



Preliminary Series 5 User Manual

Revision D/February 26, 1982

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TABLE OF CONTENTS

SECTION 1. INTRODUCTION

GENERAL INFORMATION	1-1
Scope and Purpose of this Manual	1-1
How to Use this Manual	1-2
GENERAL SYSTEM DESCRIPTION	1-3
General Hardware Description	1-3
SYSTEM COMPONENTS	1-4
Table 1-1. Altos Series 5 Configuration Chart	1-5
CONVENTIONS USED IN THIS MANUAL	1-5
TERMS AND ABBREVIATIONS USED IN THIS MANUAL	1-6
RELATED PUBLICATIONS	1-6

SECTION 2. INSTALLING YOUR COMPUTER SYSTEM

GENERAL INFORMATION	2-1
PREPARING YOUR WORK STATION AREA	2-1
UNPACKING YOUR COMPUTER SYSTEM	2-2
SHIPPING CONTAINER CONTENTS LIST	2-2
ITEMS YOU MUST SUPPLY	2-3
SYSTEM CONFIGURATION	2-4
SETTING UP YOUR COMPUTER SYSTEM	2-4
TURNING ON YOUR SYSTEM	2-8

SECTION 3. EXECUTING DIAGNOSTIC PROGRAMS

GENERAL INFORMATION	3-1
---------------------------	-----

SECTION 4. OPERATING SYSTEMS

GENERAL INFORMATION	4-1
---------------------------	-----

SECTION 5. ALTOS UTILITY PROGRAMS

GENERAL INFORMATION	5-1
---------------------------	-----

SECTION 6. UPGRADE KITS AND ADD KITS

GENERAL INFORMATION	6-1
---------------------------	-----

SECTION 7. HARDWARE OPERATING SPECIFICATIONS

SUMMARY OF SPECIFICATIONS (Models 5-5D, and 5-15D)	7-1
Computer	7-1
Chip Set	7-1
I/O Ports	7-1
System Memory	7-1
Mass Storage	7-1
DETAILED COMPUTER SPECIFICATIONS	7-2
System Memory	7-2
Memory Mapping	7-2
Bank Selection	7-2
Write Protection	7-3
Parity	7-3
Boot PROM	7-3
Floppy Disk Controller	7-3
Hard Disk Controller	7-4
I/O Ports	7-4
Configuration Port	7-5
I/O Port Assignment	7-5
Bit Assignment for the I/O Port	7-7
Interrupt Priority Daisy Chain	7-8
Mass Storage Devices	7-9
Floppy Disk Drive Specification Summary Flexible Disk Drive (Control Data 9409T 5-1/4")	7-9
Performannce Specifications	7-9
Functional Specifications	7-9
Error Rates	7-10
Hard Disk Drive Specification Summary (Winchester Type Fixed Disk) Seagate Technology (ST506 Microwinchester)	7-10
Performannce Specifications	7-10
Functional Specifications	7-11
Error Rates	7-11
General Physical Specifications	7-11
Environmental Requirements	7-11
AC Power Requirements	7-11
Physical Dimensions	7-12
Weight	7-12
Jumpers on the CPU Board (11073)	7-12
System Configuration Jumpers	7-12
Debugging Aids Jumpers	7-12
Network Port Enabling Jumpers	7-12
RTS/CTS Loop Enabling Jumpers	7-13
Optional On-Board Baud Rate Generator Jumpers	7-13

APPENDICES

APPENDIX A. MATRIX MAPS A-1
APPENDIX B. SCHEMATICS B-1
APPENDIX C. SHIPPING DAMAGE AND SYSTEM REPAIR PROCEDURES ... C-1
APPENDIX D. INSTRUCTIONS FOR PINNING SERIES 5 PRINTED
CIRCUIT BOARDS D-1

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 the 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 addit- ional hard drives sup- ported	Diagnostic Notes
5-5D	1	1	3	1*	Run both floppy and and Hard Disk diag- nostic tests.
5-15D	2	0	3	2**	Run floppy disk diag- nostics 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. If you initially received a preliminary edition of the user manual, you will have a final manual request card. Return this card to Altos Computer Systems, Publications Department. When final manuals become available, yours will be sent to you at no charge, postpaid.

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:

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

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	"
	Y7	0F	(CTC, timer)
		1C	(SIO, console 3)
	Y11	1E	(SIO, printer)
		2C	(SIO, console 2)
	Lowest priority	2E	(SIO, console 1)

Mass Storage DevicesFLOPPY 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 10^9
Hard Read Errors	1 per 10^{12}
Seek Errors	1 per 10^6

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

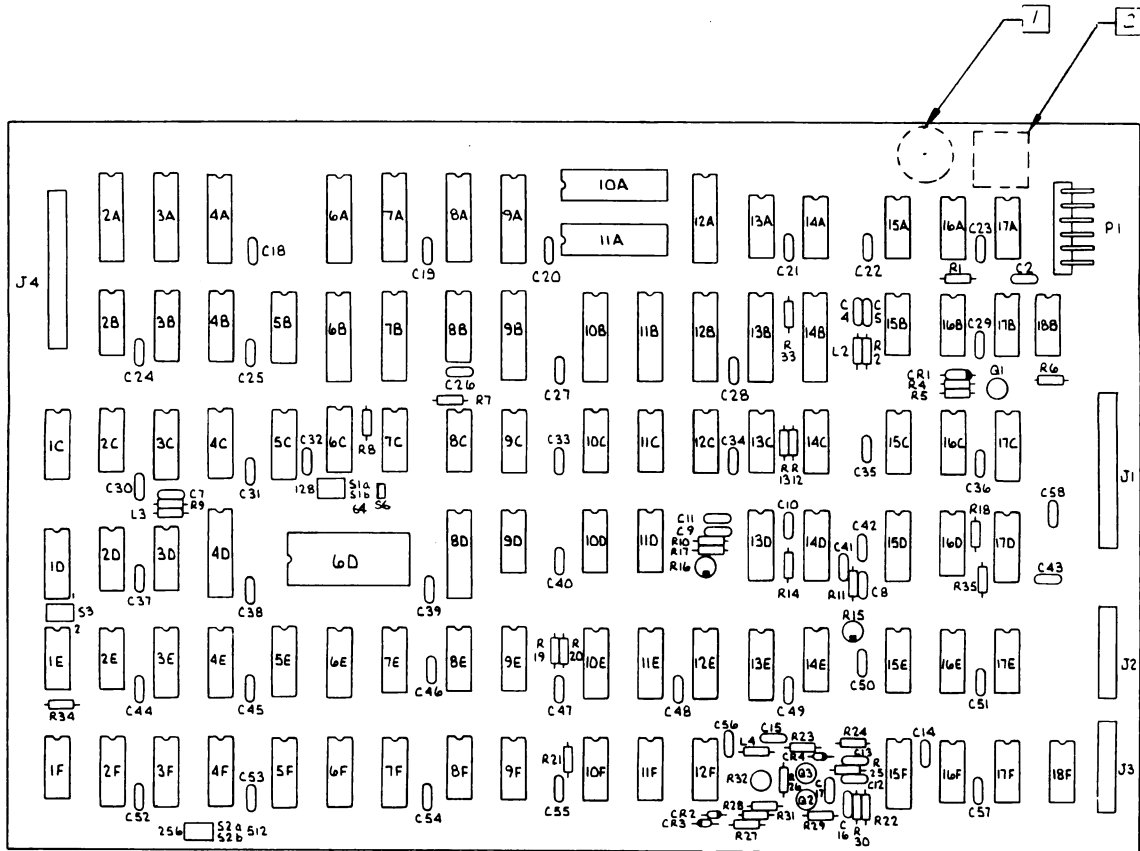
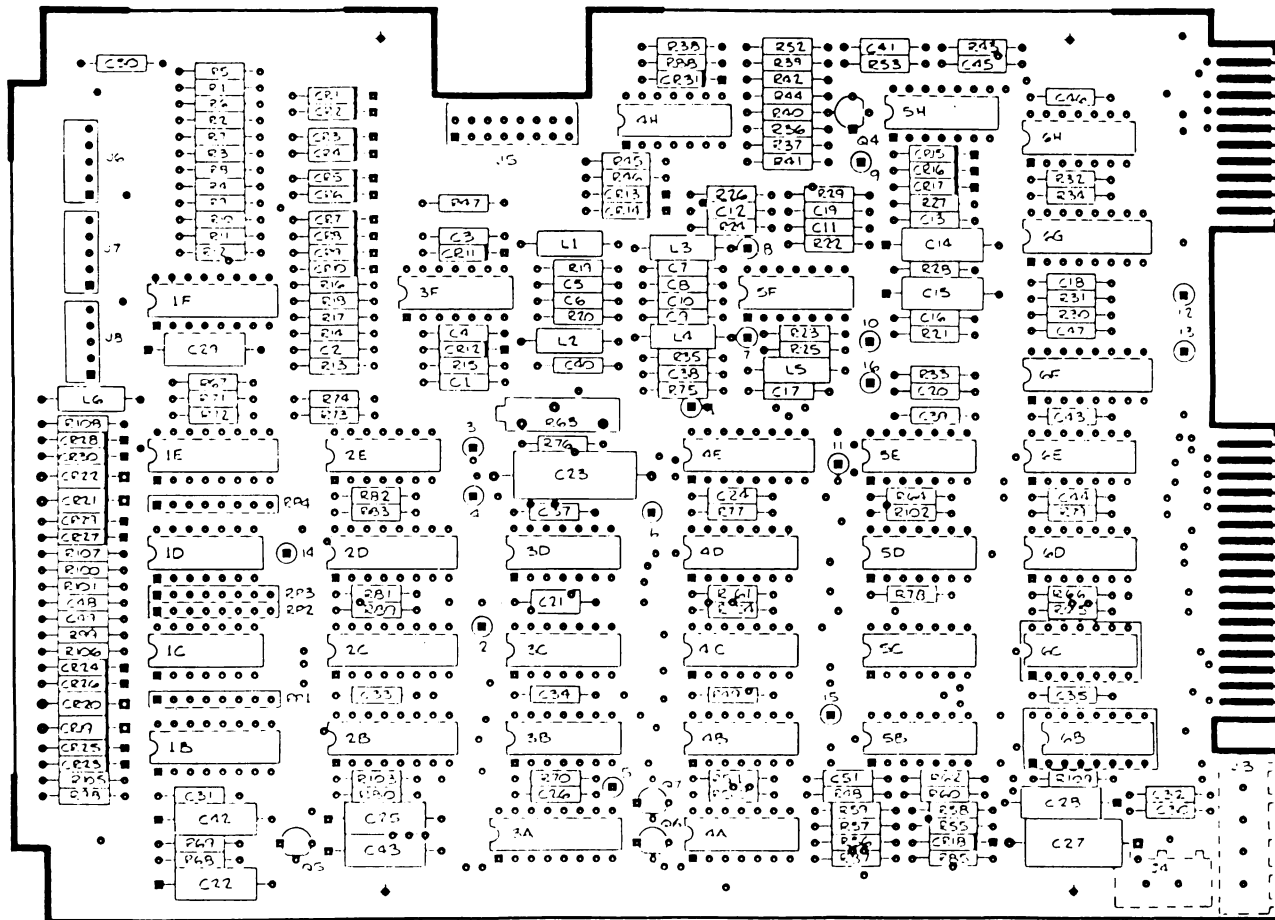
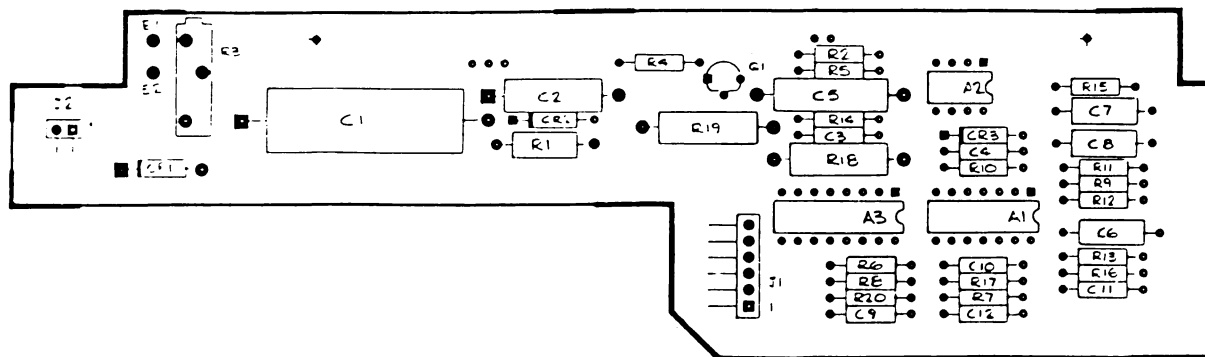


