3107

WANG

DISK PROCESSING UNIT

Model: 2280

Customer Engineering
Product Maintenance Manual

741-0971

PREFACE

The purpose of this manual is to provide the Wang-trained Customer Engineer (CE) with instructions to operate, troubleshoot and repair the Disk Processing Unit Model 2280.

Second Edition (August 1984)

This edition is the converted number for and obsoletes document number 729-0971. It also incorporates Publication Update Bulletin (PUB), 729-0971-1. This edition of the manual may be used only for the purpose stated in the Preface. Updates and /or changes to this document will be published as Publication Update Bulletins (PUB's) or subsequent editions.

CUSTOMER ENGINEERING

PUBLICATION UPDATE BULLETIN

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REASON FOR CHANGE:

This PUB corrects a previous error by reversing the photos in figures 2-8, and 2-9 for the proper sequence, enhancing figures 2-12 and 2-13, and adding figures 2-12A and 2-13A.

INSTRUCTIONS:

Remove pages and insert attached pages as follows:

	REMOVE	INSERT
1.	2-11, 2-12	2-11, 2-12
2.	2-15, 2-16	2-15, 2-16
3.	2-17, 2-18	2-17, 2-17A
4.		2-17B
5.		2-17D, 2-18
6.		
7.		
8.		
9.		
10.		

This page is to be used as a permanent record of revisions; place it directly following the title page.

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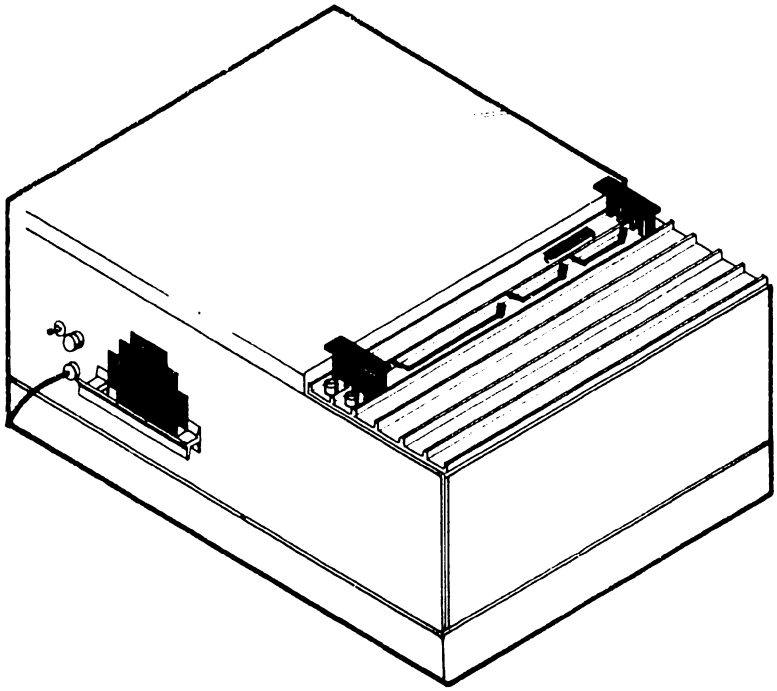


SECTION 1 GENERAL DESCRIP-TION

SECTION 1

INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Product Maintenance Manual (PMM) is to provide sufficient information for the Wang CE to install and maintain the Model 2280 Disk Processor. The information is presented as follows:

Section	Title
1	INTRODUCTION
2	INSTALLATION
3	OPERATION
4	MAINTENANCE
5	THEORY OF OPERATION
Appendix A	DISK ERROR CODES
Appendix B	DISK SECTOR LAYOUT
Appendix C	BILL OF MATERIAL
Appendix D	SCHEMATICS

1.2 RELATED PUBLICATIONS

Following is a list of documentation categories referenced by this PMM. Documentation from these other categories is required for the performance of certain installation/maintenance tasks.

Phoenix Disk Drive -- III.A.7
Disk Diagnostics -- IV.C.1
2280 DPU-to-2280 DPU/MUX Conversion -- I.B.2
22C03, 22C11, 22C32 Disk I/O Controllers -- IV.B.1

1.3 FUNCTIONAL DESCRIPTION

The 2280 DPU (Disk Processing Unit) controls all disk drive operations (such as reading, writing, and head positioning) for the CDC Model 9448 Cartridge Module Disk Drive (CMD)--commonly called the "Phoenix"--when the drive is a component in a 2200VP/LVP/MVP/SVP Computer System. The DPU permits two Phoenix drives to be daisy-chained, providing up to 162 megabytes (approximate) of on-line storage. The 2280 processor (WL No. 187-2200-80) consists of nine printed circuit boards and a motherboard contained in a 2200S chassis. This chassis is housed (located) in the bottom of the Phoenix cabinet/stand. All printed circuit boards are defined in section 2.5.2.

The 2280 DPU connects to a 22C03, 22C11, or 22C32 disk I/O controller in the CPU via a 12-ft (3.6-m) twisted pair cable. The processor connects to the disk drive via two 15-ft (4.5-m) ribbon cables. Figure 1-1 shows a dual disk drive 2200/2280 system configuration.

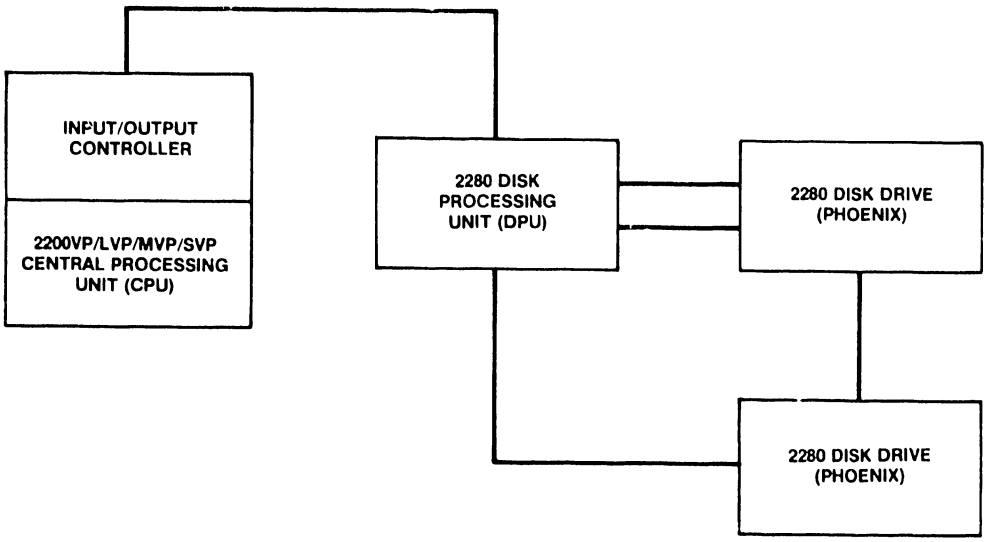


Figure 1-1. 2200/2280 System Configuration

1.4 SPECIFICATIONS

The specifications for the 2280 DPU system are listed below as follows:

Physical Dimensions

Height - 9 in. (23 cm)
Width - 16 in. (41 cm)
Depth - 21 in. (53 cm)

Power Requirements

115 or 230 Vac ±10%
50 or 60 Hz ±1.0 Hz
230 Watts

Fuses

3.0 A (SB) for 115 Vac
1.5 A (SB) for 230 Vac

Operating Environment

Temperature - 60°F to 80°F (15°C to 27°C)
Relative Humidity - 40% to 60% (noncondensing)

Heat Output

787 BTU/hr (197 Kcal/hr)

Cables

Power - 10 ft (3.0 m)
Data - 15 ft (4.5 m)

SECTION 2 INSTAL-LATION

SECTION 2

INSTALLATION

2.1 SITE PREPARATION

For information concerning preinstallation site planning and preparations, refer to the corporate "Customer Site Planning Guide" WL No. 700-5978, its updates, and CE documentation category I.A.7.

2.2 PRE-UNPACKING INSPECTION

Before unpacking the 2280 DPU, check the packing slip to ensure that the proper equipment has been delivered. After checking the slip, visually inspect the container carefully for any indications of possible shipping damage (crushed edges or corners, puncture holes, tears, etc.). If any damage is noted, file an appropriate claim promptly with the carrier involved and notify the WLI Distribution Center (Department 90), Quality Assurance Department, of the nature and extent of the damage, making arrangements for equipment replacement, if necessary.

2.3 UNPACKING INSTRUCTIONS

a. Using an x-acto knife, cut the tape securing the shipping carton cover.

b. Open the box and remove the instapack covering the top of the unit.

c. Remove the unit from the carton.

d. Save the shipping carton and protective padding for use when reshipping the unit.

2.4 PRE-INSTALLATION INSPECTION

a. Remove the top cover from the unit (see section 4.5).

b. Inspect the DPU chassis for damaged or loosened assemblies. Also check for loose hardware or debris. If any damage is noted, notify the WLI Distribution Center (Department 90), Quality Assurance Department, of the nature and extent of the damage, making arrangements for equipment replacement, if necessary.

c. Thoroughly clean the unit. Use a soft bristle brush and a vacuum cleaner to remove dust from the inside of the unit. Use a mild detergent and a soft cloth or sponge to remove dirt and grime from the chassis. Do not use abrasive or corrosive materials.

2.5 INITIAL SETUP

This section consists of:

a. ac input voltage selection information

b. photographs of the circuit boards giving all pertinent information concerning each board (if applicable) along with motherboard loading

c. an explanation of system interconnection cabling.

d. device address selection information.

Section 2.6 (Installation Procedure) helps link together the various information items contained in this section.

2.5.1 Motherboard AC Input Voltage Selection Jumpers

Jumper wires are provided on the motherboard for ac input voltage selection (115V or 230V). Two jumpers are installed for 115Vac and one jumper for 230Vac. Figure 2-1 shows the positions of these jumpers. Be certain the jumper configuration is correct for the supplied ac voltage (see table 2-1).

