below.

HARDS5 Select Test #3 (Seek Test) selects 0-152 (153 cylinders). Allow test to run approximately thirty seconds.

**NOTE**

**If any errors occur, call the Dealer/Distributor.**

HARDS5 Select Test #2 (Verify Addresses for all sectors on disk).

**NOTE**

**If any errors occur, check Media Defects Report.**



---

# Preliminary Series 5 Computer System Altos Utility Program Supplement

**Revision E**  
**June 30, 1982**

**Disclaimer**

This is a preliminary publication of the Altos Series-5 Computer System Documentation and is presented for information purposes only; it will be changed without notice.

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**NOTE**

This revision replaces but does not  
obsolete previous revisions  
of this document.



**PRELIMINARY**

**ALIOS SERIES 5 COMPUTER SYSTEM**

**ALIOS UTILITY PROGRAM SUPPLEMENT**

**Revision E, June 30, 1982**

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**Revision E, June 30, 1982**

ADDENDUM NUMBER ONE

to

ALTOS SERIES 5 COMPUTER SYSTEM

ALTOS UTILITY PROGRAM SUPPLEMENT

June 30, 1982

**PURPOSE:** This addendum provides information regarding Series 5 Utility Programs FILE TRANSFER PROGRAM (FTP), and BACKUP.

**DESCRIPTION:** This addendum describes the relationships between Altos Series 5 Utility Programs, the distribution diskettes on which they are contained, and the Series 5 models on which the programs may be executed.

**INSTRUCTIONS:** Insert this addendum immediately after the title page of your Series 5 Computer System Altos Utility Supplement manual.

DISTRIBUTION DISKETTE	UTILITY PROGRAMS	APPLICABLE ACS MODELS
BACKUP 1.0S0	BACKUP	ALL MODELS
CP/M 2.21S0	FTP BACKUP	ALL MODELS ALL MODELS
MP/M 2.11S0	FTP BACKUP	ALL MODELS ALL MODELS

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**SECTION 2****FILE TRANSFER PROGRAM (FTP)****(Version 2.5)****INTRODUCTION**

The File Transfer Program (FTP) resident on both CP/M and MP/M master distribution diskettes, is used to transfer files between two Altos Computer Systems through an asynchronous serial channel.

**DESCRIPTION**

FTP runs with either the Control Program Monitor (CP/M) or the Multi-Program Monitor (MP/M) Operating System, serving as a useful tool for transferring files between systems with 8 inch disks (such as the Altos ACS 8000-10 computers) and systems with 5-1/4 inch disks (such as the Altos Series 5 computers). Full error checking and correction is provided through a CRC-16 polynomial.

FTP Version 2.5 corrects the following problems:

1. More than 16 files can now be transferred using FTP under MP/M II.
2. FTP now works correctly with MP/M II V2.1.

The copies of FTP provided on the distribution diskette use the printer port on the Altos computers. The printer ports can be connected to each other with a null modem cable or with two modems. (The null modem cable is a standard RS-232 cable that swaps lines 2 and 3. Such a cable is available from Inmac; part number 277 in the Summer 1982 catalog.)

**NOTE**

**If you want to re-connect the printer after running FTP, be sure to re-boot the system.**

FTP is brought up on both the sending and receiving computers. It does not matter which side is brought up first. Be careful that files transmitted with FTP do not have the Read Only (RO) attribute. If the file is Read Only, FTP will not be able to write it on the receiving side. If an RO file is accidentally received, erase it on the receiving side, change the attribute to Read Write (RW) using the SET command under MP/M II on the sending side, and transfer it again using FTP.

**Baud Rates**

There are several versions of FTP on the distribution diskette. The only difference between the various versions is the baud rate used for the transfer. The file named FTP.COM is the standard one that uses 9600 baud. The file name of each of the other versions indicates its baud rate. Both the sending and receiving sides must run at the same baud rate.

These slower versions may be used under either CP/M or MP/M:

FTP12 - 1200 bps  
FTP24 - 2400 bps  
FTP48 - 4800 bps  
FTP - 9600 bps

These faster versions only work in CP/M:

FTP31K - 31250 bps - max cable length - 75 feet  
FTP41K - 41666 bps - max cable length - 8 feet

Experimentation with 9600 vs. 31250 baud rates has shown that there is very little difference in total transfer time. The experiment has run on floppy disk systems; on hard disk systems, there might be a greater difference.