Figure A-2. 5-1/4 Inch Hard Disk Controller PCB Matrix Map

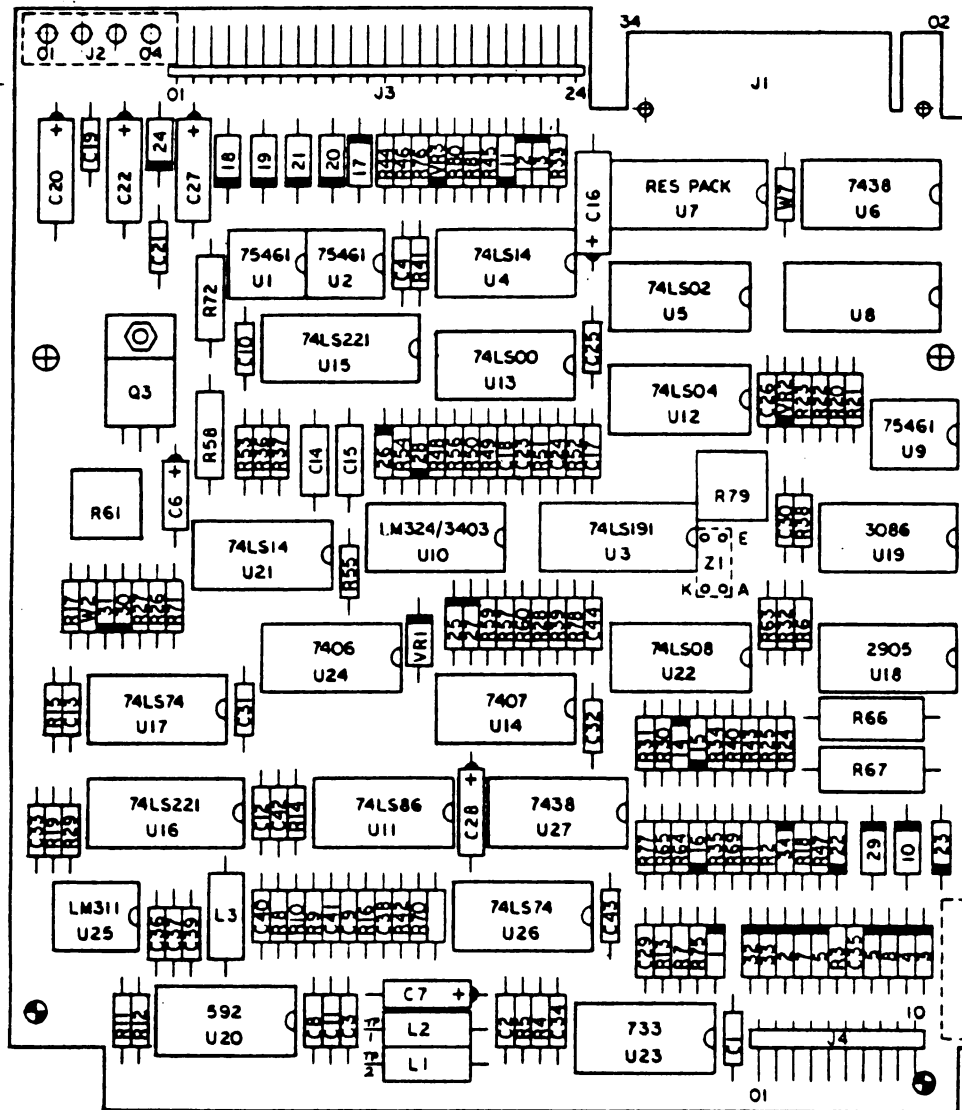


MAIN CONTROL P.C.B. P/N 20040



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
 CR9, CR10, CR17, CR18, CR19, CR20, CR21, CR24, CR29
 1N914B
 1N4001

VOLTAGE REGULATORS

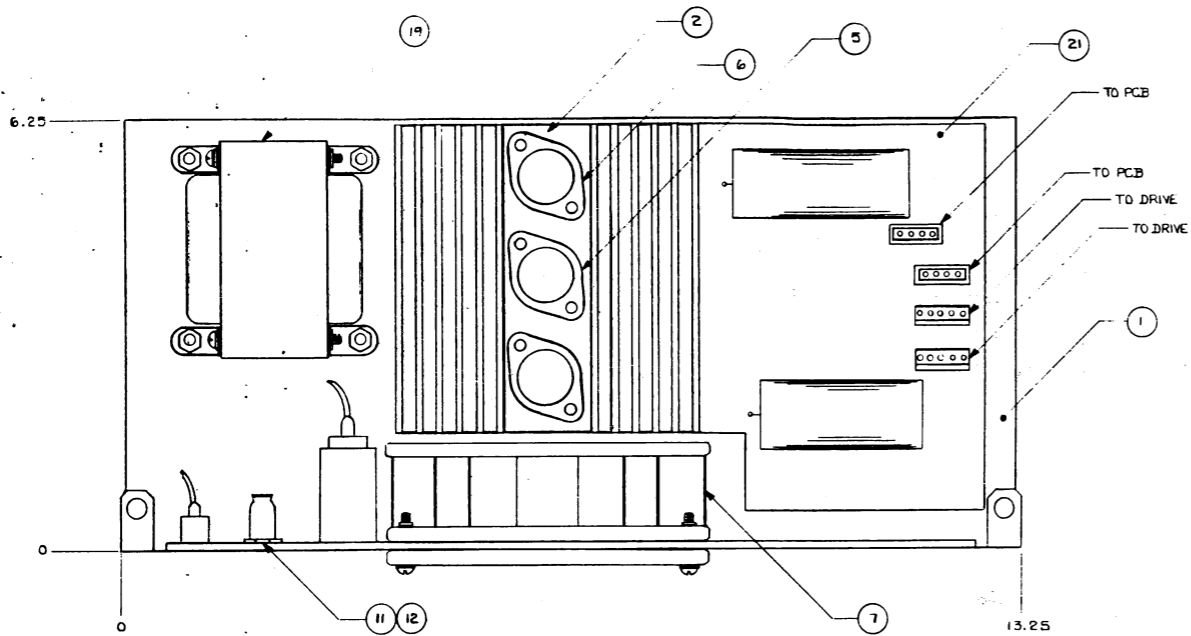
VR1, VR3 - DIODE ZENER 7.5 V
 VR2 - VOLT REG 5% 2.4 V

GG235

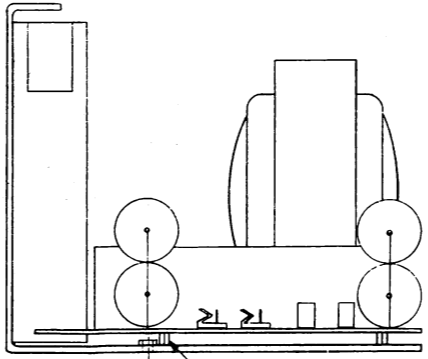
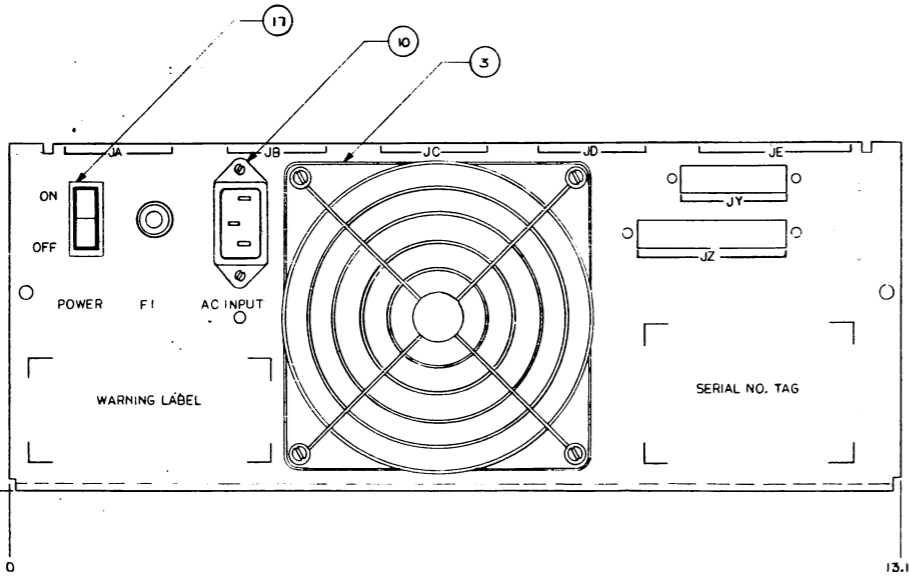
Figure A-4. CDC Floppy Disk Drive PCB Matrix Map

APPENDIX B

SCHEMATICS



NOTES: UNLESS OTHERWISE SPECIFIED
 1. FOR SPECIFICATION OF ASSEMBLED POWER SUPPLY SEE XENTEC PARTS LIST NO. 612B-B01 REFERENCED BELOW.
 2. FOR SCHEMATICS SEE SHEET 2.



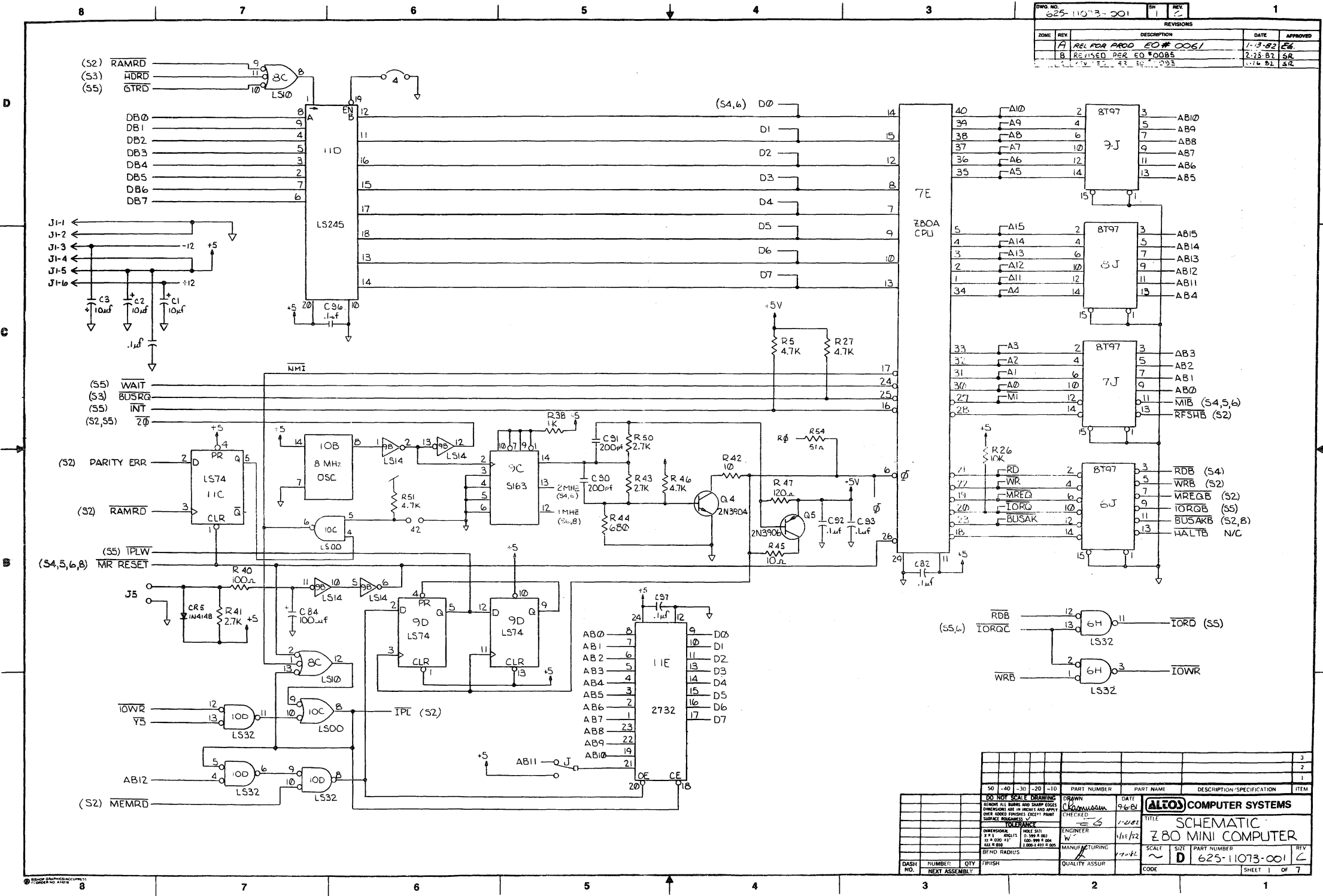
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REF		612B-P04	XENTEC P/N	CHASSIS SILKSCREEN	22
REF		612B-A02	XENTEC P/N	REG BOARD ASSY	21
REF		612B-IND1	XENTEC P/N	WIRE LIST PWR SUPPLY	20
	1	612B-T01	XENTEC P/N	TRANSFORMER	19
	1	1-208140-0	XENTEC P/N	BRIDGE	18
	1	6-400002-1	XENTEC P/N	SWITCH	17
	6	1-620001-1	XENTEC P/N	PIN	16
	1	1-610606-0	XENTEC P/N	CONNECTOR	15
	6	1-620002-1	XENTEC P/N	PIN	14
	1	1-610706-1	XENTEC P/N	CONNECTOR	13
	1	1-9000-0	XENTEC P/N	FUSE HOLDER	12
	1	1-800200-0	XENTEC P/N	FUSE 2A	11
	1	1-750002-0	XENTEC P/N	FILTER / CORCOM	10
	2	2-54040-1	XENTEC P/N	SPACER BRASS 8-32 x 1/4	9
	3	2-54122-1	XENTEC P/N	SPACER NYL 8-32 x 1/2	8
	1	1-70002-0	XENTEC P/N	FAN / ROTRON	7
	1	1-203771-0	XENTEC P/N	TRANSISTOR	6
	1	1-206055-0	XENTEC P/N	TRANSISTOR	5
	1	1-700004-0	XENTEC P/N	FAN CORD 12"	4
	1	1-700006-0	XENTEC P/N	FINGERGUARD/ROTRON	3
	1		XENTEC P/N	HEATSINK	2
	1	310-11297-001	ALTOS P/N	CHASSIS	1

DO NOT SCALE DRAWING
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 CHECKED: [Signature] DATE: 11-20-62
 ENGINEER: [Signature] DATE: 11-20-62
 MANUFACTURING: [Signature] DATE: 11-20-62