TABLE 2-1 Voltage Selection Jumpers

JUMPER	115VAC	230VAC
A	IN	OUT
B	OUT	IN
C	IN	OUT

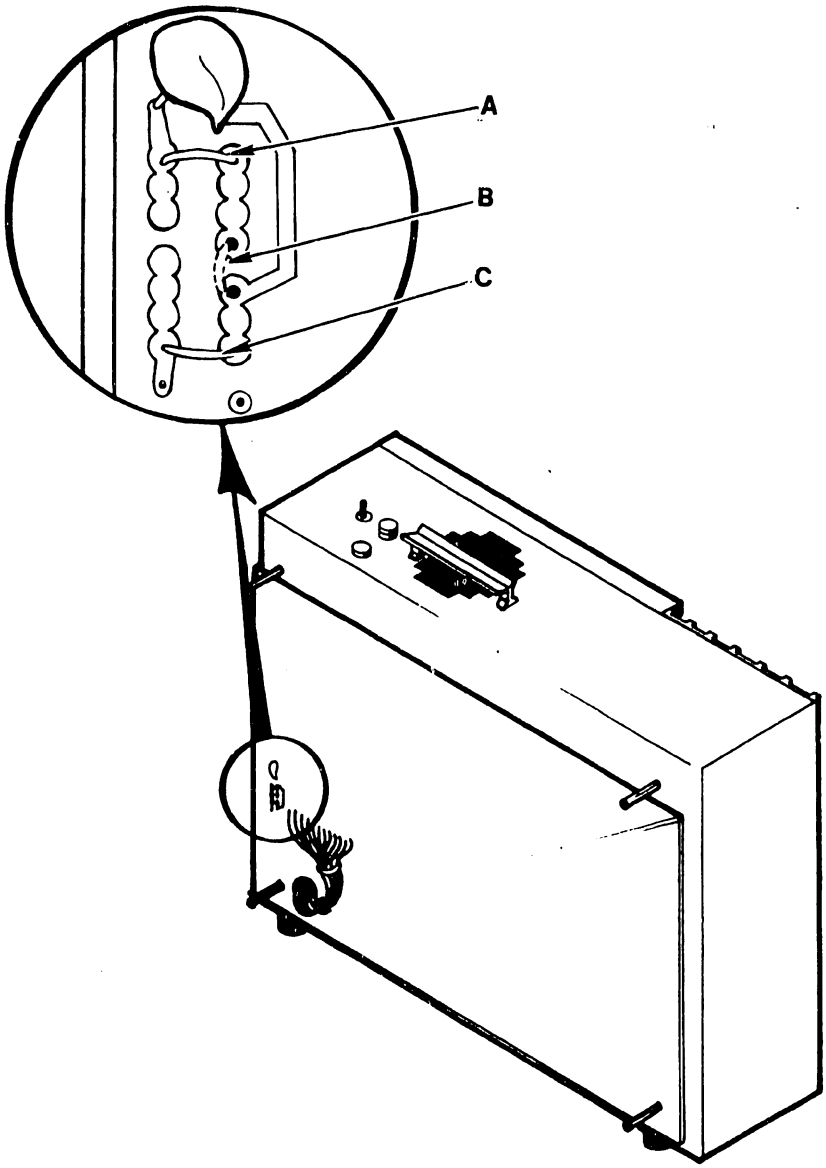


Figure 2-1. AC Input Voltage Selection Jumpers

2.5.2 Circuit Boards

Figures 2-2 through 2-9, 2-11, and 4-1 illustrate the individual printed circuit boards that comprise the 2280 DPU. The specific reference to each figure is as follows:

WL Number	Nomenclature	Figure
210-7415	Prime Circuit Board	2-2
210-7421-A	ALU/MUX Interface Board	2-3
210-7422	ECC/Device Interface Board	2-4
210-7423-A	RAM/PROM Control Board	2-5
210-7424	I/O Controller Board	2-6
210-7715	2280 MUX Disk Conntoller	2-7
210-7716	Motherboard	2-11
210-7717	2280 MUX Master	2-8
210-7718	2280 MUX Slave	2-9
210-L567	Regulator Board	4-1

2.5.3 Motherboard/PCB Layout

The locations of the 2280 DPU circuit boards in relation to the motherboard/chassis are shown in figures 2-10 and 2-11. Ensure that all fingerboard connectors are clean prior to installing the boards in the DPU. (An ink eraser should be used to clean the pins if necessary.)