Experimentation has shown that the maximum baud rate for FTP under MP/M II with one user is 9600. That is, only FTP12, FTP24, FTP48, and FTP (i.e. 9600 baud) work on MP/M II. If more than one user is active, the maximum baud rate could be as low as 1200.

**OPERATING INSTRUCTIONS**

The sending side of the transfer is started by the command:

**FTP <afn>**

where: <afn> is an ambiguous file name as described in the CP/M manuals.

For example, the command:

**FTP \*.COM**

sends all of the .COM files to the receiving side.

Whereas the command:

**FTP FILE.NAM**

sends only file FILE.NAM. The sending FTP periodically types an 's' while waiting for the receiver to become active.

The receiving side is started by one of the following commands:

**FTP or FTP u:**

where: 'u' is the drive letter of the destination disk. If no drive letter is specified, the logged disk is the destination disk.

The receiving FTP periodically types a 'w' while waiting for the sender to become active. Since the receiving side normally does not exist by itself, enter [CONTROL] C to get back to CP/M.

**NOTE**

**The File Transfer Program is copyrighted by the Balcones Computer Corporation.**



### SECTION 3

#### BACKUP UTILITY PROGRAM

##### INTRODUCTION

The Altos Backup Utility, BACKUP, transfers files from a hard disk to one or more floppy diskettes, and restores hard disk files from those diskettes. The restore function can be for all files or selected files. BACKUP runs under either a CP/M 2.2 or higher operating system, or an MP/M (Multiple Program Monitor) operating system. Under MP/M, BACKUP should be run in the single user mode. Currently, the Backup Utility is available for the Z-80 based Altos systems, that is, the Altos 8000 systems and the Series 5 systems.

##### DESCRIPTION

###### Features

The BACKUP Utility Program has many useful features that give it more power and flexibility than the PIP and COPY system utilities.

1. BACKUP uses the same disk file name conventions as PIP, the standard utility used for copying disk files. With either PIP or BACKUP it is possible to select files by name, or by categories of files using ambiguous file names (names using ? or \*), or by user number, or by a combination of these.
2. BACKUP automatically verifies every read and write operation.
3. BACKUP condenses diskette file space. CP/M and MP/M allocate hard disk file space in fixed sizes, such as one kilobyte or four kilobytes. BACKUP removes unused space at the end of disk files.

4. BACKUP can save a file which is too large to fit on a single diskette. Files that do not fit on one diskette are automatically partitioned to fit onto as many diskettes as are needed. The maximum file size is eight megabytes.
5. BACKUP informs you how many diskettes you will need, after you have specified the files to be saved and before you begin operation.
6. When restoring files, BACKUP checks with you before writing over existing files.
7. BACKUP has intelligent mechanisms for consistency checking and error recovery.

### Current Limitations

Currently, BACKUP has the following limitations:

1. The largest file that can be backed up or restored is eight megabytes.
2. The maximum number of files that can be backed up in one session is 1200.
3. The most data that can be backed up in one session is 64 megabytes.

### File Concepts in BACKUP

Each backup floppy has two files, named MAP and DATA. The MAP file has a user-defined label, and a list of all files backed up and the diskette where each file resides. The MAP file for a BACKUP session is duplicated onto each diskette used in that session.

The DATA file contains backed-up data files from the hard disk, treated as one long file. Original files within the data file are carried across diskette boundaries when necessary.

Both MAP and DATA files are CP/M and MP/M compatible. The TYPE command can be used with the MAP file to display the user label. For example:

```
A>TYPE MAP<CR>
```

### Backing Up and Restoring Random Files

BACKUP can back up and restore random files. BACKUP determines the maximum size of the file and backs up from the first sector to the last, including undefined blocks. Caution must be used for that reason:

## NOTE

If a random file has undefined blocks within its maximum allocation, those blocks will appear to have E5's when restored. BACKUP will provide sectors of E5's when backing up to floppy diskette, and those sectors will be restored to the hard disk.

## Documentation Conventions

The system prompts are shown as A> for CP/M and ØA> for MP/M. The actual system prompt may be different.