SCALE: D SIZE: 430-11069-001
 PART NUMBER: 430-11069-001
 REV: A

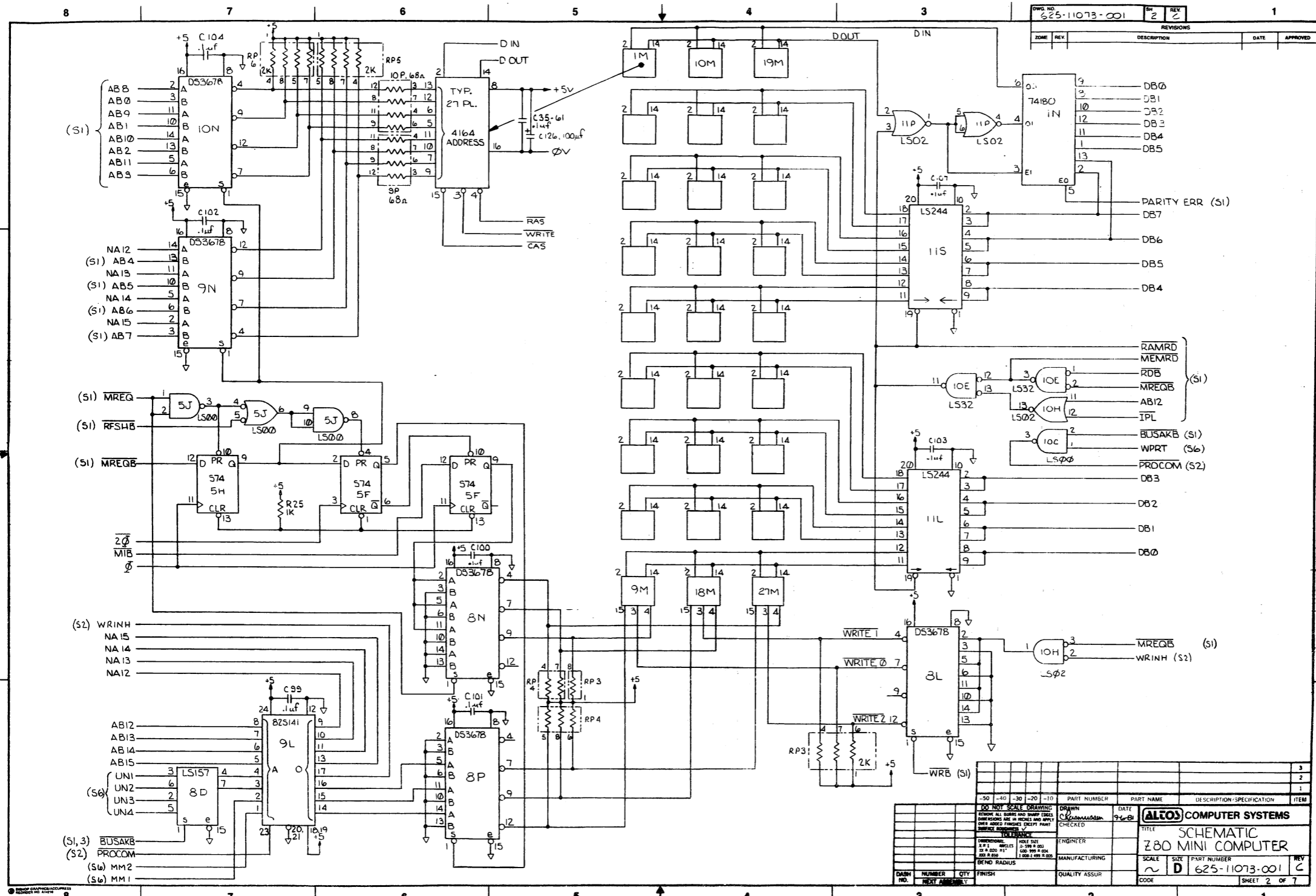
ALLOS COMPUTER SYSTEMS
 TITLE: ASM, POWER SUPPLY SERIES - 5
 SHEET 1 OF 2

DWO. NO. 625-11073-001		REV. 2		REV. 1		REV. 2	
ZONE	REV.	DESCRIPTION	DATE	APPROVED			
A	REL FOR PROD	EO# 0061	1-13-82	EL			
B	REVISED PER EO# 0085		2-23-82	SR			



50	-40	-30	-20	-10					
PART NUMBER					PART NAME				
50-40-30-20-10					DESCRIPTION/SPECIFICATION				
ITEM									
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2									
3									
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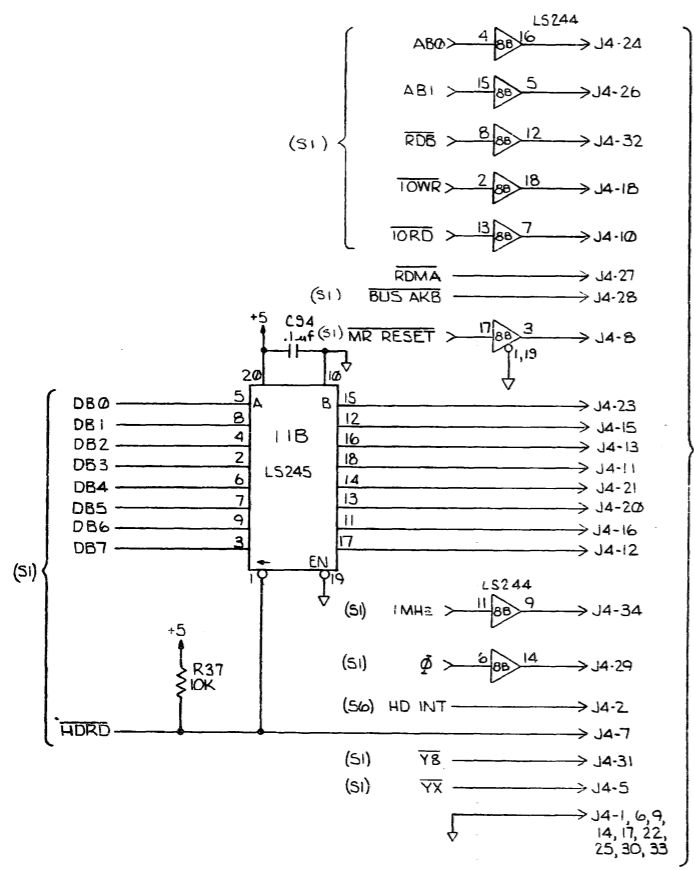
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C. J. [Signature]		9/6/82		SCHEMATIC	
CHECKED		DATE		TITLE	
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ENGINEER		DATE		TITLE	
W. [Signature]		1/15/82		Z80 MINI COMPUTER	
MANUFACTURING		DATE		TITLE	
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QUALITY ASSUR.		DATE		TITLE	
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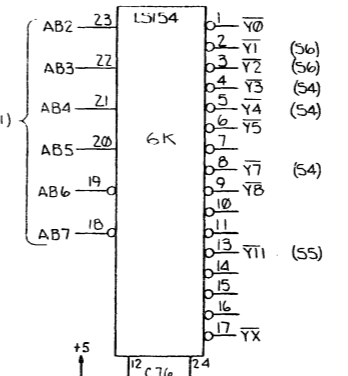
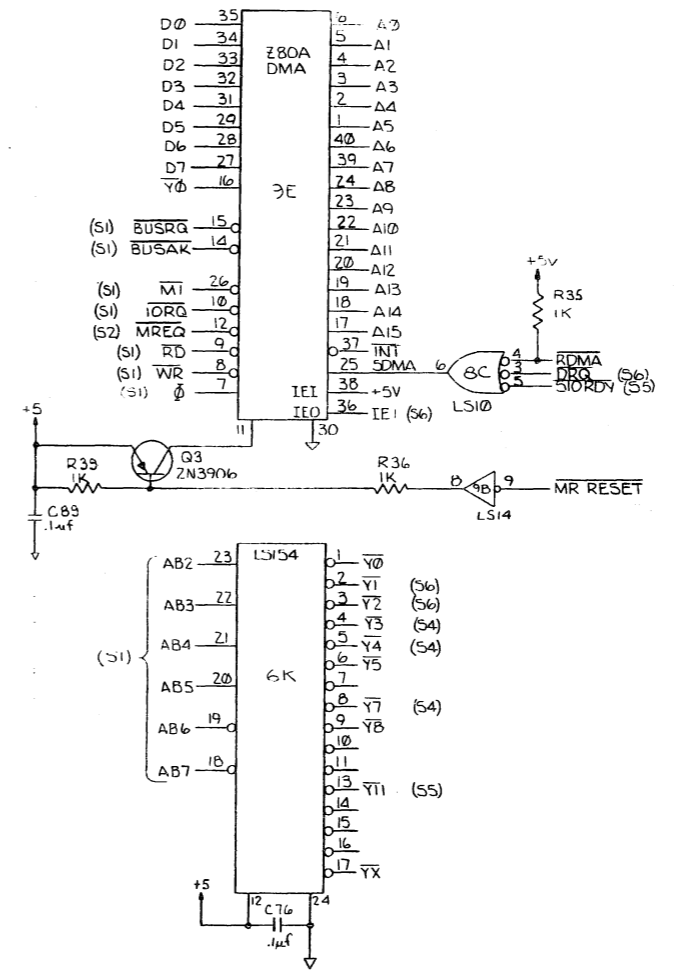
NO.	REV.	DESCRIPTION	DATE	APPROVED
1				
2				
3				

DRAWN	CHECKED	ENGINEER	MANUFACTURING	QUALITY ASSUR.

DO NOT SCALE DRAWING	REMOVE ALL DIMS AND DIMP LINES	FOR DIMENSIONS SEE IN HOLES AND APPLY OVER ADDED FINISHES EXCEPT PRINT DIMENSIONS INDICATED BY DIMENSION LINES
DIMENSIONS: 1/8" & 1/4" UNLESS OTHERWISE SPECIFIED HOLE SIZE: .0015" UNLESS OTHERWISE SPECIFIED TOLERANCES: .0015" UNLESS OTHERWISE SPECIFIED BEND RADIUS: .0015" UNLESS OTHERWISE SPECIFIED	TITLE: SCHEMATIC Z80 MINI COMPUTER	SCALE: D SIZE: 625-11073-001 SHEET 2 OF 7