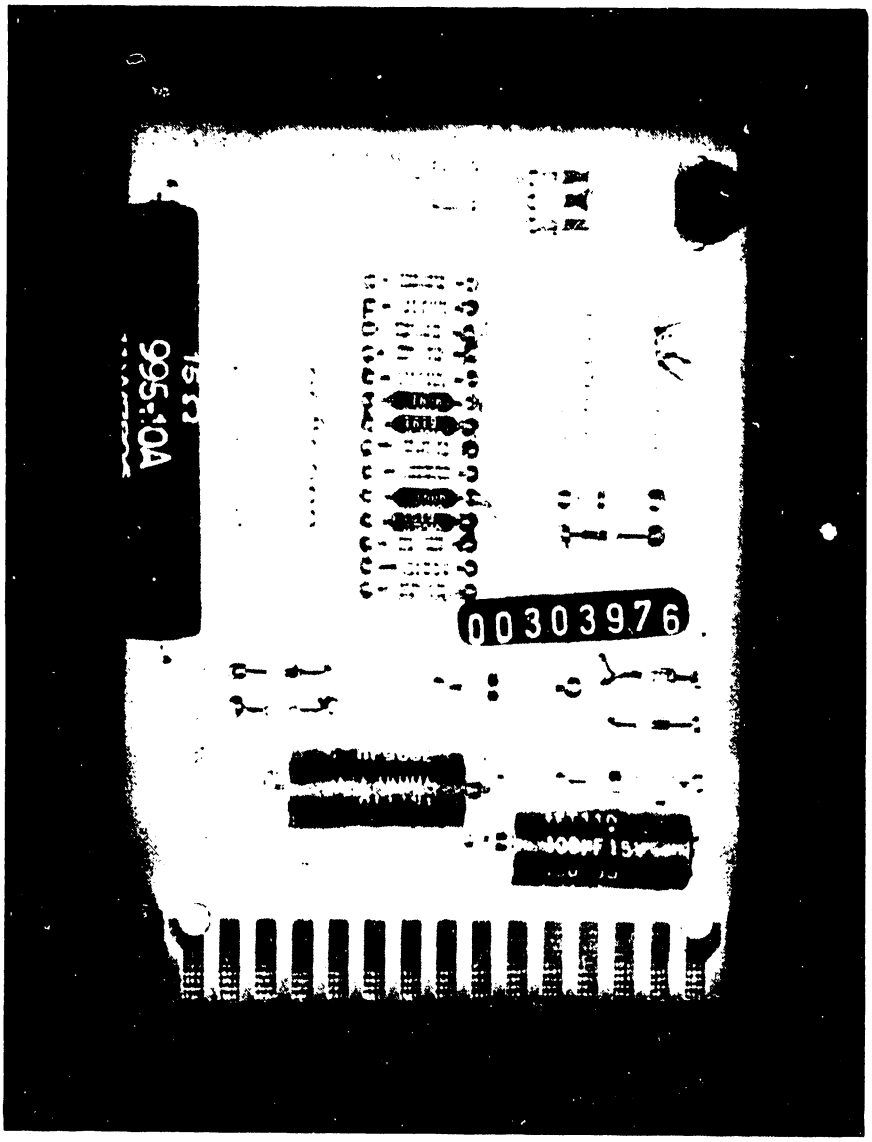


Figure 2-2. WL No. 210-7415 Prime Circuit Board

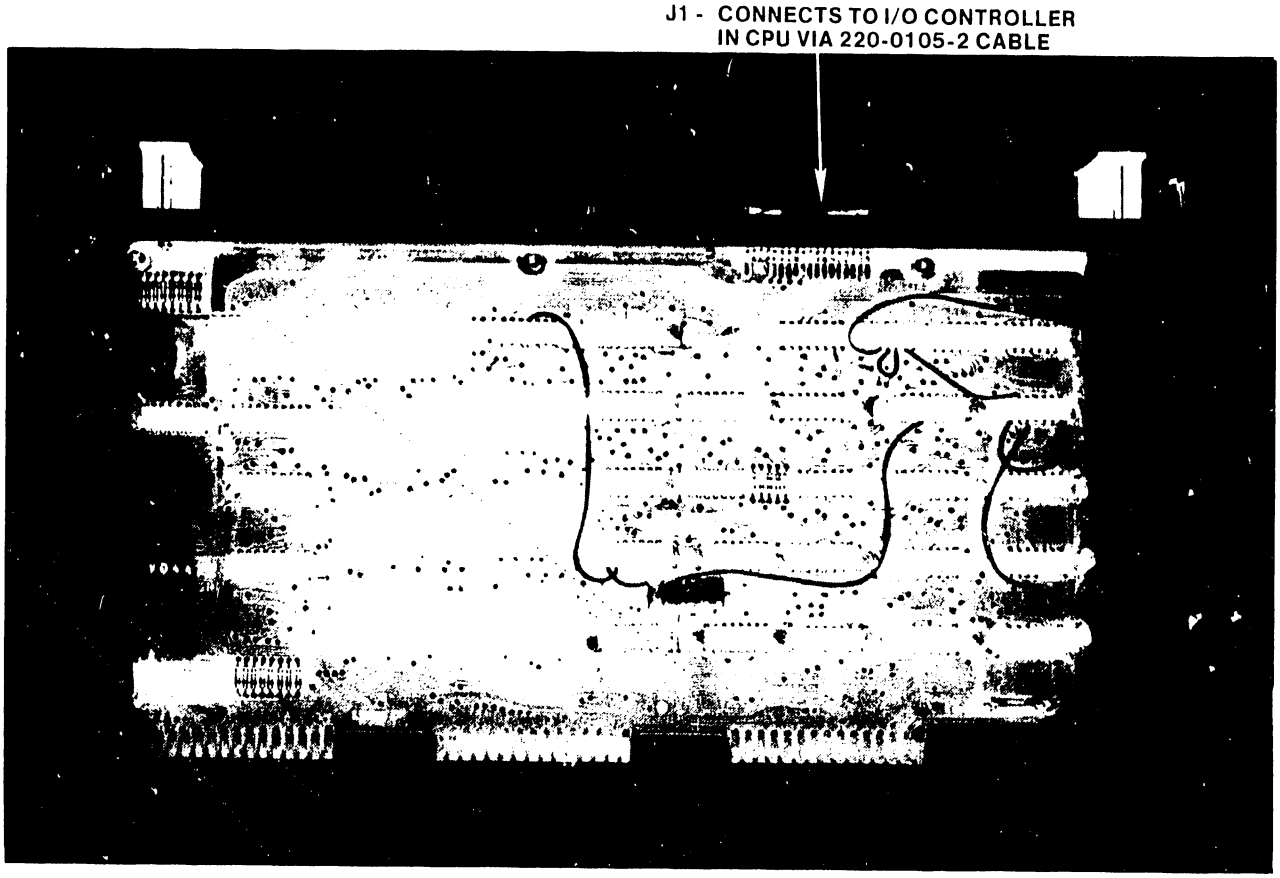
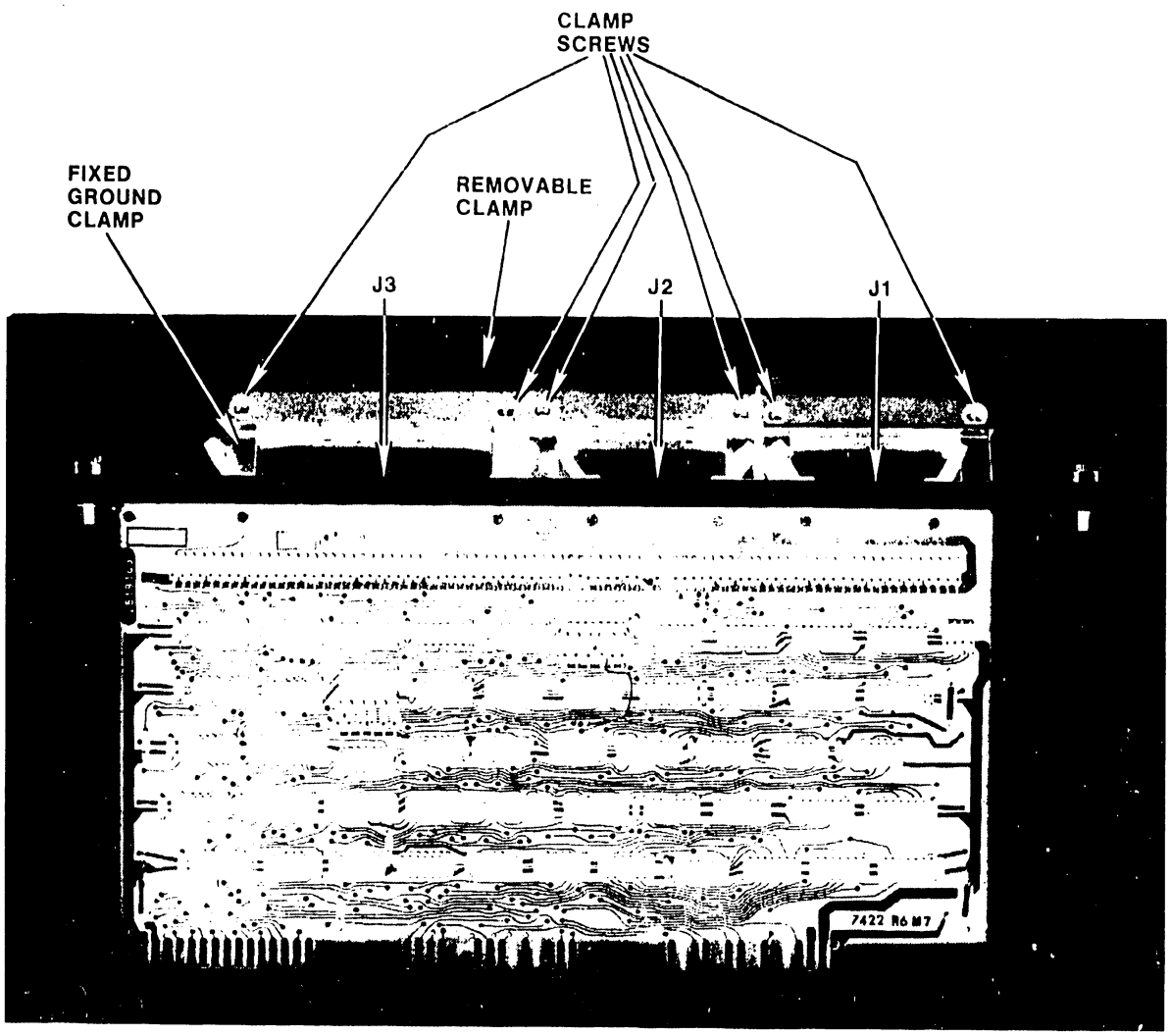