When user input is shown with system generated information, user input is in bold (darker face) print. In this example, ØA> stands for the MP/M system prompt and the rest of the line is entered by the user:

```
ØA>BACKUP -L "User #3 Files, July 7, 82"<CR>
```

A small a is used to represent any letter, a small n to represent any number, and a small x to stand for either a letter or a number. For example:

```
Drive a           File xxxxxxxx.xxx           Diskette n of n
```

<CR> stands for Carriage Return, and means pressing that key. Keys are referred to with a leading capital letter, as in "Space Bar" or "Reply Y or N", or shown within angle brackets (< >) where convenient.

Control-A means to hold down the control key (CTRL on most keyboards) while pressing the A key. Similarly, Control-C, or any Control-a combination, means to hold down the control key while pressing the other key.

Left and right brackets, "[" and "]", are actual entry keys and displays. For example, "[Default is B]" is an actual display and "[G\*]" is an actual entry.

The term "E5's" used in this document is a hexadecimal bit pattern. It is equivalent to the binary pattern "1110 0101". In the CP/M and MP/M operating systems, a disk or diskette sector filled with this pattern is considered to be unused.

**OPERATING INSTRUCTIONS**

**Installation of BACKUP**

If the BACKUP program was supplied to you on a separate diskette, Altos recommends that you copy it to the hard disk or another floppy diskette, using the PIP utility. Save the original diskette to make duplicates from and use only the copied diskettes to run the program.

**Operation of BACKUP**

BACKUP is run by entering the name followed by a Carriage Return. It displays the menu shown below.

A>BACKUP<CR> (CP/M Prompt)

ØA>BACKUP<CR> (MP/M Prompt)

ALTOS Hard Disk Backup Utility -- Version x.x  
-----

Copyright 1982 Altos Computer Systems  
Licensed by Altos for use on Altos systems only

Functions:

- B - Backup files from hard disk to floppy diskettes
- R - Restore files from floppy diskettes to hard disk
- L - List filenames from a backup floppy diskette
- P - Print filenames from a backup floppy diskette  
(must be preceded by B, R, or L function)
- Q - Quit

Please select a function: [default is B]

Respond by entering the letter, in upper case or lower case, and pressing Return. For example, to select Restore:

Please select a function: [default is B] R<CR>

Backup includes the following functions which are described later in this section the heading INDIVIDUAL FUNCTIONS.

Backup      Restore      List      Print      Quit

After performing a backup, restore, list, or print function, the program displays the menu again and allows another function to be done.

**Aborting from within a Function**

Control-A aborts the current command and returns to the program menu.

Control-C aborts the BACKUP program and returns to the operating system.

**Individual Functions****Q THE QUIT FUNCTION**

This gives the message "Normal Exit" and returns to the operating system.

**B THE BACKUP FUNCTION**

Back Up Files From Hard Disk To Floppy Diskettes.

Before running the Backup function, be sure to have sufficient scratch diskettes on hand. These diskettes must be formatted and empty of files. Either a freshly formatted diskette, or a used diskette on which all files have been erased by the ERA command, is suitable. The diskette may have a system on the system tracks (boot tracks), and may have an MP/M diskette label. It must be writeable.

Hard disk files which are password read-protected, or locked, cannot be written to a floppy diskette by the Backup operation. If it is to be backed up, the condition must be changed.

The first prompt is

From disk? [default is A]

Enter the drive identification, A-P, of the hard disk source file.

The next prompt is

To disk? [default is A]

Enter the logical drive identification, A-P, of the floppy diskette destination drive. The From and To identifications cannot be the same.

The next prompt is

Enter label:

Enter the information label you will use to identify these diskettes. The maximum number of characters is 80. Although this field is optional, it is a good idea to provide a meaningful identification and the date. For example,

User 7 Files, August 3

Accounts Payable, 08/03/82

The next prompt is

Enter Files to be backed up:

The BACKUP program will then ask you to enter the names of files that you want backed up. You can enter a list of names, or specify groups of files using ambiguous file names. File name specification ends when you enter a Carriage Return by itself.