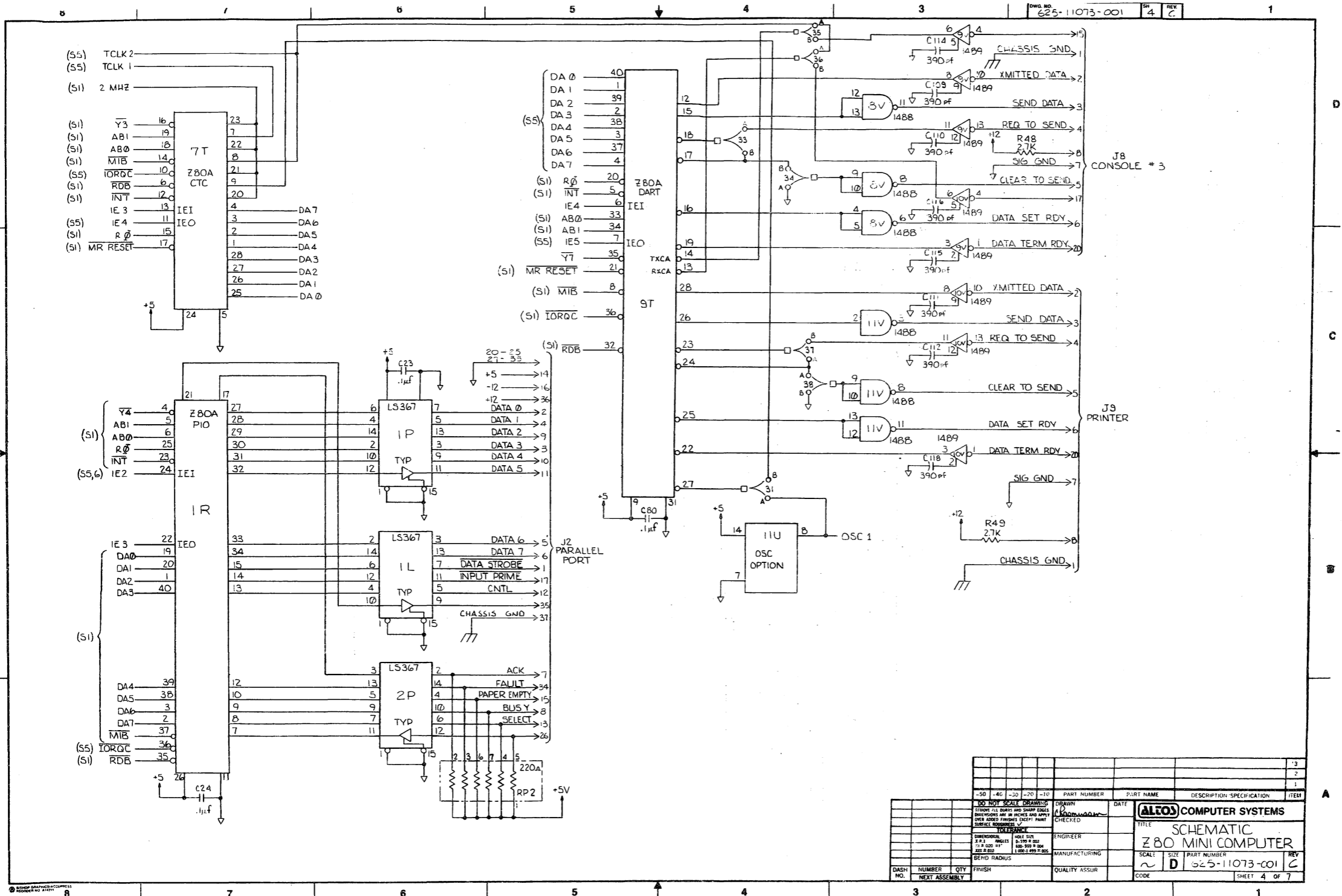
HARD DISK INTERFACE



DASH NO.	NUMBER	QTY	FINISH	QUALITY ASSUR.	SCALE	SIZE	PART NUMBER	REV

ITEM	DESCRIPTION/SPECIFICATION	PART NAME	PART NUMBER
1			
2			
3			

DO NOT SCALE DRAWING REMOVE ALL BURRS AND SHARP EDGES DIMENSIONS ARE IN INCHES AND APPLY UNLESS OTHERWISE SPECIFIED SURFACE FINISH:	DRAWN: _____ DATE: _____ CHECKED: _____ ENGINEER: _____ MANUFACTURING: _____ QUALITY ASSUR: _____	ALTO'S COMPUTER SYSTEMS TITLE: SCHEMATIC Z80 MINI COMPUTER SCALE: D SIZE: D PART NUMBER: 625-11073-001 REV: C SHEET 3 OF 7
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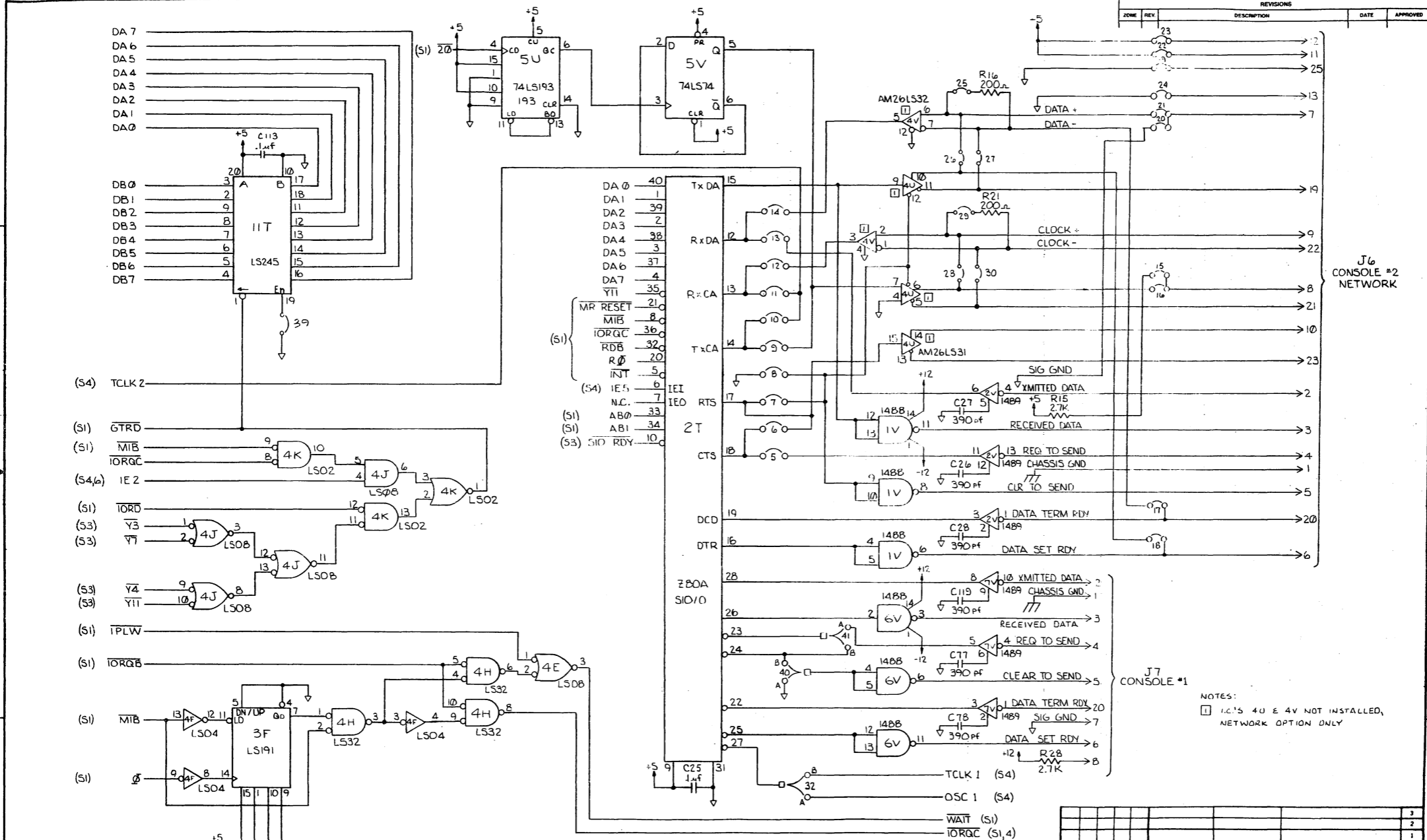


TOLERANCE		DRAWN		DATE		PART NUMBER		PART NAME		DESCRIPTION-SPECIFICATION		ITEM
±0.1		A. K. ...		...		...		...		...		1
±0.05		...		...		...		...		...		2
±0.02		...		...		...		...		...		3
±0.01		...		...		...		...		...		4
±0.005		...		...		...		...		...		5
±0.002		...		...		...		...		...		6
±0.001		...		...		...		...		...		7
±0.0005		...		...		...		...		...		8
±0.0002		...		...		...		...		...		9
±0.0001		...		...		...		...		...		10

DO NOT SCALE DRAWING		DRAWN		DATE		PART NUMBER		PART NAME		DESCRIPTION-SPECIFICATION		ITEM
STRIKE ALL DIMS AND SHARP EDGES		A. K. ...		...		...		...		...		1
OVER ADDED FINISHES (EXCEPT PAINT)		CHECKED		...		...		...		...		2
SURFACE REQUIREMENTS		ENGINEER		...		...		...		...		3
BEND RADIUS		MANUFACTURING		...		...		...		...		4
QUALITY ASSUR		...		...		...		...		...		5

ALLOS COMPUTER SYSTEMS		TITLE		SCALE		SIZE		PART NUMBER		REV	
...		SCHEMATIC		D		...		625-11073-001		C	
DASH NO.		NUMBER		QTY		FINISH		QUALITY ASSUR		CODE	
...		

ZONE	REV	DESCRIPTION	DATE	APPROVED
	5			



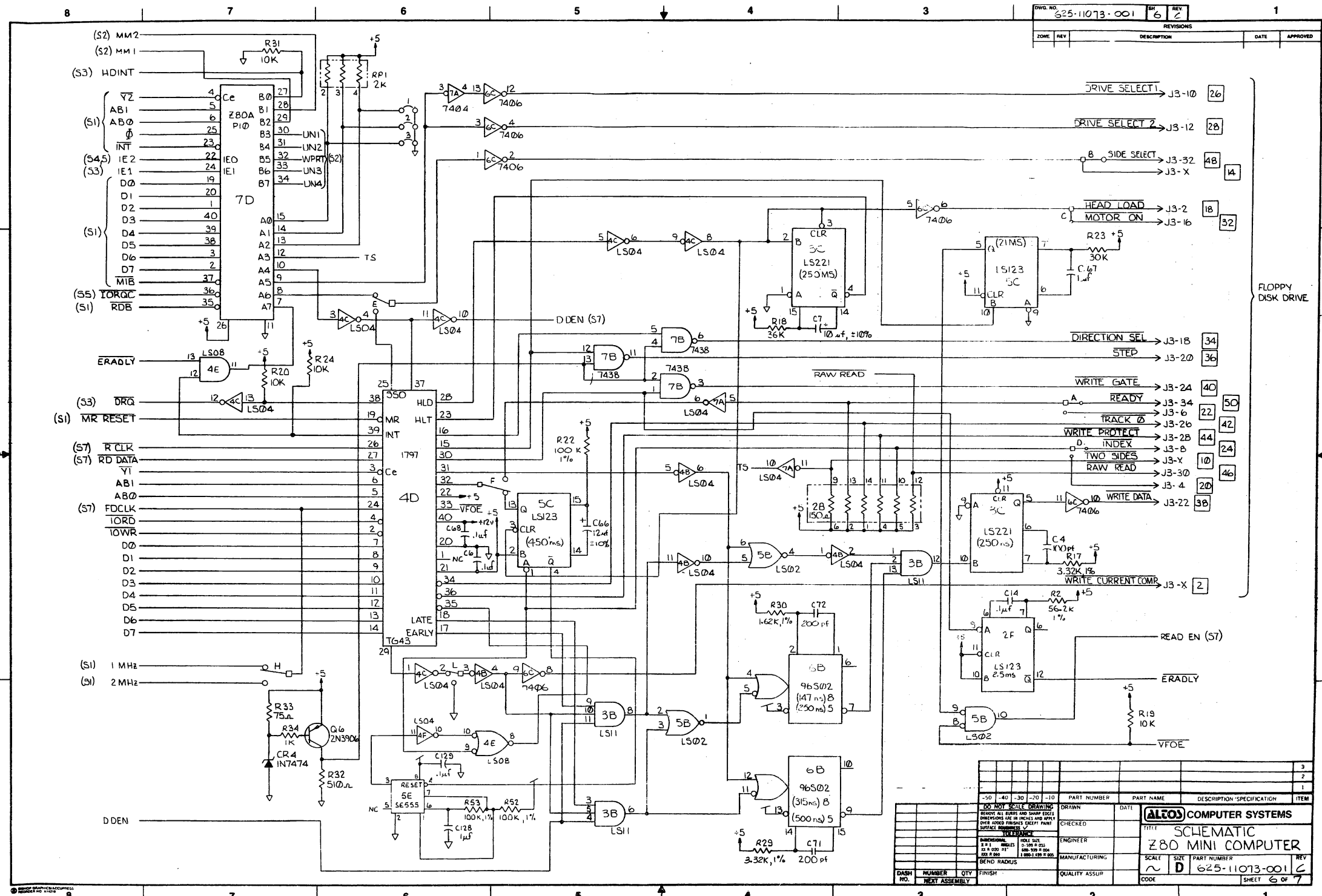
J6 CONSOLE #2 NETWORK

J7 CONSOLE #1

NOTES:
 □ IC'S 40 E 4V NOT INSTALLED,
 NETWORK OPTION ONLY

REV	DATE	DESCRIPTION	ITEM
3			
2			
1			

DO NOT SCALE DRAWING		DRAWN	DATE	ALTO'S COMPUTER SYSTEMS	
REMOVE ALL DIMENSIONS AND DIMENSION LINES		CHECKED	9-6-81	TITLE	
DIMENSIONS ARE IN INCHES AND APPLY OVER HOLES THROUGH PLATE		ENGINEER		SCHEMATIC	
SURFACE FINISHES		MANUFACTURING		Z80 MINI COMPUTER	
DIMENSIONAL TOLERANCES		QUALITY ASSUR		SCALE	PART NUMBER
HOLE SIZE				D	625-11073-001
Ø .125 ± .003				SIZE	REV
Ø .1875 ± .003					5
Ø .250 ± .003					7
Ø .3125 ± .003					
Ø .375 ± .003					
Ø .4375 ± .003					
Ø .500 ± .003					
Ø .5625 ± .003					
Ø .625 ± .003					
Ø .6875 ± .003					
Ø .750 ± .003					
Ø .8125 ± .003					
Ø .875 ± .003					
Ø .9375 ± .003					
Ø 1.000 ± .003					
Ø 1.0625 ± .003					
Ø 1.125 ± .003					
Ø 1.1875 ± .003					
Ø 1.250 ± .003					
Ø 1.3125 ± .003					
Ø 1.375 ± .003					
Ø 1.4375 ± .003					
Ø 1.500 ± .003					
Ø 1.5625 ± .003					
Ø 1.625 ± .003					
Ø 1.6875 ± .003					
Ø 1.750 ± .003					
Ø 1.8125 ± .003					
Ø 1.875 ± .003					
Ø 1.9375 ± .003					
Ø 2.000 ± .003					
Ø 2.0625 ± .003					
Ø 2.125 ± .003					
Ø 2.1875 ± .003					
Ø 2.250 ± .003					
Ø 2.3125 ± .003					
Ø 2.375 ± .003					
Ø 2.4375 ± .003					
Ø 2.500 ± .003					
Ø 2.5625 ± .003					
Ø 2.625 ± .003					
Ø 2.6875 ± .003					
Ø 2.750 ± .003					
Ø 2.8125 ± .003					
Ø 2.875 ± .003					
Ø 2.9375 ± .003					
Ø 3.000 ± .003					
Ø 3.0625 ± .003					
Ø 3.125 ± .003					
Ø 3.1875 ± .003					
Ø 3.250 ± .003					
Ø 3.3125 ± .003					
Ø 3.375 ± .003					
Ø 3.4375 ± .003					
Ø 3.500 ± .003					
Ø 3.5625 ± .003					
Ø 3.625 ± .003					
Ø 3.6875 ± .003					
Ø 3.750 ± .003					
Ø 3.8125 ± .003					
Ø 3.875 ± .003					
Ø 3.9375 ± .003					
Ø 4.000 ± .003					
Ø 4.0625 ± .003					
Ø 4.125 ± .003					
Ø 4.1875 ± .003					
Ø 4.250 ± .003					
Ø 4.3125 ± .003					
Ø 4.375 ± .003					
Ø 4.4375 ± .003					
Ø 4.500 ± .003					
Ø 4.5625 ± .003					
Ø 4.625 ± .003					
Ø 4.6875 ± .003					
Ø 4.750 ± .003					
Ø 4.8125 ± .003					
Ø 4.875 ± .003					
Ø 4.9375 ± .003					
Ø 5.000 ± .003					