Figure 2-3. WL No. 210-7421-A ALU/MUX Interface Board



J1 AND J2 CONNECT TO PHOENIX EM2
BOARDS VIA 220-3033-36 CABLE

J3 CONNECT TO PHOENIX EM1 BOARD
VIA 220-3041-22 CABLE

Figure 2-4. WL No. 210-7422 ECC/Device Interface Board

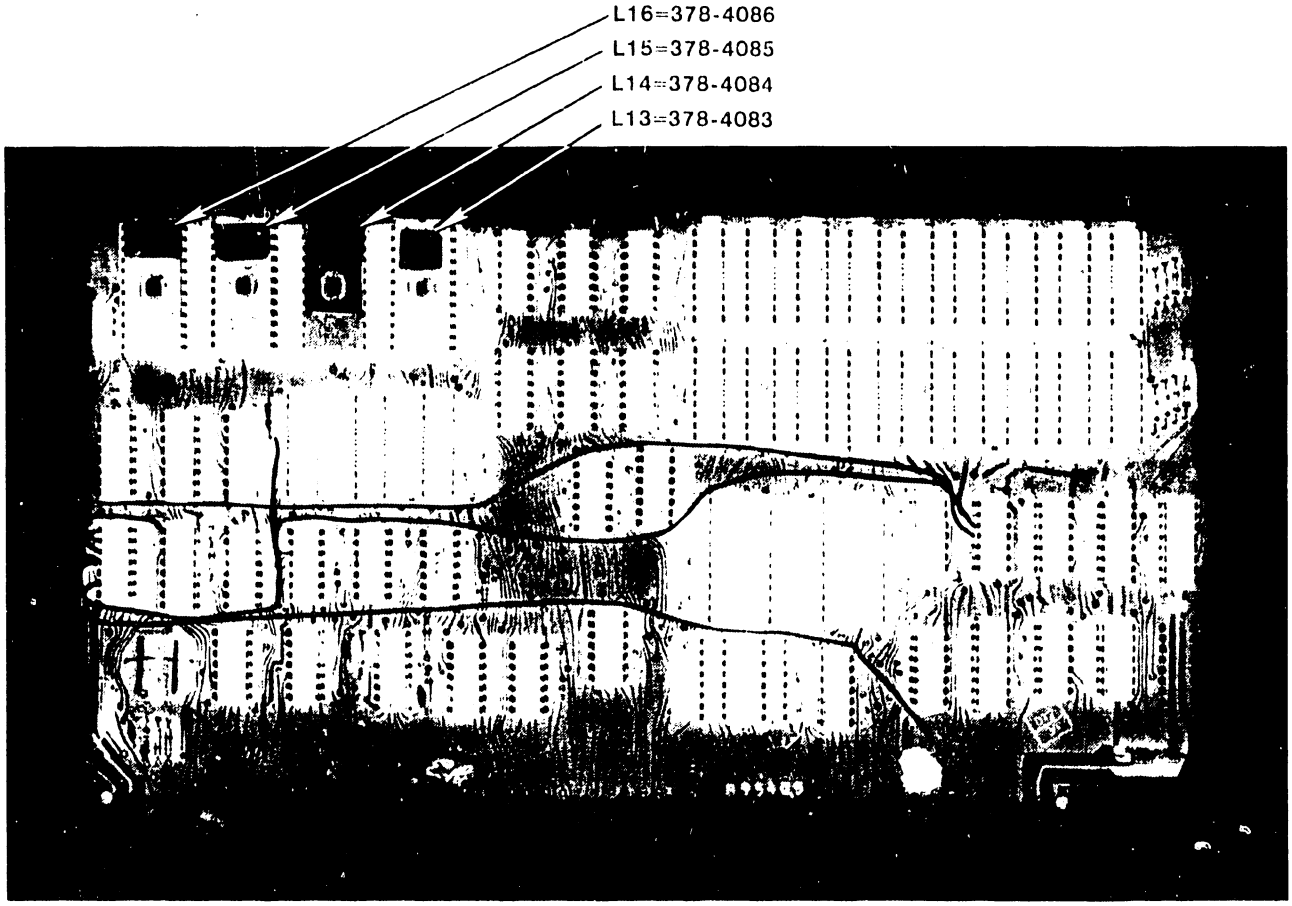


Figure 2-5. WL No. 210-7423-A RAM/PROM Control Board

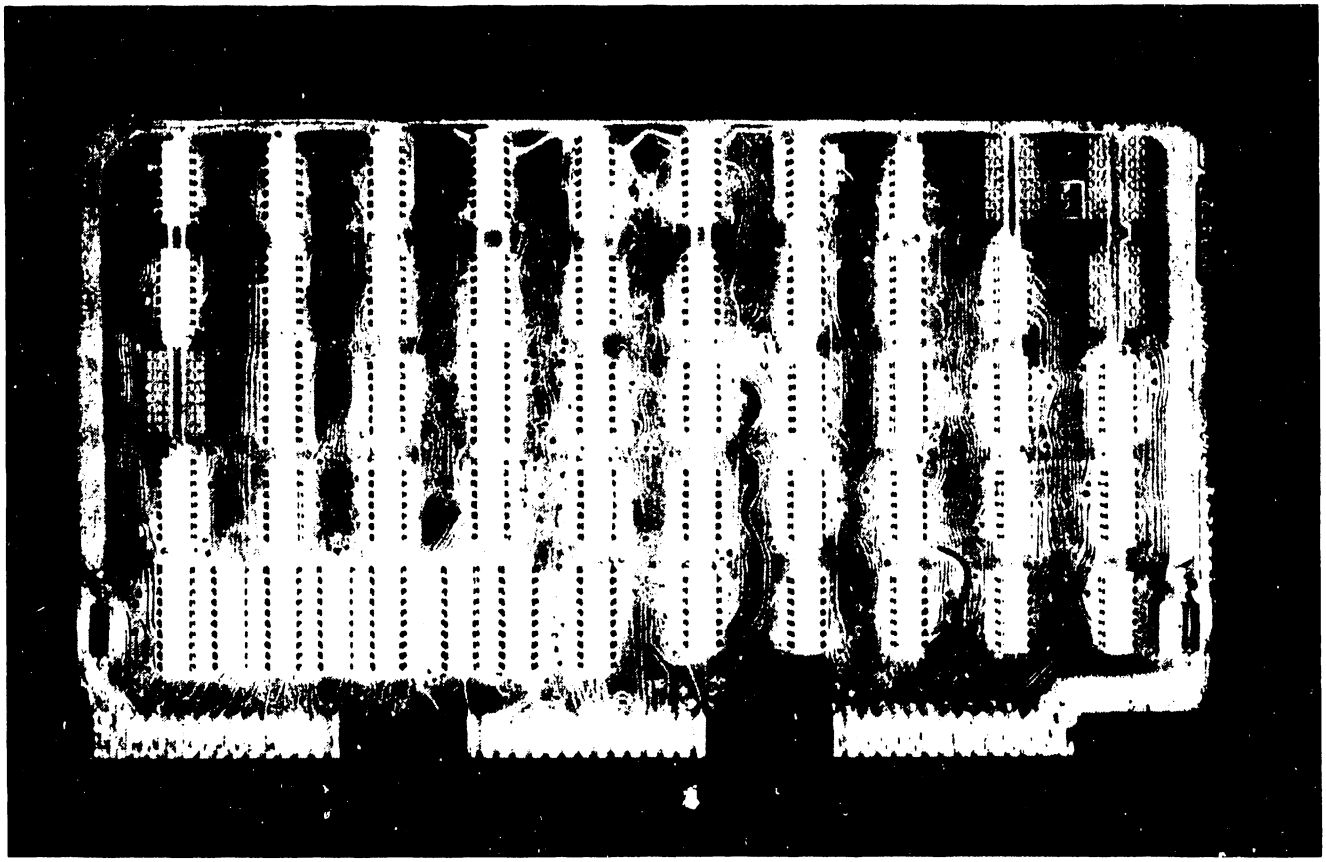


Figure 2-6. WL No. 210-7424 I/O Controller Board

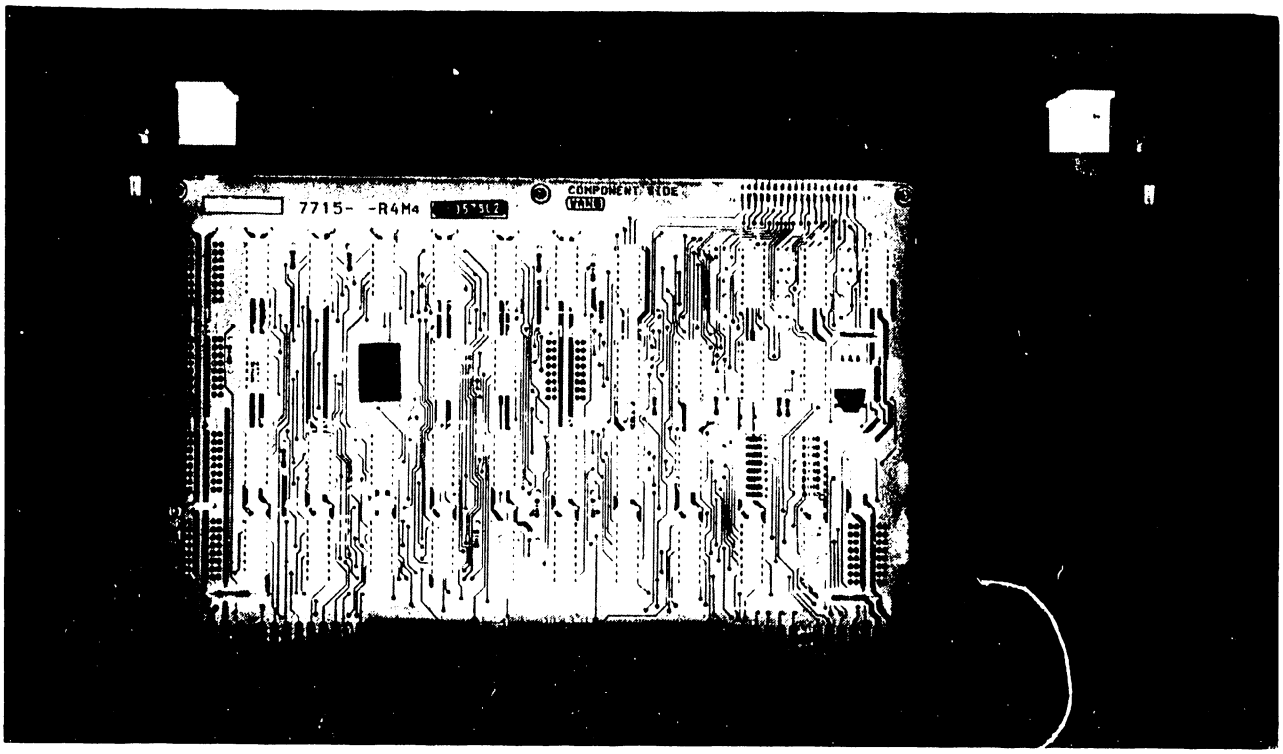
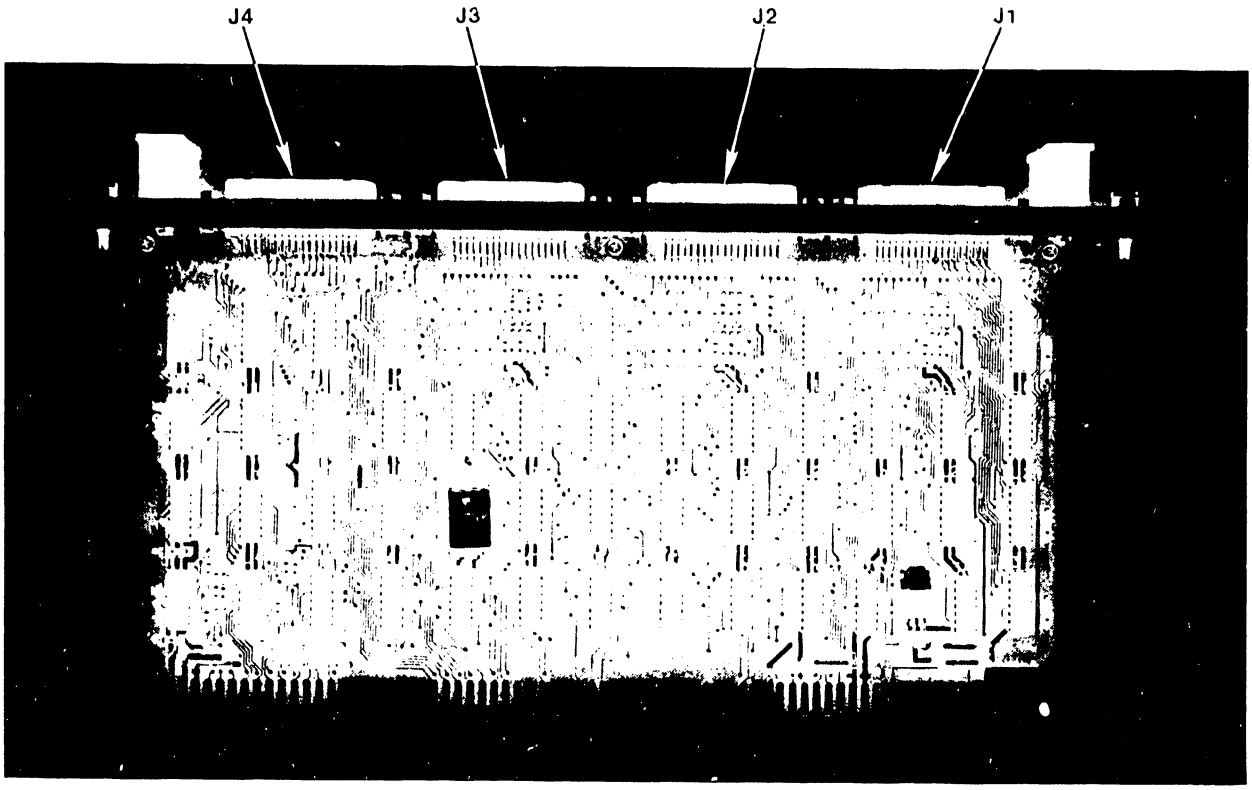
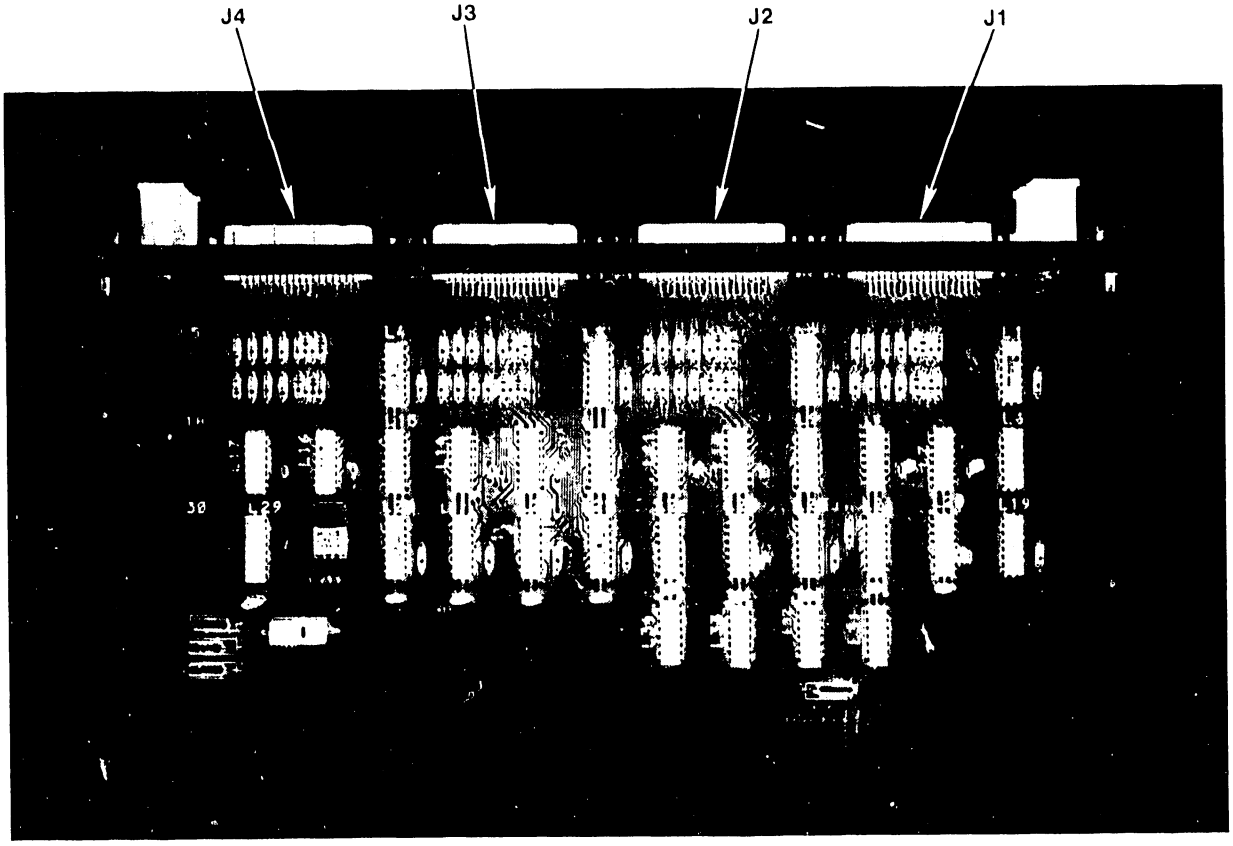