Filenames and ambiguous filename specification, "afn," is discussed in the CP/M or MP/M manuals provided with your system. Further examples are given in these manuals under the PIP utility. In general, the information given on PIP which pertains to disk file operations also pertains to BACKUP. The PIP options used within brackets, such as [V], do not pertain except for the G option.

For convenient reference, here is some information on ambiguous filename specification. Consult the CP/M or MP/M manuals for details.

? means match any character in this position. For example, JACK?.TXT specifies files such as JACK4.TXT and JACKV.TXT.

\* is the equivalent of filling the rest of the field with a variable number of ?s. For example, \*.FOR specifies every filename with an extension of FOR, and Q\*.PAY specifies every file beginning with Q and having PAY as its extension, such as QUERY.PAY QR3.PAY. \*.\* specifies every filename.

G refers to user number. ("Get files from user n.") G can be followed by a user number (0 to 15) or \* (all users). User numbers are implicit in MP/M file handling, and may be used in CP/M file handling, to categorize files as belonging to a particular user. If G is not used, the current user is assumed to be specified. "G" by itself is equivalent to "G0".

Examples of file specification:

JACK4.COB, JACK4.DOC<CR>	The two files named.
*.*[g*]<CR>	Every file of every user.
*.c<CR>	All .c files from current user.
*.prl[g3]<CR>	All .prl files of user 3.
<CR>	End of specifications.

BACKUP accepts file specifications until a line that contains only a Carriage Return is entered. Then the program scans the directory of the logical hard disk drive and creates an internal list of all the files that match the specifications. This list is in alphabetical order. If a file has been specified more than once, the duplication is removed. Only one copy of a file will be backed up. A file must have contents; zero-length files are not backed up.

When the internal map is prepared, the screen displays it. Here is an example.

Projected MAP of Floppy Diskettes on Drive B:

User#	Filename.ext	Records	On Disk
0	ASM .PRL	156	1
0	DSKRESET.PRL	167	1
0	PIP .PRL	157	1

3 files, 61 1K byte blocks, 1 diskette,

The prompt is

Is this correct? [default is Y]

If you reply Y, the backup operation proceeds.

If you reply N to this query, you can re-specify the files. At this stage, you can also verify that you have enough diskettes to hold the specified files and take appropriate action if you do not. That is, you can obtain more diskettes or use Control-C to abort.

After you reply Y, you are prompted

Backing up disk 1.  
Please place empty diskette in Drive x; hit RETURN  
to continue...

Place a scratch diskette in the designated drive and press the Return key when ready. This prompt will be repeated for each diskette needed.

If the diskette is not empty, the program says

Diskette not empty, please use empty diskette

If this happens, place an empty diskette in the drive and press Carriage Return.

BACKUP writes the user label information and the MAP file onto each diskette. Then it writes the data files in the order shown on the MAP.

Writing MAP file onto Floppy Diskette.

Backing up file: xxxxxxxx.xxx User n

The program will continue to back up each file in the order shown on the MAP. If necessary, it will prompt you to insert new diskettes with

Backing up diskette n  
Please place empty diskette in Drive a; hit RETURN to continue...

As you remove each diskette, write the user label information and the diskette number on it, and any other useful information. Use a felt-tip pen to avoid harming the diskette.

When the backup is finished, it advises

Backup complete.

When all specified files have been written successfully, the program returns to the menu to do another operation or quit. At this point you may wish to use the P function to print a MAP of what you have saved.



R THE RESTORE FUNCTION

Restore Files From Floppy Diskettes To Hard Disk

Before starting this operation, insure that all floppy diskettes to be used are available. This operation can restore all files saved on the set of floppy diskettes or selected files. If a file of the same name exists on the hard disk, you are prompted as to whether you wish to replace it or not with the floppy diskette file. An option allows you to have this choice for all files, whether or not the file is already on the hard disk. See the Command Line Option information.

The first prompt is:

From disk? \[default is B]

Specify the floppy disk drive identification, A-P.

The next prompt is:

To disk? [default is A]

Specify the logical hard disk drive, A-P.

The next prompt is:

Please place a diskette to be restored in Drive a; Hit RETURN to continue...

When the diskette has been inserted, the program will read its MAP file and display information as shown in this example.