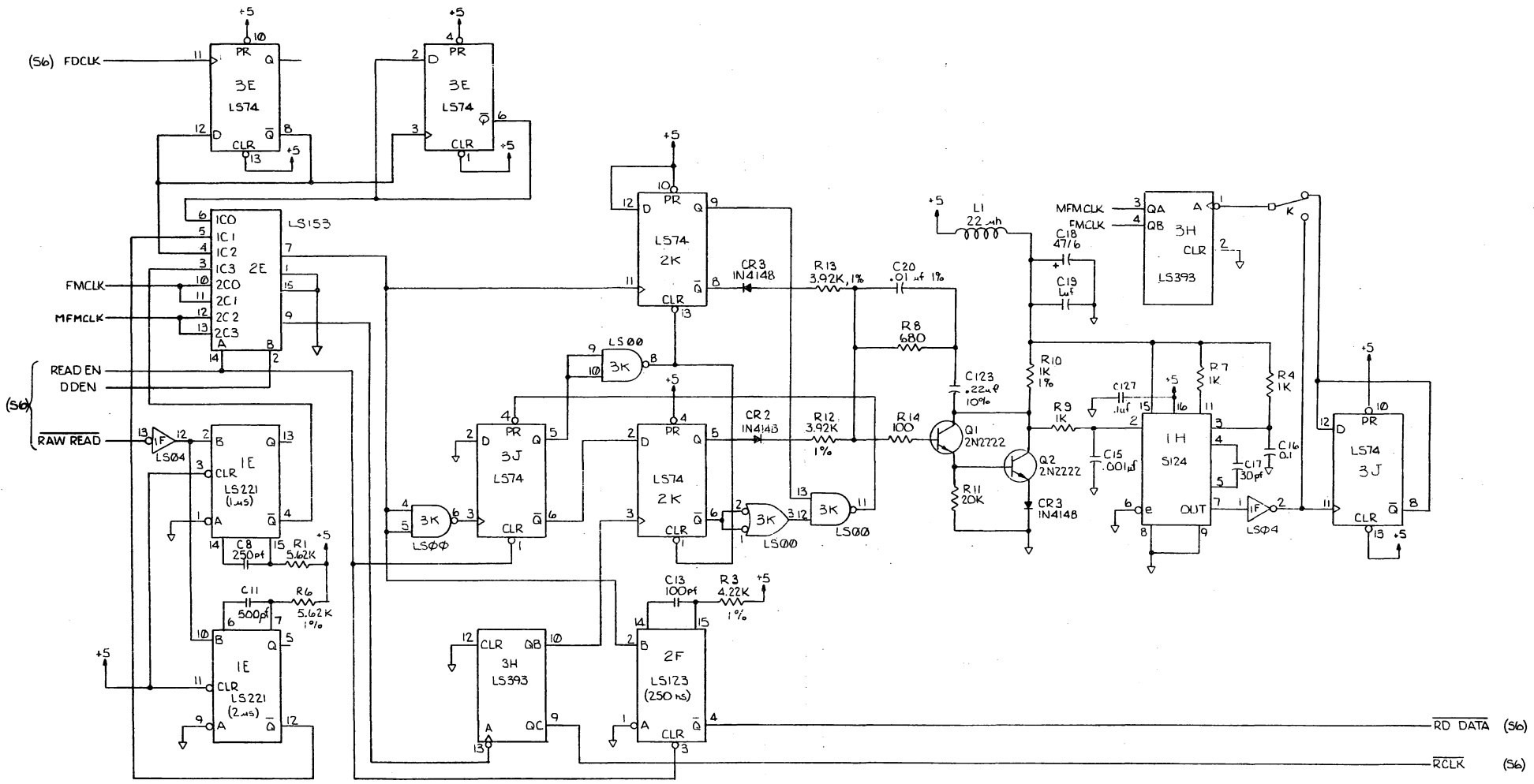


DASH NO.	NUMBER	QTY	FINISH	QUALITY ASSUP	MANUFACTURING	ENGINEER	DATE	DESCRIPTION	ITEM
									3
									2
									1

NO.	REV.	DESCRIPTION	DATE	APPROVED
1	1			
2	2			
3	3			
4	4			
5	5			
6	6			
7	7			
8	8			

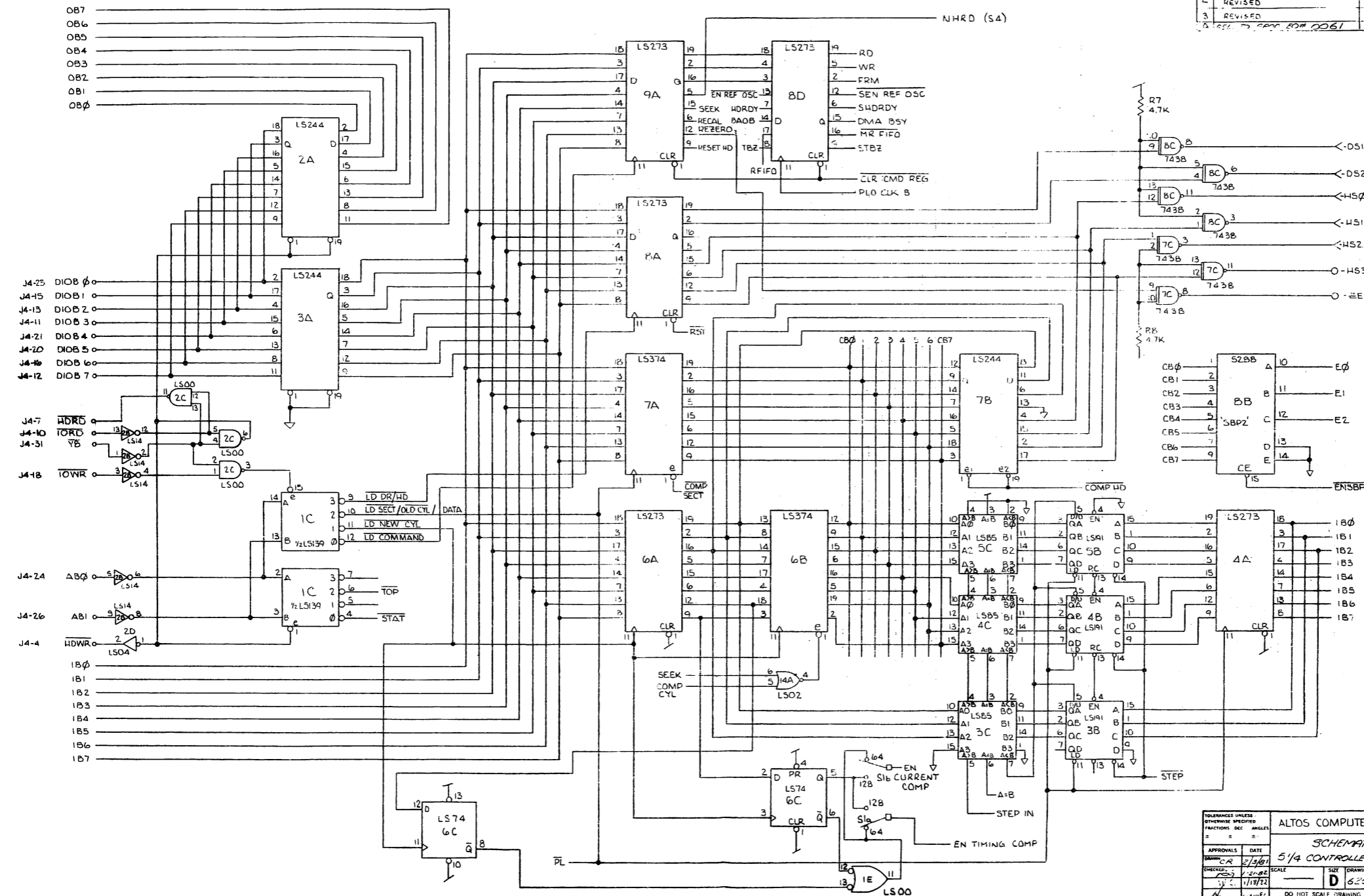
DRAWN		DATE	
CHECKED		DATE	
ENGINEER		DATE	
MANUFACTURING		DATE	
QUALITY ASSUP		DATE	

ALLOS COMPUTER SYSTEMS			
TITLE: SCHEMATIC			
Z80 MINI COMPUTER			
SCALE	SIZE	PART NUMBER	REV
~	D	625-11073-001	C
CODE	SHEET		6 OF 7



3					
2					
1					
-50	-40	-30	-20	-10	ITEM
					PART NUMBER PART NAME DESCRIPTION/SPECIFICATION
<p> DO NOT SCALE DRAWING REMOVE ALL BURS AND SHARP EDGES DIMENSIONS ARE IN UNITS AND APPLY OVER ADD'D FINISH'S UNLESS NOTED OTHERWISE </p>					
DRAWN		DATE		9-16-81	
CHECKED		ENGINEER		ALTO'S COMPUTER SYSTEMS	
TELEPHONE		MANUFACTURING		TITLE	
BEND RADIUS		QUALITY ASSUR.		SCHEMATIC	
				ZBC MINI COMPUTER	
				SCALE SIZE PART NUMBER	
				D 625-11073-001 C	
DASH NO.		NUMBER		REV	
NEXT ASSEMBLY		FINISH		CODE	
				SHEET 7 OF 7	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	PROTOTYPE	10/26/81	EG
2	REVISED	11-15-81	SR
3	REVISED	12-01-81	SR
4	REVISED FOR DOB1	1-12-82	EG