Figure 2-7. WL No. 210-7715 2280 MUX Disk Controller Board



J1 THROUGH J4 ARE EACH CONNECTED
TO THE 7715 PCB IN THEIR RESPECTIVE
CPU VIA 220-0365 CABLE

Figure 2-8. WL No. 210-7717 2280 MUX Master Board



1. J1,J2,AND J3 ARE EACH CONNECTED TO THE 7715 PCB IN THEIR RESPECTIVE CPU VIA 220-0365 CABLE
2. J4 IS CONNECTED TO THE 7421 PCB IN ITS RESPECTIVE CPU VIA 220-0360 CABLE

Figure 2-9. WL No. 210-7718 MUX Slave Board

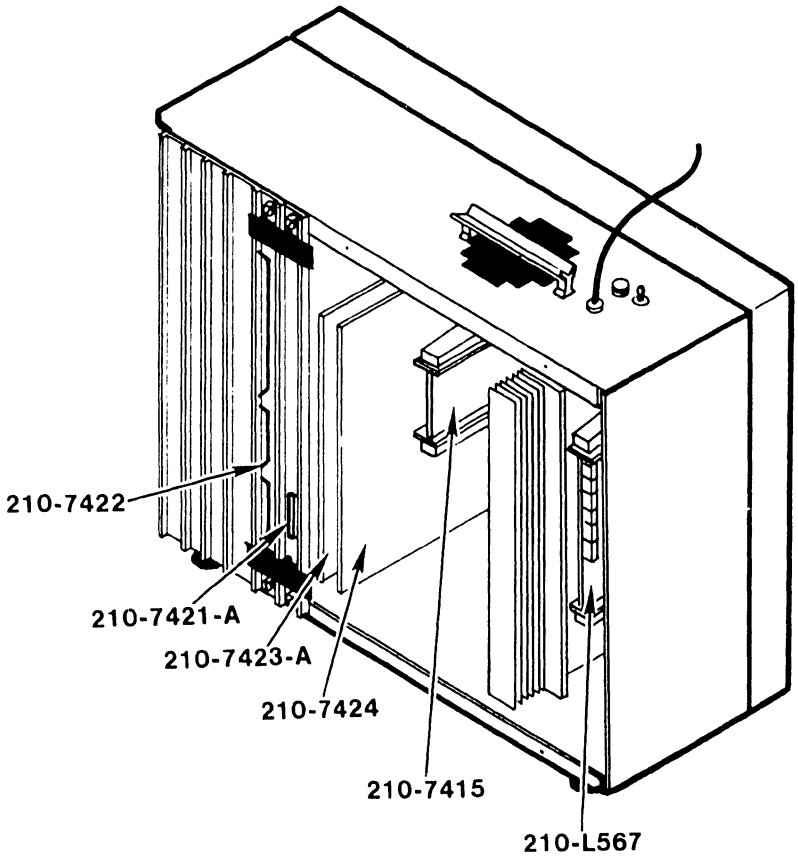


Figure 2-10. Circuit Board Loading

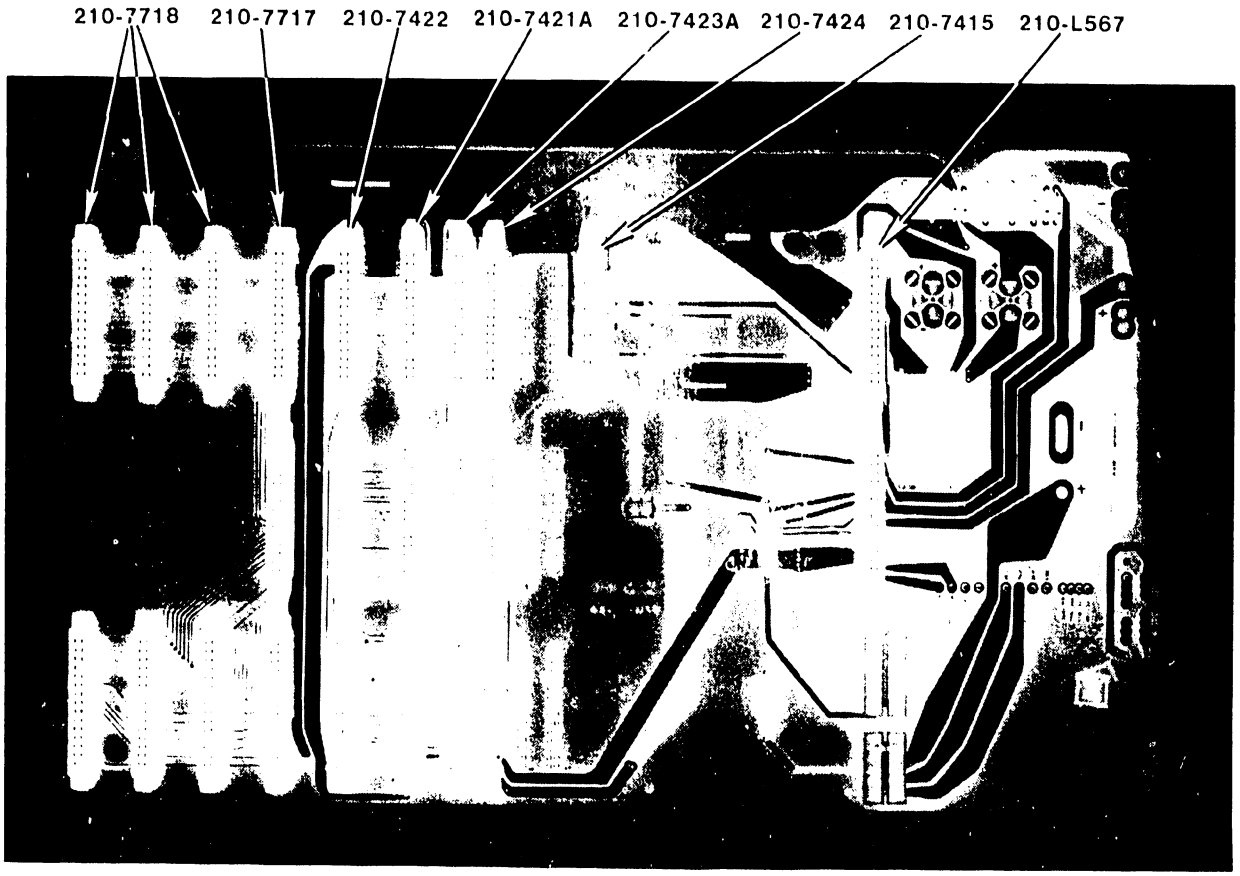


Figure 2-11. WL No. 210-7716 Motherboard

2.5.4 Input/Output Cable Connections (see figure 2-12)

Refer to documentation category 3105 for Phoenix disk drive connection locations.

CAUTION:

> Since the "A" the "B" cables are not keyed, carefully check the routing of the cables (following steps) to ensure that pin 1 on the drive connector receiving the cable connects to pin 1 on the appropriate DPU interface connector. Pin 1 of the cables is designated on the connectors of the cable by an embossed triangle. Pin 1 is also recognized by the black strand of the ribbon cable that is attached to that pin.

A 36-pin I/O cable (WL No. 220-0365) connects J1 on the 210-7421-A board in the DPU (see figure 2-3) to the appropriate jack on the I/O controller in the CPU.

A 60-pin "A" cable (WL No. 220-3041-22) connects J3 on the 210-7422 board in the DPU (see figure 2-4) to J1 on I/O logic board EM1 in the Phoenix drive.

A 26-pin "B" cable (WL No. 220-3033-36) connects J2 (Device No. 1 connector) on the 210-7422 board in the DPU (see figure 2-4) to J3 on Control/Mux logic board EM2 in the Phoenix drive.

If only one disk drive is connected to the DPU, a terminator board (WL No. 726-5790) is installed in J2 on I/O logic board EM1 in the Phoenix drive; otherwise, the terminator is installed in the same location in the second drive.

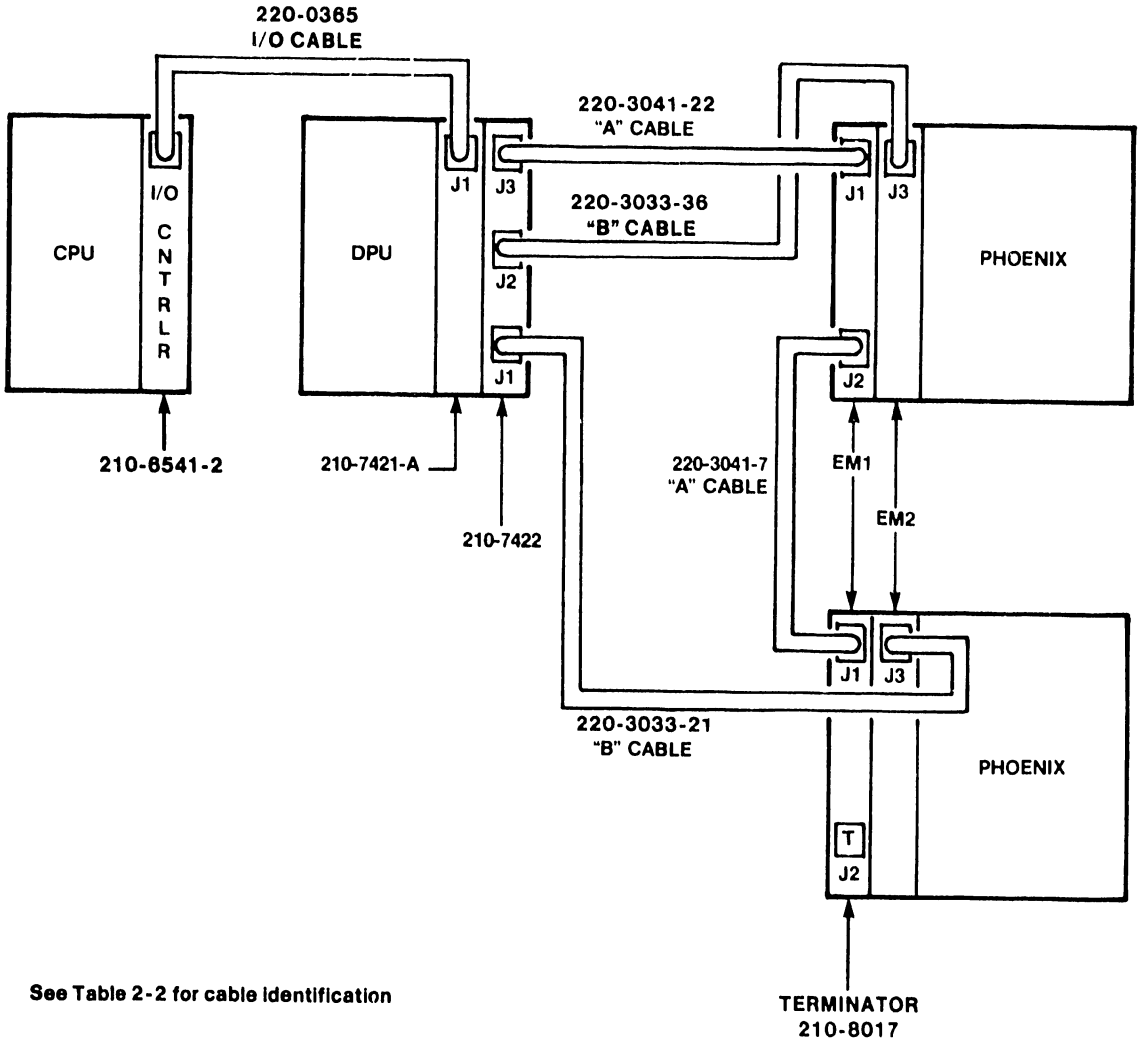
If two disk drives are connected to the DPU, the following cable connections are also required.