Diskette on Drive B is number 1 of 4:  
Label: User 7 Files, August 3

The program will then list all files saved on the set of diskettes. It gives the file sizes and user number for each file. For example:

User#	Filename.ext	Records	On Disk
0	ASM .PRL	156	1
0	DSKRESET.PRL	167	1
0	PIP .PRL	157	1
	... ..		

If there are additional files to be displayed, the prompt will be:

MORE Hit RETURN to continue...

The file display is followed by a summary

nn files, nnn 1K byte blocks, 1 diskette.

The program then asks:

Is this the correct disk? [default is Y]

If you reply N, you can place a different diskette in the drive.

After a Y response, the next prompt is:

Enter files to be restored:

Each file is entered either by explicitly naming it or by using the ambiguous filename conventions, (\* or ?), followed by a <Carriage Return>. The program will continue to ask for files to be restored with the following prompt:

More (hit RETURN when done):

Specifying \*.\*[g\*]<CR> will ask for all files to be restored.

If you specify the same file more than once, no harm is done. Only one copy will be restored.

When only a <Carriage Return> is given to the MORE prompt, the program gives the following messages:

Restoration will begin.

Restoring file: xxxxxxxx.xxx User n

If the old file already exists on the hard disk, the program will warn you with the following message:

CAUTION file already on hard disk,  
Type Y to erase old file and continue, N to skip this  
file: [default is Y]

When all files have been transferred back from the diskette to the hard disk, the message will be given that:

Restoration is complete.

Finally, the program will return to the menu to allow you to choose another function or to quit the program.

L THE LIST FUNCTION

List Filenames From A Backup Floppy Diskette

The list function reads the MAP file from a diskette and displays its contents on the screen. The contents include the user label, which number the diskette is in its set, and the file names for all diskettes in the set. The diskette location of each file is shown.

If desired, you can use the Control-P facility of the operating system to print a copy of what you see on the screen. However, the Print function shown next gives a more concise copy.

When you start this function by indicating L for List, the prompt you will get is:

Which disk? [default is B]

After you choose the appropriate disk, the next prompt will be:

Please place the diskette to be listed in Drive x; hit RETURN to continue...

When the diskette has been inserted and the Return hit, the program will give the information as shown in the following example

Diskette on Drive B is number 1 of 1  
Label: User 7 Files, August 3

User#	Filename.ext	Records	On Disk(s)
0	ASM .PRL	156	1
0	DSKRESET.PRL	167	1
0	PIP .PRL	157	1

3 files, 61 1K byte blocks, 1 diskette

If the information cannot be displayed entirely on the screen, it is shown a page at a time. You are prompted with:

MORE?

Press Carriage Return when you wish to see the next page.

When all the contents have been listed, the program will return to the menu to choose another function or quit the program.

P THE PRINT FUNCTION

Print Filenames From A Backup Floppy Diskette

This function must be preceded by a Backup, Restore, or List function, because it lists the MAP file currently in memory from a prior operation.

It allows the printing of a list of file names in a more concise manner than the List operation. Rather than printing directly on the printer, it is meant to be used with the Control-P facility. (Entering Control-P causes the operating system to print whatever is shown on the screen.)

After hitting the P key, the prompt given is:

Please type Control-P and ready printer, then hit RETURN to continue...

The program then displays and prints the MAP information. File identifications are shown in a concise form, as user number, file name, extension. Five identifications fit on each line.

Diskette number n:

n:xxxxxxxx.xxx n:xxxxxxxx.xxx n:xxxxxxxx.xxx ....

When the display and print is finished, the program asks you to stop printing with

Type Control-P again, then hit RETURN to continue.

A warning message is printed if either the first or last file is not on one complete diskette.

**ERROR HANDLING**

The error messages discussed below are generated by the BACKUP program. You may also encounter error messages from your CP/M or MP/M operating system. In some cases, you will see both system error messages and BACKUP error messages. Note that when a CP/M message, such as a BDOS Error, is displayed, the system pauses requiring a Carriage Return to proceed. With MP/M, no operator response is required. For information on system errors, consult your CP/M or MP/M manuals.

**ERRORS WHILE BACKING UP**

1. Permanent Error. Disk is bad.

BACKUP has detected a floppy diskette error while backing up files, and could not recover. This warns of a potentially hazardous error. The backup should be redone on another diskette.