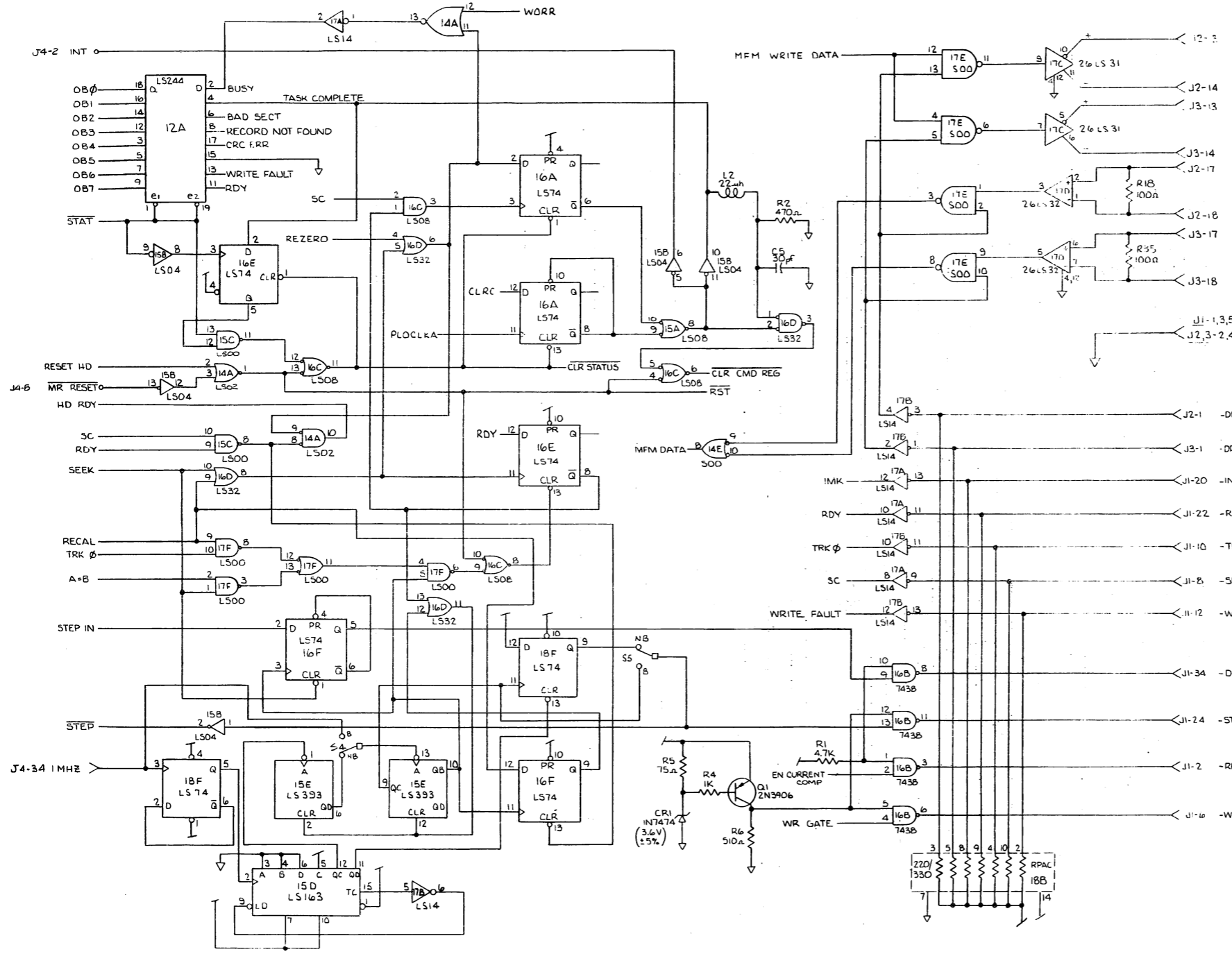
TOLERANCES UNLESS OTHERWISE SPECIFIED
DIMENSIONS DEC ANGLES

APPROVALS	DATE	SCALE	SHEET	DRAWING NO.
CR	2/3/81		D	625-11099-001
CHECKED	1/28/82			
BY	1/18/82			
1/2/81				

DO NOT SCALE DRAWING SHEET 1 OF 3

ALLOS COMPUTER SYSTEMS
SCHEMATIC
5 1/4 CONTROLLER P.C.B.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



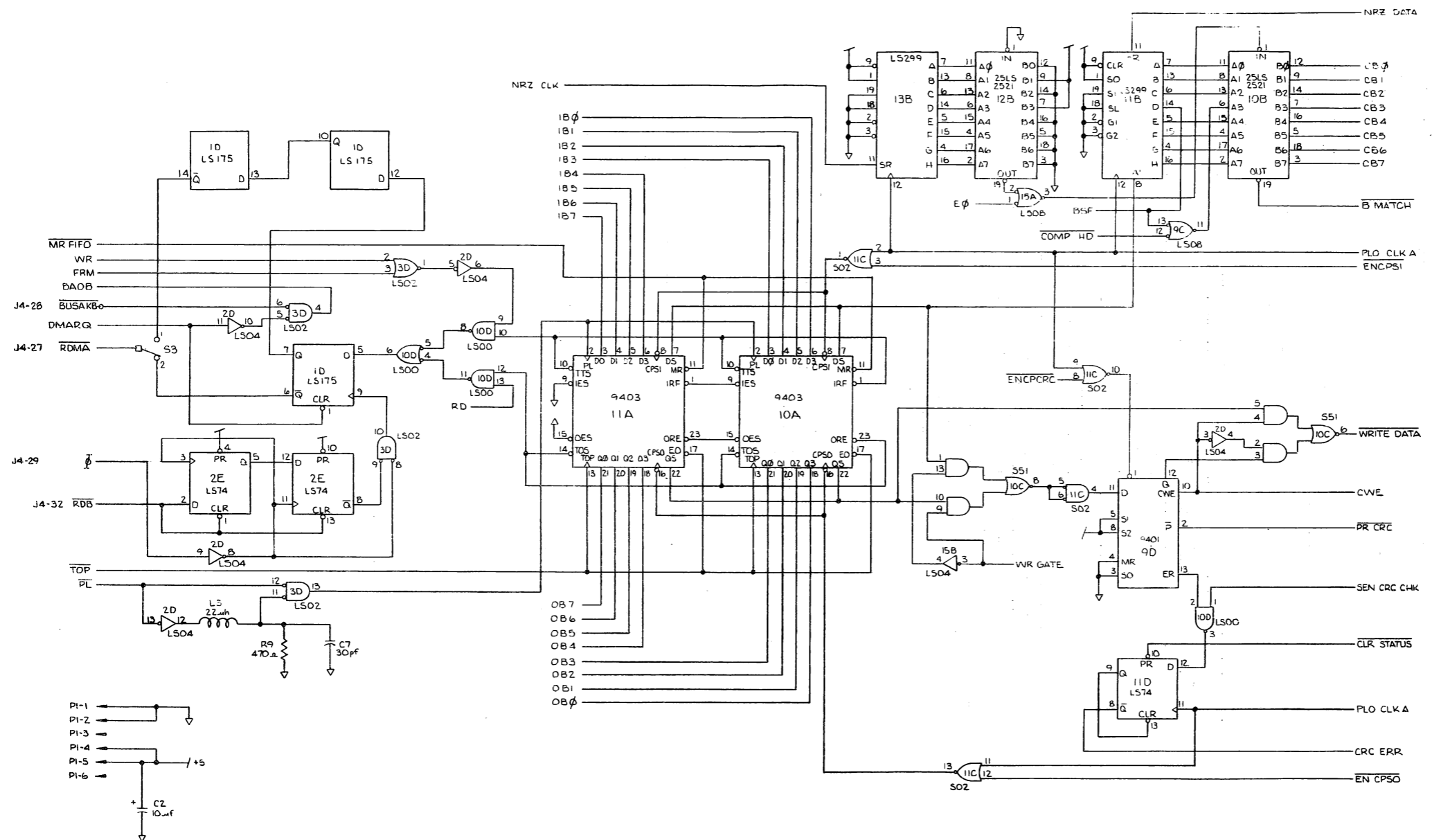
J1-1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33
 J2,3-2,4,6,8,10,12,15,16,19,20

TOLERANCES UNLESS OTHERWISE SPECIFIED			
FRACTIONS	DEC	ANGLES	

APPROVALS		DATE	

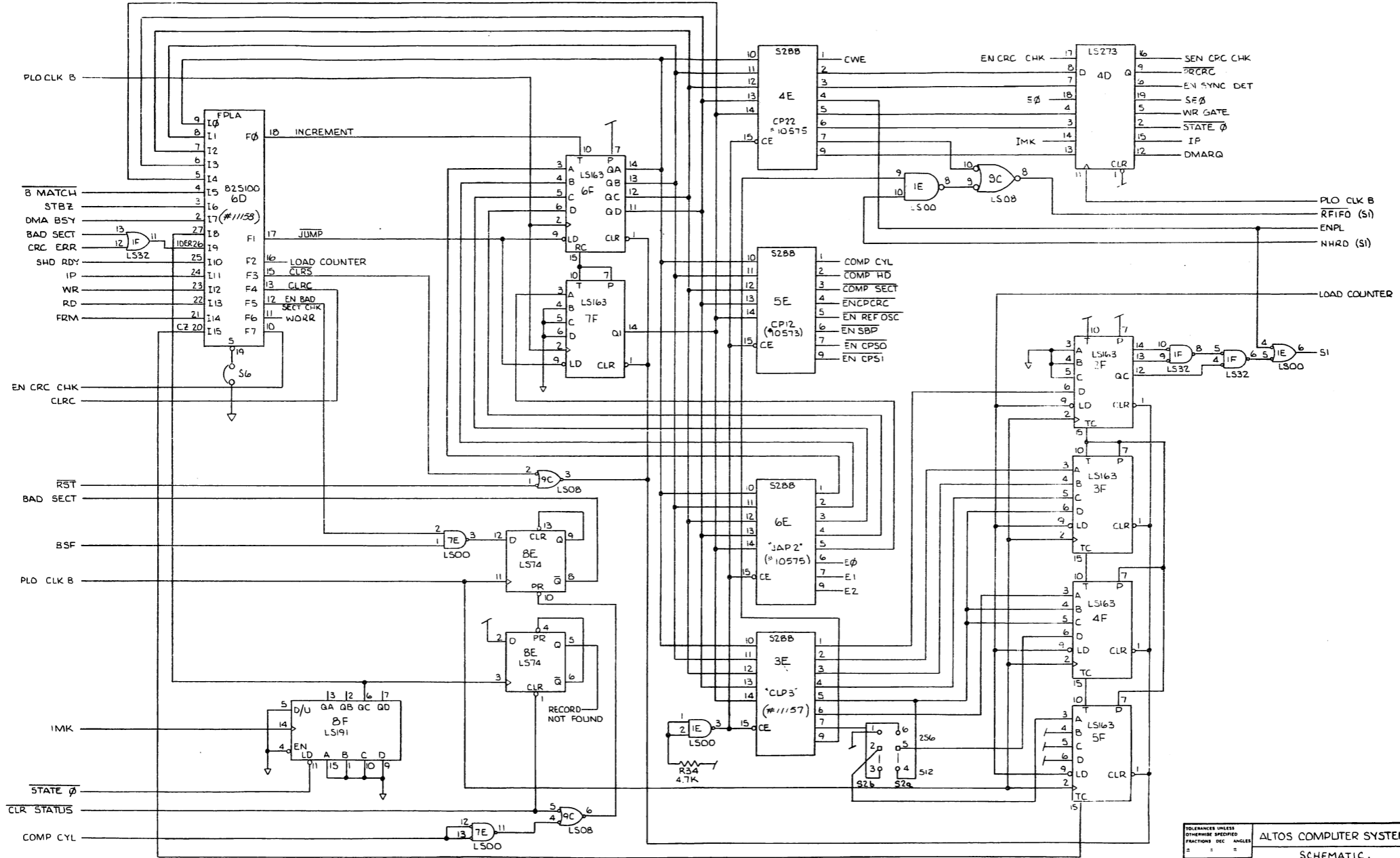
ALTO'S COMPUTER SYSTEM			
SCHEMATIC, 5 1/4" CONTROLLER PCB.			
DRAWN	CHECKED	SCALE	SIZE
CK	2/5/81		D
DRAWING NO. 625-11099-001		SHEET 2 of 3	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



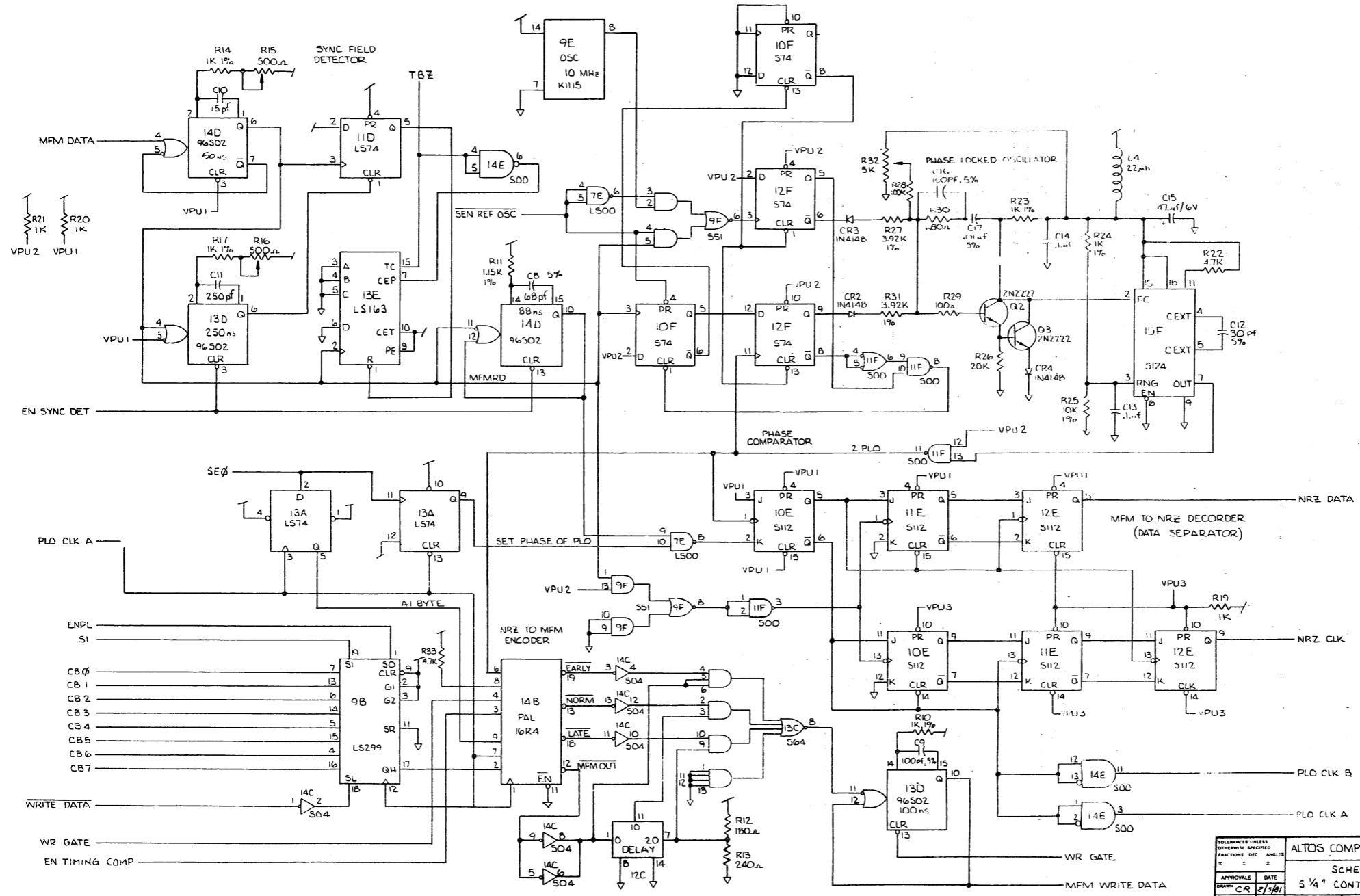
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DECIMALS		ALTO COMPUTER SYSTEMS	
APPROVALS DATE		SCHEMATIC,	
DRAWN: C.R. 2/19/81		5 1/4" CONTROLLER P.C.B.	
OWNER: 200	SCALE: 1-20X	SIZE: D	DRAWING NO: 625-11099-001
DO NOT SCALE DRAWING		SHEET 3 OF 5	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

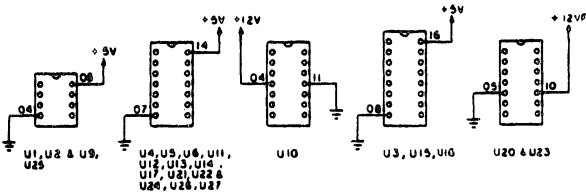
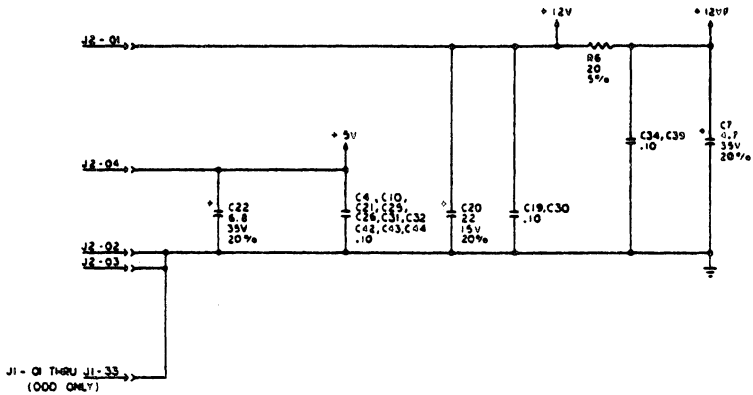


TOLERANCES UNLESS OTHERWISE SPECIFIED		ALLOS COMPUTER SYSTEMS	
FRACTIONS	DEC	SCHEMATIC,	
°	'	5 1/4" CONTROLLER PCB.	
APPROVALS	DATE	SIZE	DRAWING NO.
DRAWN: R	2/2/81	D	625-11099-001 A
CHECKED: [Signature]	1-21-81	SCALE	SHEET 4 OF 5
DO NOT SCALE DRAWING			