A 60-pin "A" cable (WL No. 220-3041-7) connects J2 on the I/O logic board EM1 in the first Phoenix drive to J1 on I/O logic board EM1 in the second Phoenix drive.

A 26-pin "B" cable (WL No. 220-3033-21) connects J1 (Device No. 2 connector) on the 210-7422 board in the DPU (see figure 2-4) to J3 on Control/Mux logic board EM2 in the second Phoenix drive.

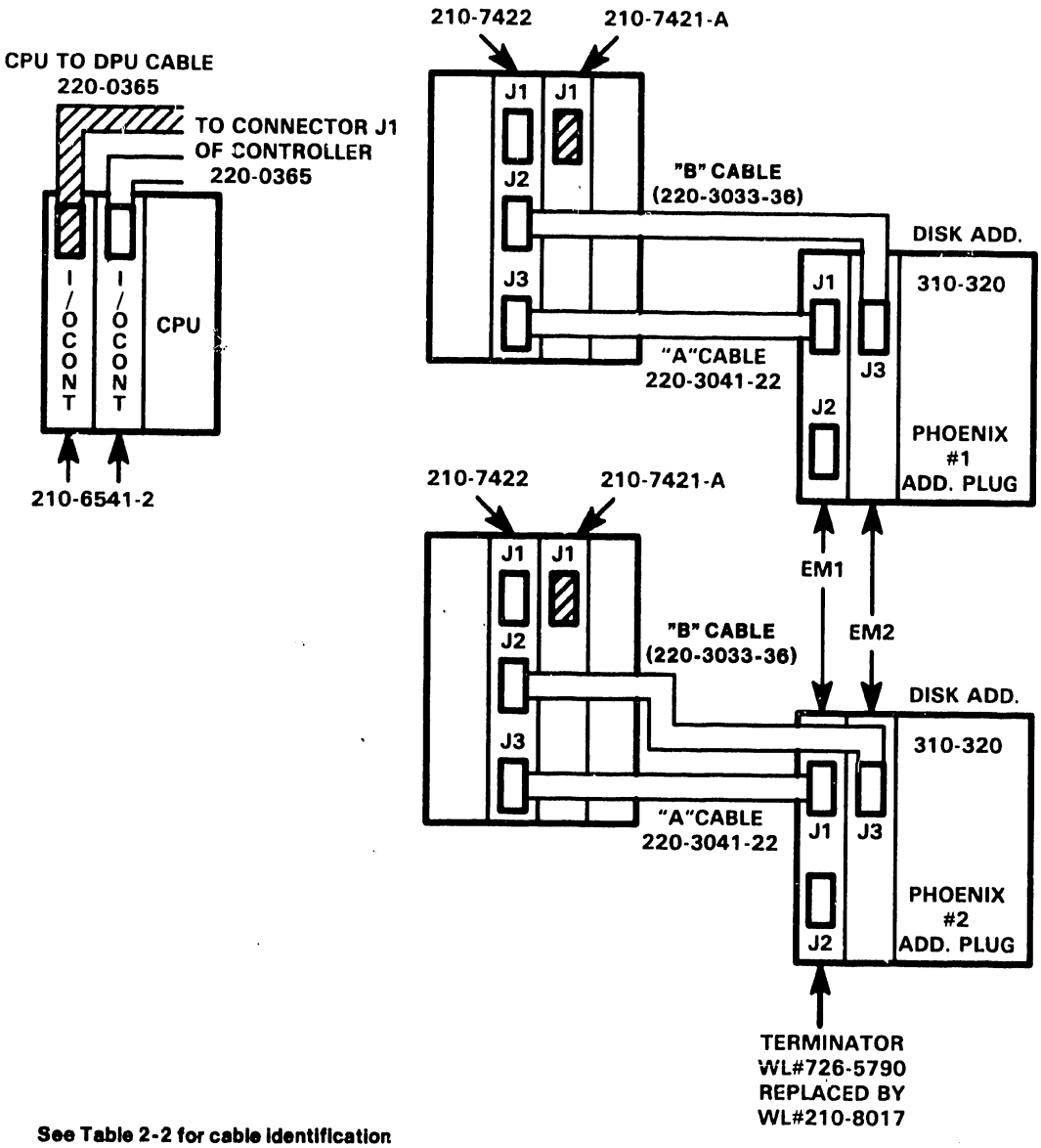
2.5.5 Device Address Plug (on Phoenix disk drive)

A device address plug must be inserted into the socket at the left of the START/STOP indicator switch on the front panel of each disk drive. The address plug must corresspond with the device number assigned to the 210-7422 connector receiving the "B" cable from the given drive. That is, install a "1" device address plug in the disk drive whose "B" cable is attached to connector J2(Device No. 1) on the 210-7422 board in the DPU, and install a "2" plug in the drive whose "B" cable is attached to connector J1 (Device No. 2) on the 210-7422 board.