2. Can't open hard disk file.

The hard disk file is password read-protected or locked. BACKUP aborts. Turn off password protection, or set a default password, and retry the Backup function.

3. ERROR on hard disk, file is marked.

A read error has occurred on the hard disk. BACKUP will skip the hard disk sector and fill the corresponding floppy disk sector with E5's. On the MAP file list for this backup session, the error will be noted alongside the file name. When this file is restored, the error sector will have E5's.

4. (System error message.)  
Will restart backup from beginning of this diskette.

This message follows an error message caused by a floppy-disk failure during reading or verifying the backup files. The operator is then instructed to place another diskette into the floppy drive and press Return to continue the backup operation. The contents of the diskette with errors on it will be rewritten.

**ERRORS WHILE RESTORING**

1. Please insert PROPER diskette.

BACKUP reads the label of every diskette before restoring files from it. This message occurs for two reasons. A). A diskette within a set does not have the same label as the first diskette in the set. B). The diskette has the wrong number

within its set.

2. Diskette is not a backup diskette.

There are three possible causes of this message. A). The BACKUP program cannot find either the MAP or the DATA file on the floppy diskette because one or both were erased. B). The diskette has neither MAP nor DATA file because it is not a backup diskette. Use the system command DIR to check these two possibilities. C). The MAP and DATA files on the diskette were created under a different user number. This can be corrected by using the -U option described under "Command Line Options" in this document.

3. Sector will be skipped.

A data error has occurred while writing on the hard disk, or a verify error while reading from the hard disk. The error sector is skipped and its address of is displayed. The operator should insert that sector into the bad sector table.

4. No more room on hard disk.

The hard disk has been filled by restore files before the end of the restore operation. To recover, erase hard disk files that are not essential and selectively restore only essential files. By selectively restoring some files and then using the system operation STAT, it is possible to see how much hard disk capacity remains.

5. Bad MAP file (permanent), try another diskette.

A data error occurred when BACKUP read the MAP file. At this point you should mount a different diskette from the backup set. Only ONE diskette from the backup set need have a MAP file that is completely error free. After one MAP file has been successfully read, the BACKUP program only reads the label from the MAP files of the other floppy diskettes. (The label is the first MAP record.) If a data error occurs while reading one of these labels, BACKUP will ask if you wish to override the label test process. Therefore, even if an error occurs while reading MAP files or labels, all files can still be restored.

6. Floppy disk has permanent error.

A data error occurred when BACKUP read the DATA file. The corresponding sector on the hard disk is filled with E5's and the sector on the floppy diskette is skipped.

7. Floppy disk is inconsistent.

The files on the floppy diskette have been tampered with. This message occurs during the restoration of a particular hard

disk file; that file is not usable because BACKUP fills part or all of the file with null sectors (sectors with E5's) in order to resolve the discrepancy.

**SYSTEM ERROR**

The following error may occur under MP/M. It should never occur under CP/M.

System  
Fatal error -- Aborting

This means the system environment is incorrect. It is not a recoverable error. Possible causes are that the number of locks in the lock list was exceeded, that another user has custody on a disk drive, and so forth.

**COMMAND-LINE OPTIONS (SUBMIT FILE FACILITIES)**

BACKUP includes provisions for entering answers to questions on the command line at the time BACKUP is invoked. This facility is especially useful when constructing SUBMIT files.

A SUBMIT file is a text file containing commands for the operating system to execute. Entering one command will execute all commands in the file. This is useful for developing a simple approach to handle a complicated procedure which must be done often. See your CP/M or MP/M manuals for information on how to construct and execute a SUBMIT file.

Command-line options are preceded with a "-", as with "-L". Here is a list and explanation of the command-line options, followed by some examples. The options may be in capital or small letters. When a string or value follows an option, there must be a blank between.

Erase                                -E

This erases prior backup files on the floppy diskette, if present, before writing new backup files. It is the equivalent of "ERA MAP" and "ERA DATA" on the diskette.

Label                                -L "string"

The string which follows becomes the user label when backing up. Because the string is on the command line, lower-case characters are changed to upper-case. Quotation marks, which are optional, allow placing blanks in the string. Either single or double quotation marks can be used.