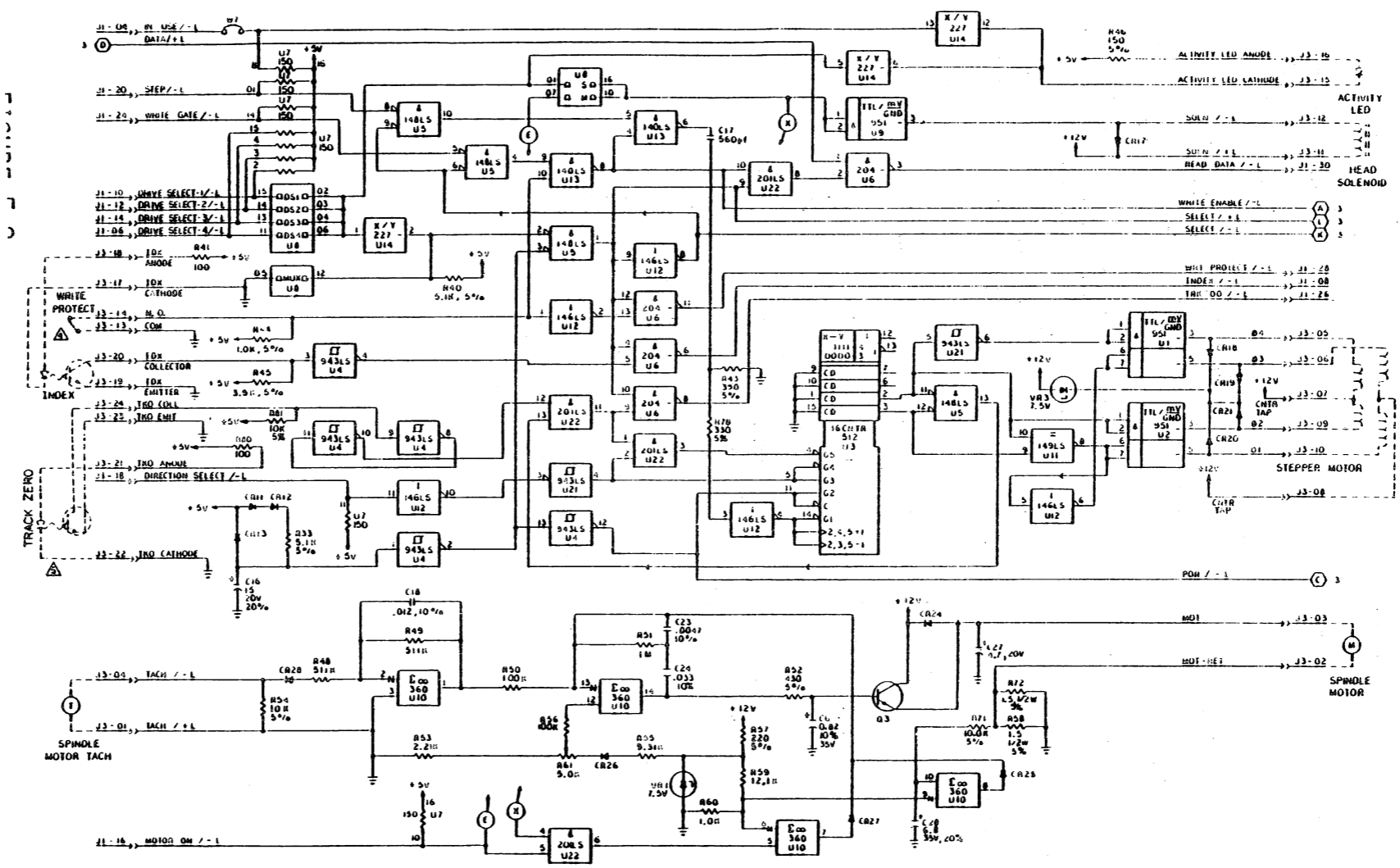
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



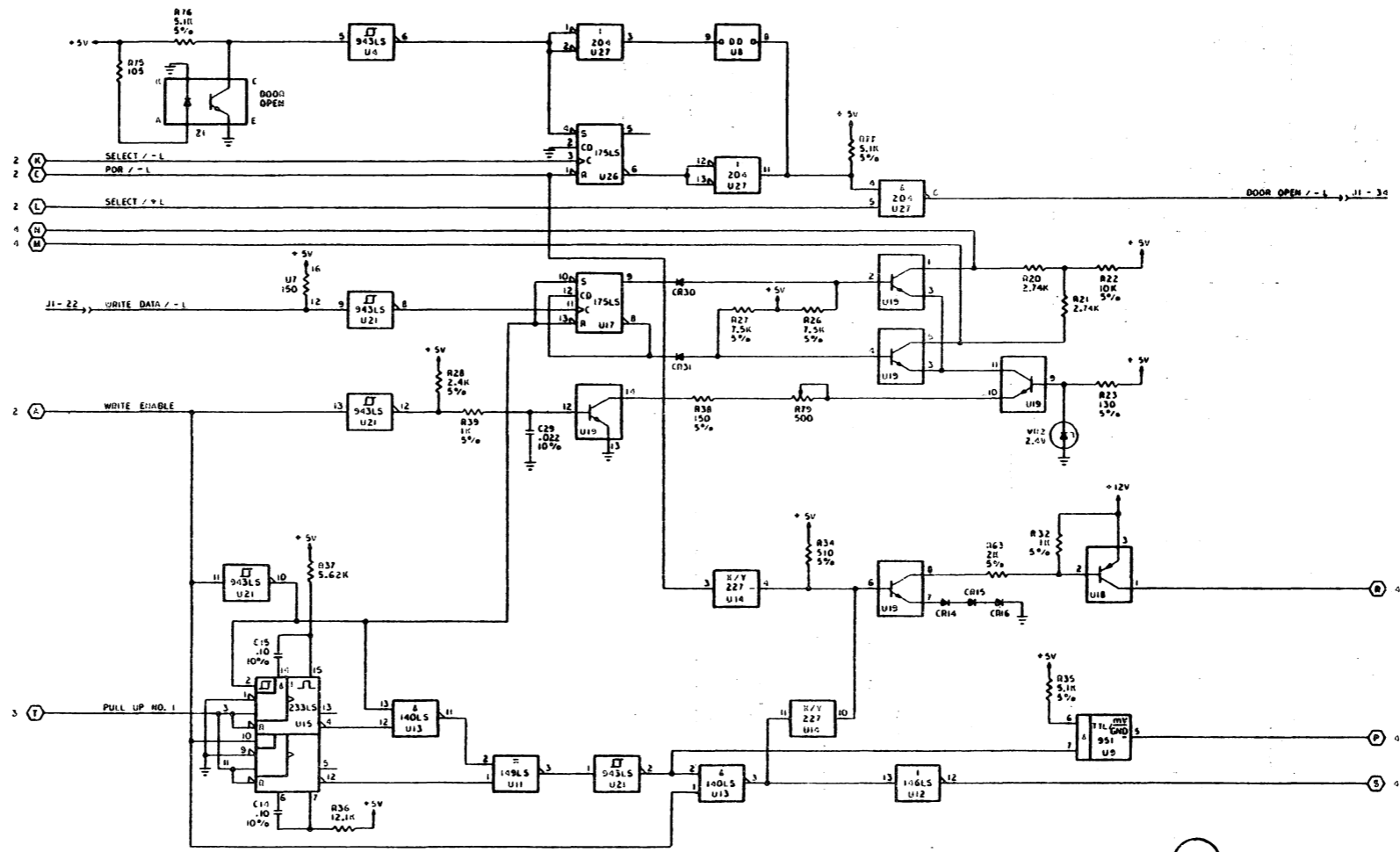
TOLERANCE UNLESS OTHERWISE SPECIFIED		FRACTIONS DEC ANGLES	
APPROVALS	DATE	ALTOX COMPUTER SYSTEMS	
		SCHEMATIC,	
		5 1/4" CONTROLLER PCB.	
CHECKED	DATE	SIZE	DRAWING NO.
		D	625-11099-001
DO NOT SCALE DRAWING		SHEET 5	



- NOTES:
1. RESISTOR VALUES ARE IN OHMS, 1/4 W, ±1%
 2. CAPACITANCE VALUES ARE IN MICROFARADS
 3. DRAWING INTERPRETATION PER 43A226599
 4. WRITE PROTECT SWITCH SHOWN IN THE WRITE PROTECTED POSITION; DISKETTE INSERTED AND WRITE PROTECT SLOT DOWNWARD.
 5. OPTICAL TRACK ZERO SWITCH: CARRIAGE FLAG INTERRUPTS LIGHT BEAM AT TRACK ZERO POSITION