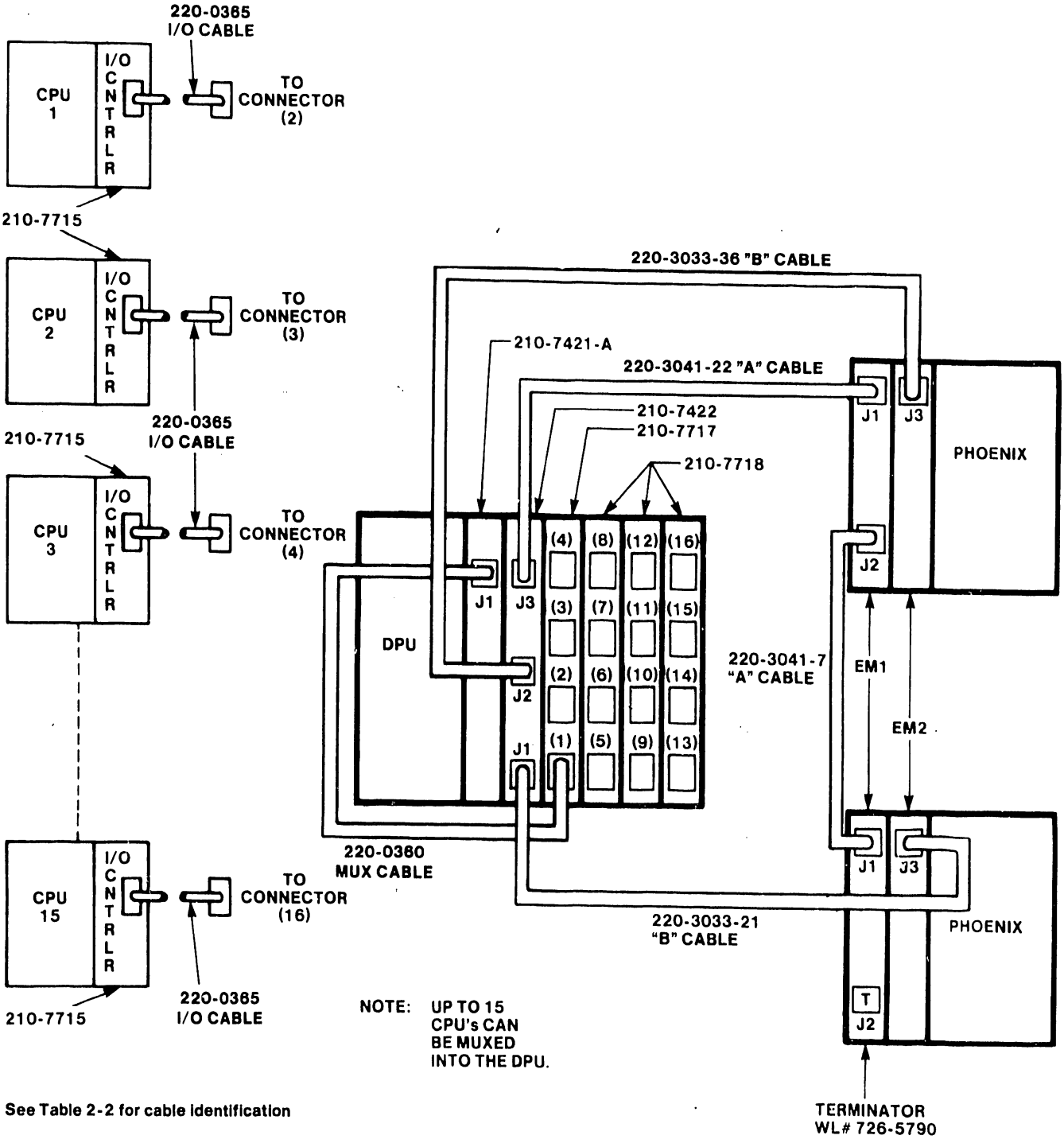
See Table 2-2 for cable identification

FIGURE 2-12 SYSTEM INTERCONNECTION DIAGRAM WITH ONE DPU



See Table 2-2 for cable identification

FIGURE 2-12A SYSTEM INTERCONNECTION DIAGRAM WITH TWO DPU'S



See Table 2-2 for cable identification

FIGURE 2-13 MUX SYSTEM INTERCONNECTION DIAGRAM WITH ONE DPU

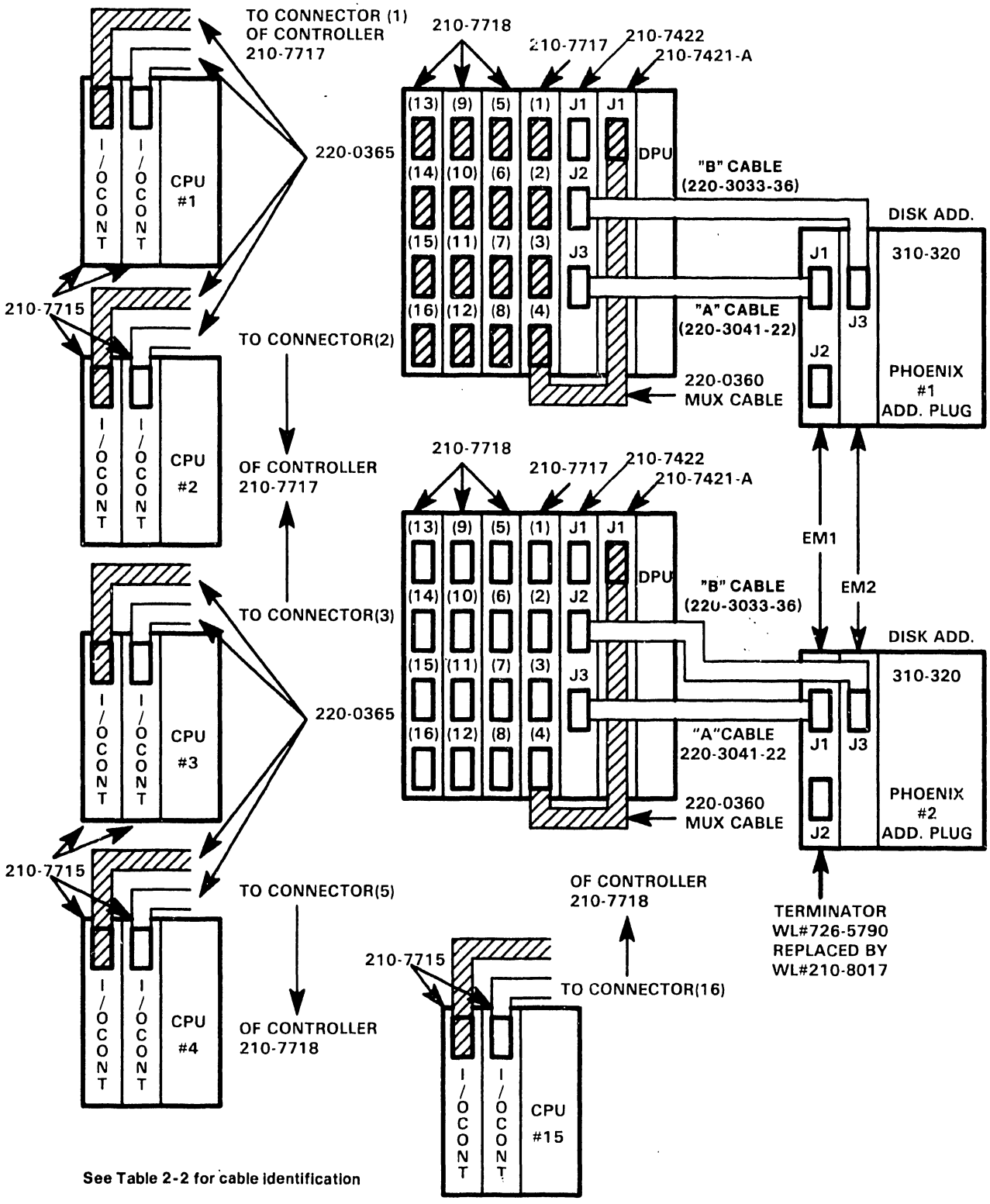


FIGURE 2-13A SYSTEM INTERCONNECTION DIAGRAM WITH TWO DPU'S

TABLE 2-2. CABLES AND TERMINATOR PART NUMBERS

CABLE NAMES	CONNECTS	STANDARD	SPECIAL
	FIGURES 2-12 & 2-12A		
CPU to DPU Cable	CPU I/O Controller to J1 of 210-7421-A	220-0365 9 ft	N/A
"A" Cable	J3 of DPU's 210-7422 to J1 of Phoenix #1	220-3041-22	N/A
"A" Cable	J2 of Phoenix #1 to J1 of Phoenix #2	N/A	220-3041-7
"B" Cable	J1 of 210-7422 to J3 of EM2 Phoenix #2	220-3308-21	220-3033-36*
"B" Cable	J2 of DPU's 210-7422 to J3 of Phoenix #1	220-3033-36	N/A
Terminator	J2 EM1 Phoenix #2	726-5790	210-8017
	FIGURES 2-13 & 2-13A		
CPU to DPU Cable	210-7715 to either 210-7717 or 210-7718	220-0365 9 ft	
"A" Cable	DPU's J3 to Phoenix's J1	220-3041-22	N/A
"A" Cable	Phoenix #1's J2 to Phoenix #2's J1	N/A	220-3041-7
"B" Cable	J1 of 210-7422 to J3 EM2 Phoenix #2	220-3308-21	220-3033-36*
"B" Cable	J2 of 210-7422 to Phoenix #1's J3	220-3033-36	N/A
Terminator	J2 EM1 Phoenix #2	726-5790	210-8017

*For Daisy Chain Configuration Only.

2.5.6 Shielded Cable Connections

The ribbon cable connecting the 210-7422 PCB to the disk drive is copper clad for good sheilding. To ensure proper contact, install the DPU cable clamp at the 210-7422 PCB as follows:

a. Loosen and remove the clamp screws that secure the two halves of the DPU cable clamp to the 210-7422 PCB (see figure 2-4).

b. Remove the removable half of the cable clamp from the 210-7422 board.

c. Connect the ribbon cable to the fixed half of the DPU cable clamp by inserting ther grounding clip (only) between the copper shield and the outer cable jacket of the ribbon cable (see figure 2-14, A).

d. Push the ribbon cable onto the clamp; fully inserting the grounding clip (see figure 2-14, B).

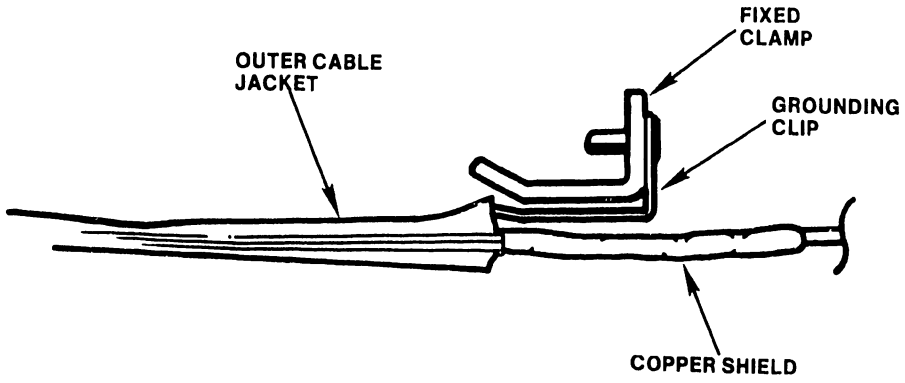
e. Install the removable clamp in the same manner (see figure 2-14, C).

f. Assemble and secure the two halves of the clamp: tighten the two clamp screws evenly, ensuring that the copper shield remains in good contact with both grounding clips (see figure 2-14, D).

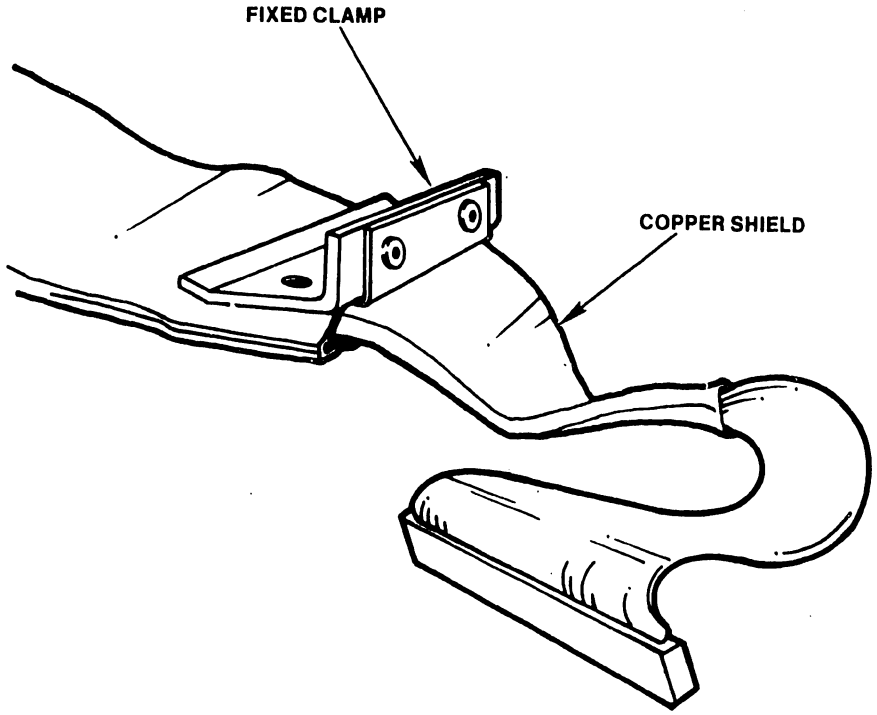
CAUTION

Do not overtighten the clamp screws which secure the two halves of the clamp; otherwise, damage to the cable may result.

g. All three ribbon cables are secure in the same fashion (refer to figure 2-14, E).