More Suppress                        -M

Suppresses the MORE prompt during listing of MAP file.

Output Suppress                      -O

This option is used with MP/M to suppress output during backup. It allows the console to be detached by using the MP/M function, Control-D.

Prompt Response                      -P "string"

The string which follows is presented to the program as responses to questions normally requiring operator answers. It cannot be used to provide a label. See the examples below. The quotation marks are optional, and either single or double quote marks can be used.



Query -Q

Causes the program to ask Y/N, that is, whether or not to write, for each file being restored. Normally only files that are already on the hard disk are queried Y/N.

User Number -U n

Provides a user number n, (0-15), for the MAP and DATA files written on the floppy diskette. If no number follows -U, 0 is assumed.

Filename name name name...

One or more names of files to back up. Any number of these names may appear on a line, separated by a space between names.

### Examples

Here are some examples. The general form is that command options follow "BACKUP" and precede any file specifications. When a string or number follows an option, there is a space between.

`0A>BACKUP -P "LB"<CR>`

This specifies a prompt response of L and B, that is, List for drive B. It will display (list) the MAP file of the diskette on drive B. The quotation marks are optional. When the list is finished, the user will be within the BACKUP program. Specifying "LBQ" would list and quit.

`0A>BACKUP -P BABYQ *.*[G*]<CR>`

The prompt response is B, A, B, Y, and Q. It asks for a Backup from disk A to disk B, gives a reply of Yes to "Is this OK?", and at the end says to Quit. The Backup file specification is for all the files of all users, specified by "\*.\*[G\*]". These command line options provide all responses except the label, which will be entered by the operator during execution.

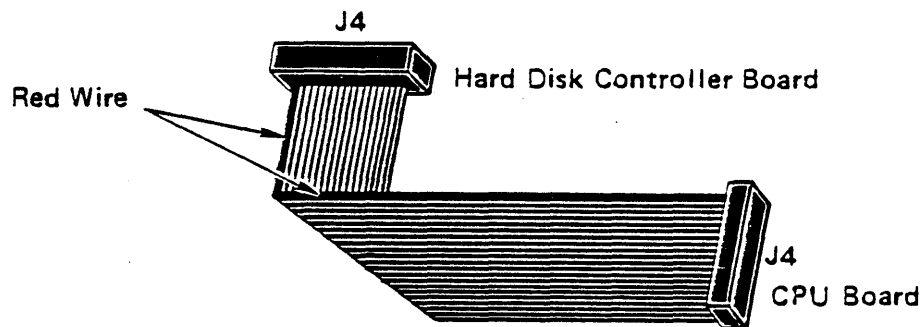
`0A>BACKUP -P BABYQ -L "MAY PAYABLES" *.PAY<CR>`

The prompt response specifies a Backup from disk A to disk B, a Yes reply, and to Quit at the end. The user label "MAY PAYABLES" is provided. The backup file specification is for all files with an extension of .PAY, specified by "\*.PAY".

Command options can be grouped. For instance, the last example could have been:

```
ØA>BACKUP -PL BABYQ "MAY PAYABLES" *.PAY<CR>
```

When options are grouped, the appropriate information follows in order, in separate groups, with any file specification information at the end. In the example above, "BABYQ" pertains to -P, and "MAY PAYABLES" pertains to L.



Step 11. Connect the 37-pin cable (red stripe to pin 1) to J4 on the CPU board (Figure 2) and to J4 on the controller board (Figure 1). When connecting cables, support the bottom of the board with a finger.

Step 12. Connect one end of the power cable (DC harness) into bayonet catch of W1 or W2 (pins 1 through 6) on the power supply. Thread the cable through the inside of the chassis, under rivet-type pin, to P1 on the controller PC board (Figure 1). Connect the other end of the cable to P1 (pins 1 through 6). Red wire to Pin 6 for correct polarity.

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Step 13. If necessary, remove the blanks from the JY and JZ connector slots on the rear panel.

Step 14. Install the hard disk controller cable connector in the slot labeled JZ (Figure 3), using the hardware provided, making sure that the wide portion is towards the top.

Part No: 510-11144-001 ASM, CABLE HD CONTR REAR PANEL



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