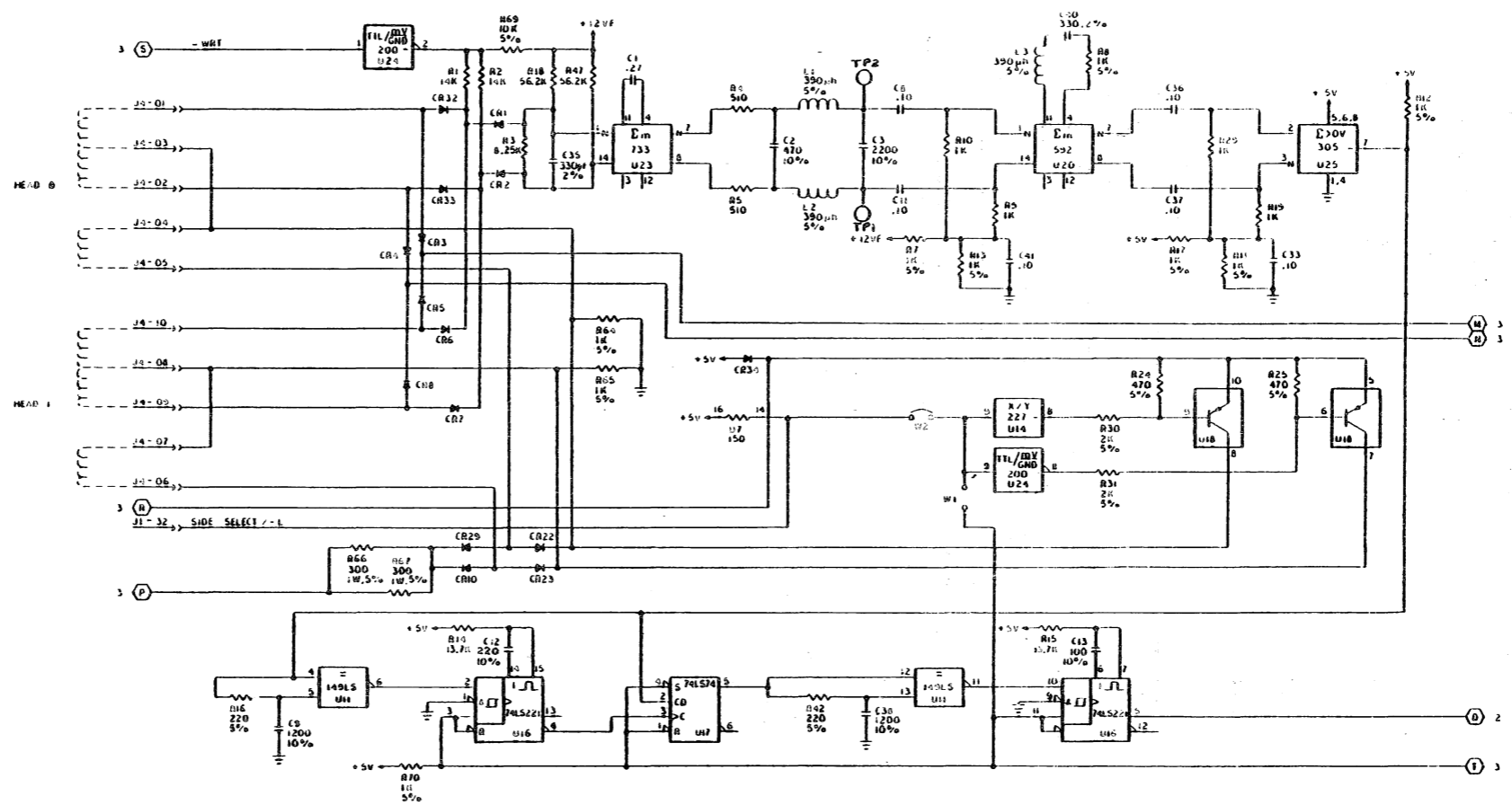


CDC Floppy Disk Drive Schematic



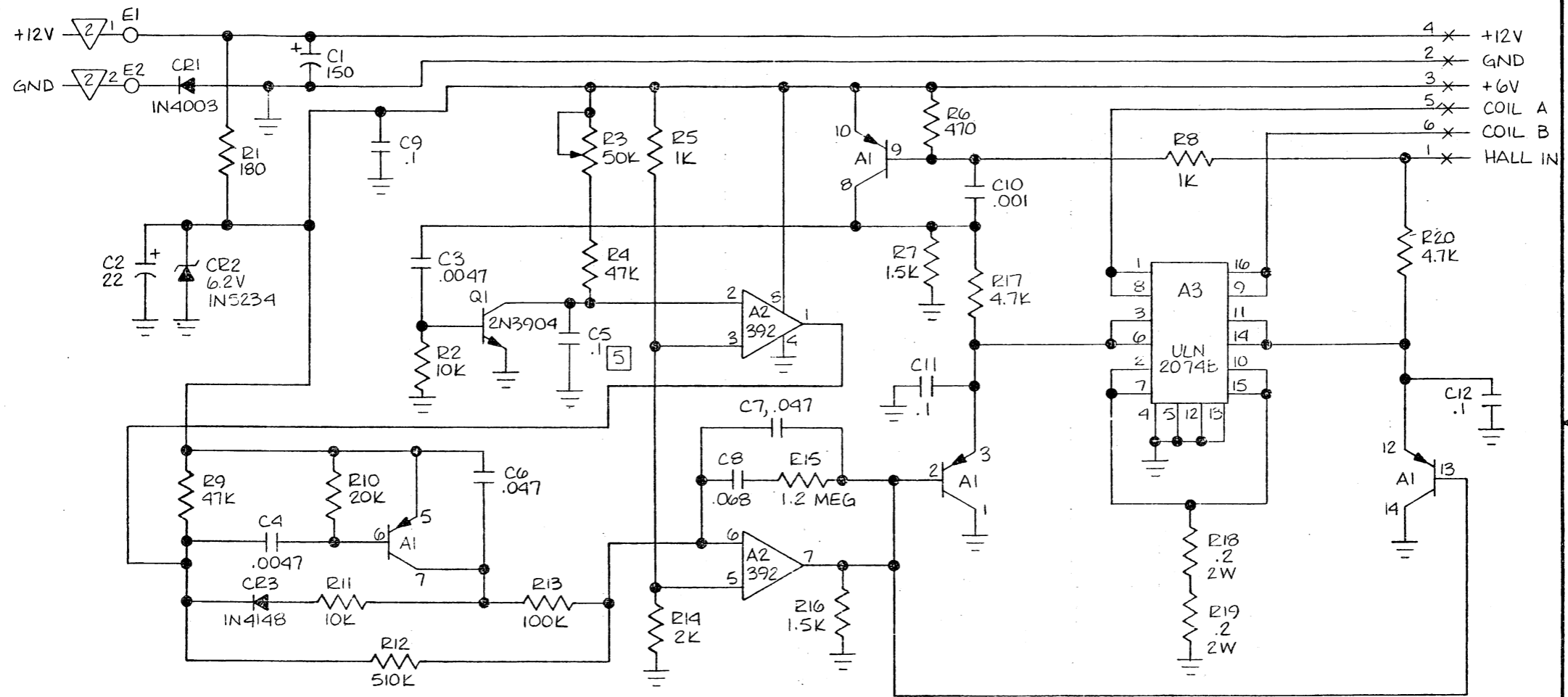
3

CDC Floppy Disk Drive Schematic



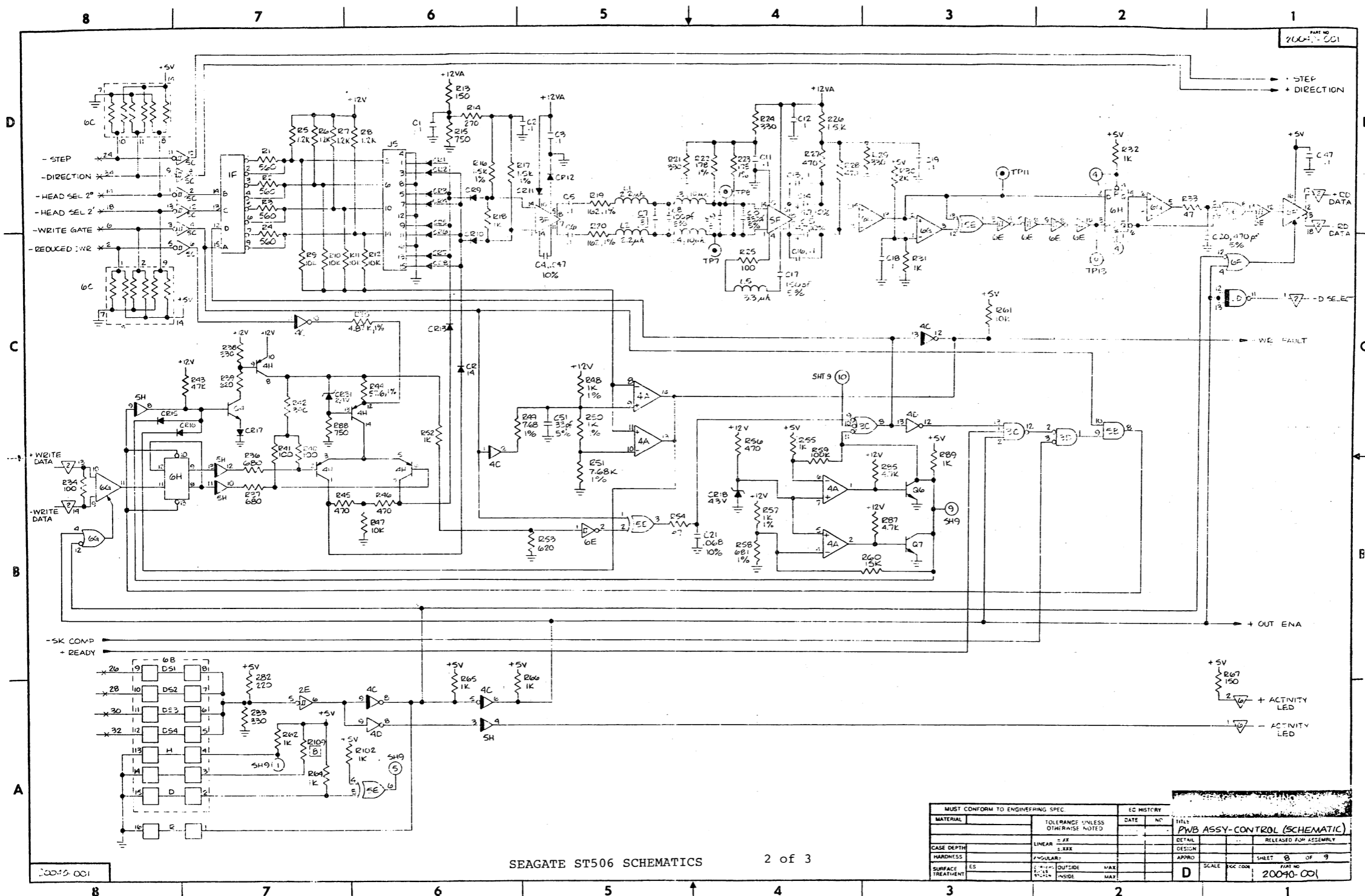
CDC Floppy Disk Drive Schematic

PART NO.
20003-001



- 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. ▽— INDICATES J2
 5. CS-POLYCARBONATE, 50V, ±10%

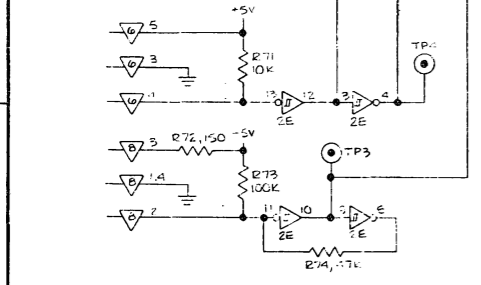
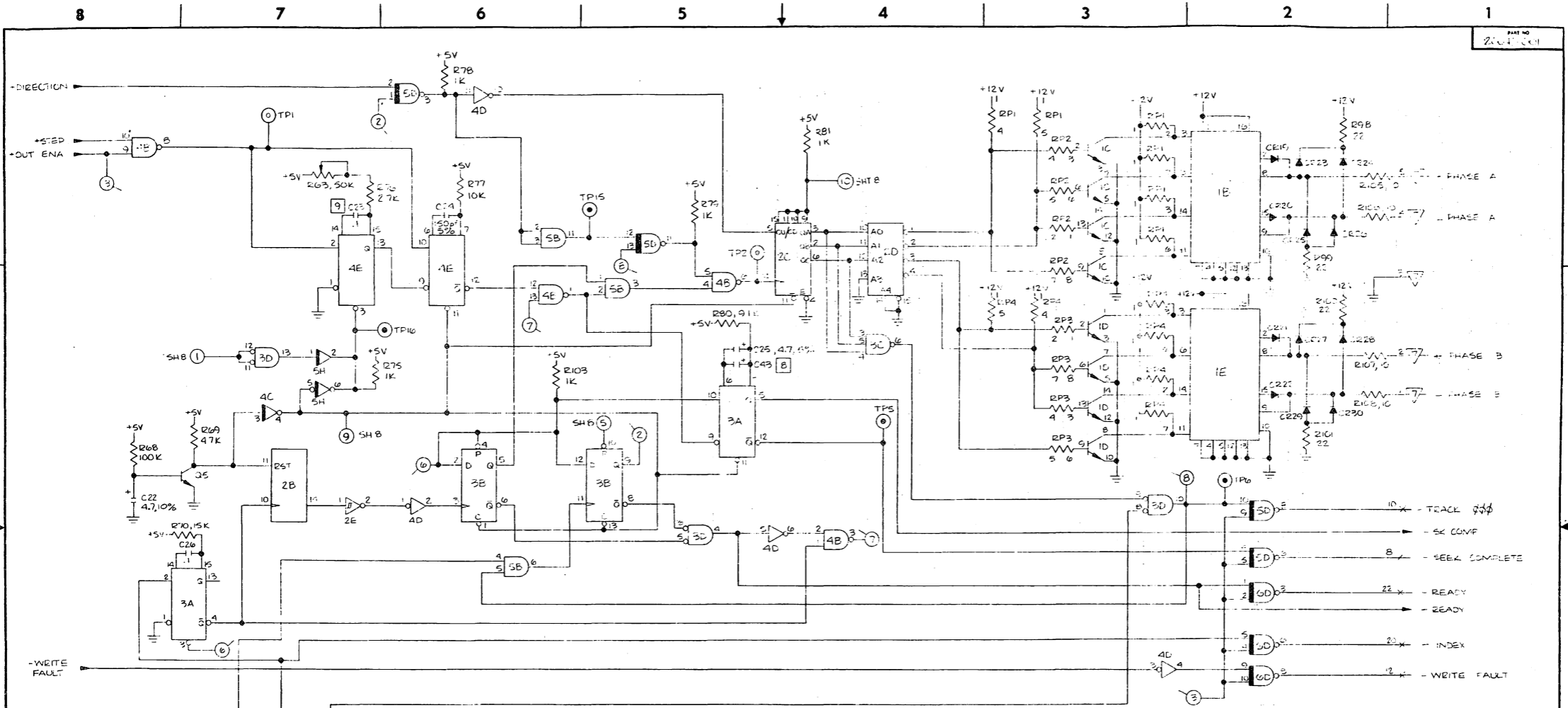
MUST CONFORM TO ENGINEERING SPEC. 30130-001				EC HISTORY			
MATERIAL:		TOLERANCE UNLESS OTHERWISE NOTED		DATE	NO.	TITLE	
		LINEAR ±.XX ±.XXX		1 10 81	0005	PWD ASSY - MTR ONTEL (SCHEMATIC)	
HARDNESS	ES	ANGULAR ±		2 10 81	0002	DETAIL	RELEASED FOR ASSEMBLY
		CORNERS EDGES BROKEN		4 20 81	0002	DESIGN	
SURFACE TREATMENT		OUTSIDE	MAX	APPRO		SHEET	OF 6
		INSIDE	MAX	SCALE		PART NO. 20003-001	



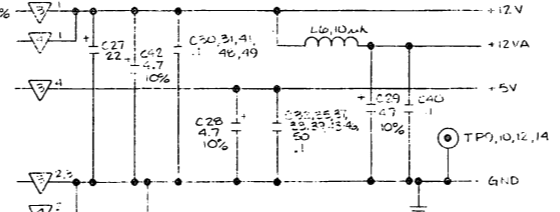
PART NO
20040-001

MUST CONFORM TO ENGINEERING SPEC.				EC HISTORY	
MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	DATE	NO.	TITLE	
				PWB ASSY-CONTROL (SCHEMATIC)	
CASE DEPTH	LINEAR ±.015	DESIGN		RELEASED FOR ASSEMBLY	
HARDNESS	ANGULAR ±.015	APPRO.		SHEET 8 OF 9	
SURFACE TREATMENT	ES ±.015	OUTSIDE MAX		SCALE	DATE
	INSIDE MAX			20040-001	

20040-001



NOTES: UNLESS OTHERWISE SPECIFIED:
 1. RESISTANCE VALUES ARE IN OHMS, KW, MW, 5%.
 2. ALL 1% RESISTORS ARE 1/8 W.
 3. CAPACITANCE VALUES ARE IN MICROSECONDS, -50-20%.
 4. DIMENSIONS ARE IN INCHES.
 5. * INDICATES CONNECTOR J1
 6. TRIANGLE INDICATES CONNECTOR J3 THRU J8
 7. CIRCLE WITH NUMBER INDICATES TEST POINT PINS.
 8. SQUARE WITH NUMBER PART NOT INSTALLED
 9. C23 - POLYCARBONATE, 50V, ±10%



IC LOCATION & VOLTAGE CHART

TYPE	LOCATION	PSY	GND	TYPE	LOCATION	PSY	GND	TYPE	LOCATION	PSY	GND
TPQ 9994	IC 10	1	2	74181	5E	6E	1A	74127	3A	7	8
4020	2E	3	4	74181	5E	6E	1A	74127	3A	7	8
74181	5E	6E	1A	74181	5E	6E	1A	74127	3A	7	8
74127	3A	7	8	74181	5E	6E	1A	74127	3A	7	8
74181	5E	6E	1A	74181	5E	6E	1A	74127	3A	7	8
74127	3A	7	8	74181	5E	6E	1A	74127	3A	7	8
74181	5E	6E	1A	74181	5E	6E	1A	74127	3A	7	8
74127	3A	7	8	74181	5E	6E	1A	74127	3A	7	8
74181	5E	6E	1A	74181	5E	6E	1A	74127	3A	7	8
74127	3A	7	8	74181	5E	6E	1A	74127	3A	7	8

PER LSC

LAST USED	NOT USED
1/80	1/80
1/80	1/80
1/80	1/80

MUST CONFORM TO ENGINEERING SPEC

MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	EC HISTORY	DATE	NO	FILE
CASE DEPTH	LINEAR ±.005 ANGULAR ±.010				
HARDNESS					
SURFACE TREATMENT					

RELEASED FOR ASSEMBLY

SCALE 1:1

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.

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