A



B

Figure 2-14. Shielded Cable Installation (Sheet 1 of 3)

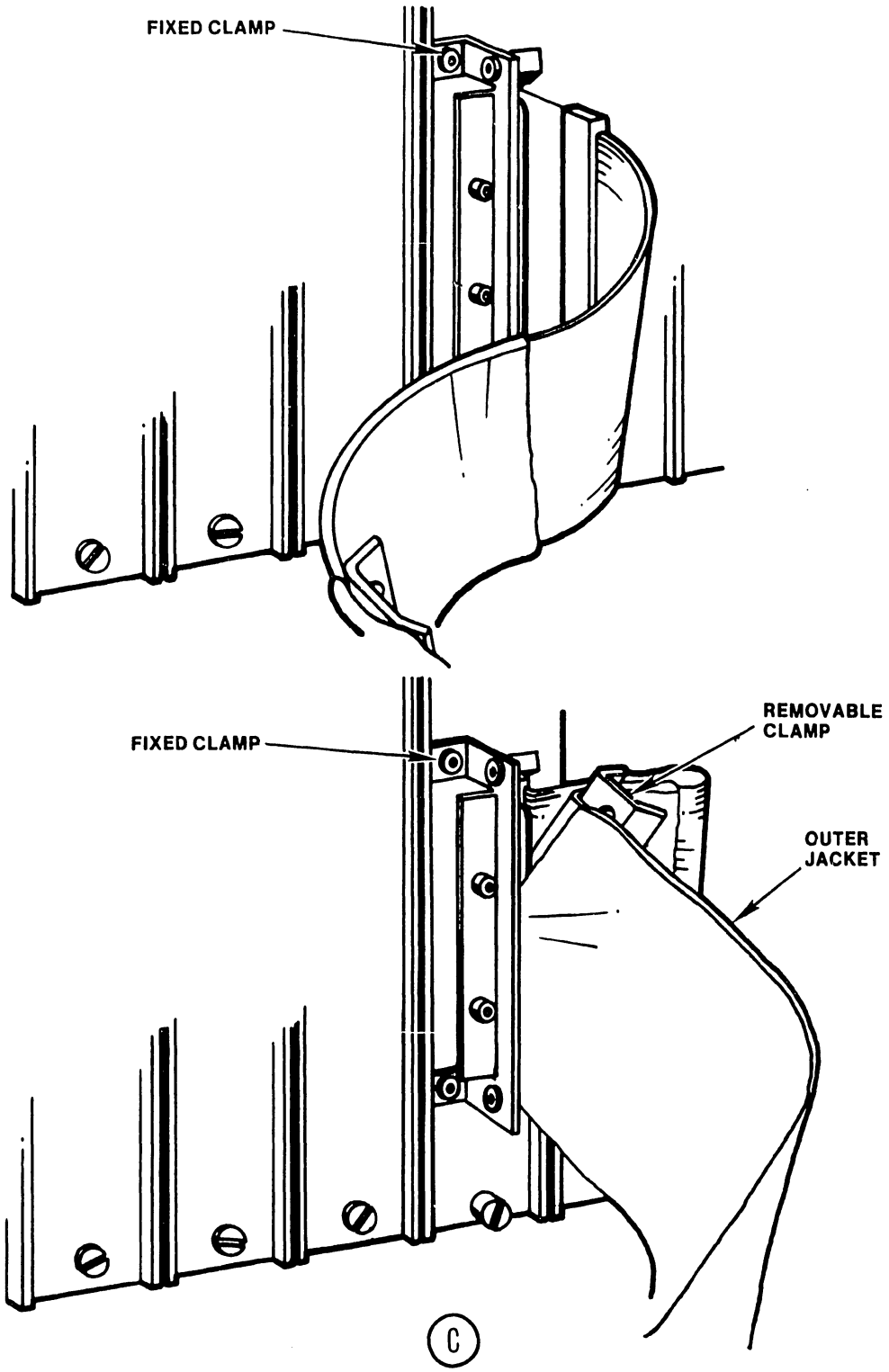


Figure 2-14. Shielded Cable Installation (Sheet 2 of 3)

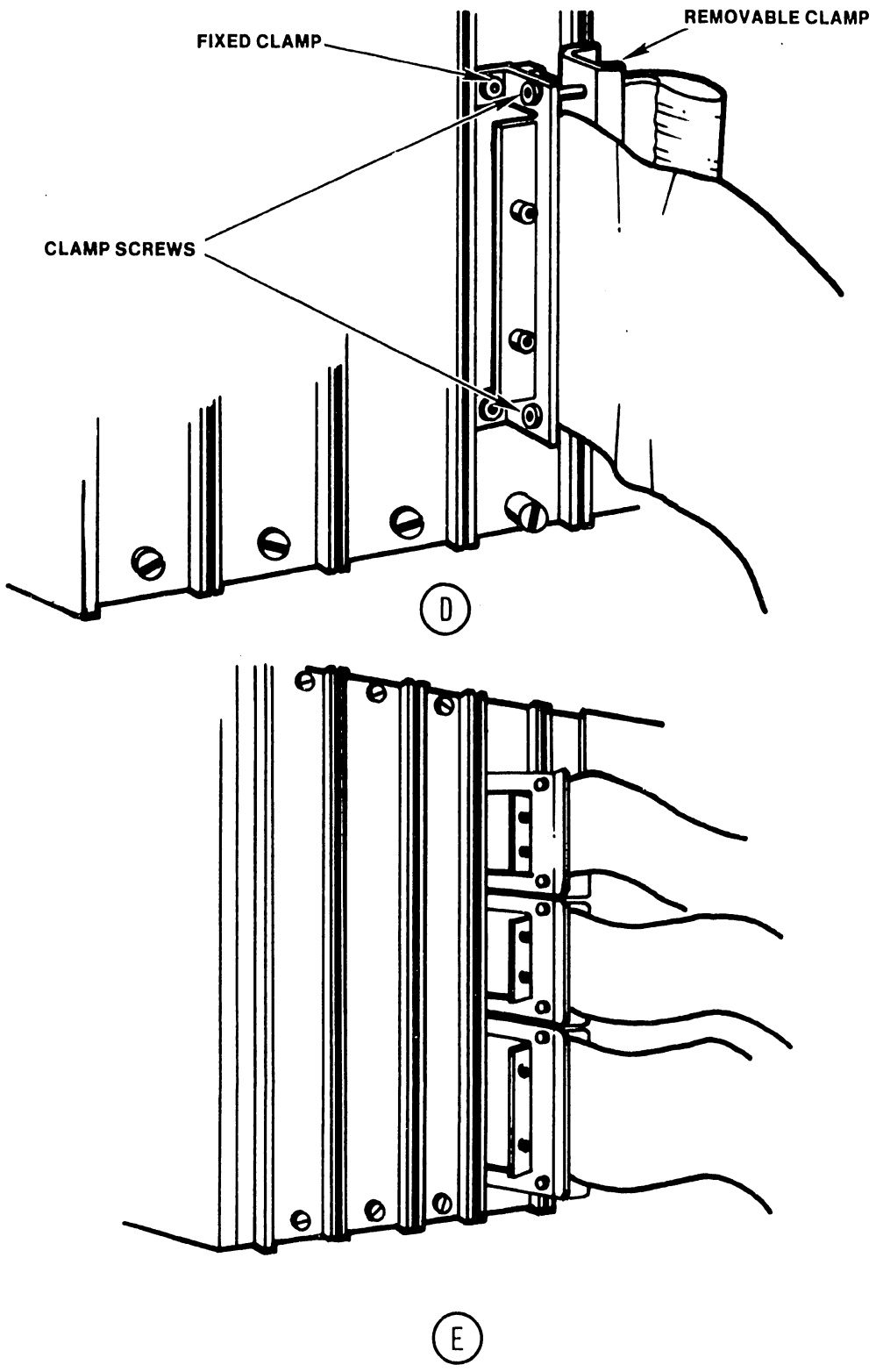


Figure 2-14. Shielded Cable Installation (Sheet 3 of 3)

2.6 INSTALLATION PROCEDURE

a. Ensure that the ac input voltage selection jumpers on the motherboard are positioned correctly for the supplied voltage (see section 2.5.1).

b. Check to see that all circuit boards are properly seated in the appropriate locations (see section 2.5.3).

c. Attach all system interconnection cables (see section 2.5.4) ensuring that the cable shields are properly connected (see section 2.5.6).

d. Check to see that the appropriate device address plug is in the disk drive (see section 2.5.5).

e. Be certain the ac power switch is OFF, and then plug the ac power cord in.

f. Set the ac power switch ON, then check and adjust, if necessary, all power supply voltages (see section 4.4).

g. Run all appropriate 2280 disk diagnostics to confirm proper operation of the system (see section 4.2).

h. Replace the unit cover(s) and place the DPU in the disk drive stand as shown in figure 2-15.

i. The system is now ready for customer use.

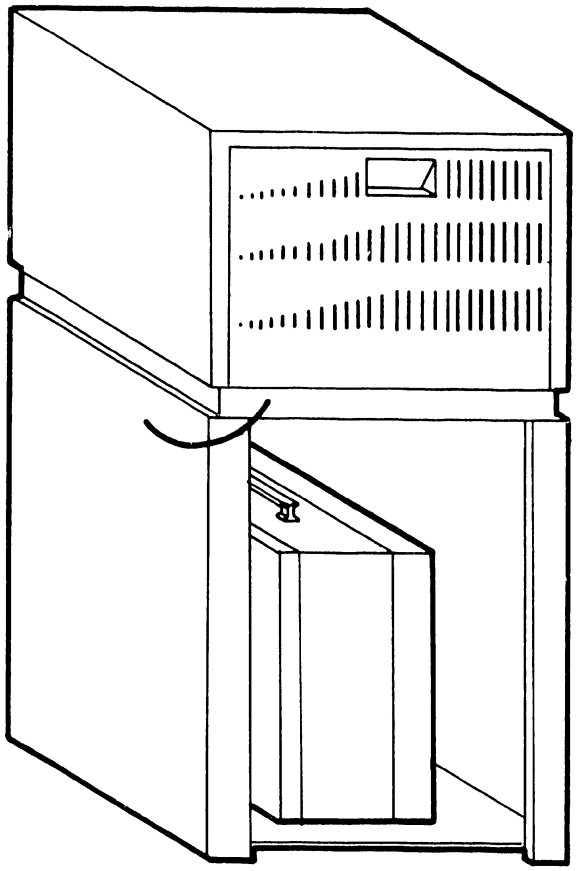


Figure 2-15. DPU Mounted In Bottom Of Stand

SECTION 3 OPERATION

SECTION 3

OPERATION

For information concerning operation/programming of the 2280 Disk System (Phoenix drive and DPU) refer to Wang BASIC-2 Disk Reference Manual, WL No. 700-4081F (III.A.0), and Model 2280 Disk Drive User Manual, WL No. 700-5216 (III.A.10).

SECTION 4 MAINT-ENANCE

SECTION 4

MAINTENANCE

4.1 RECOMMENDED TEST EQUIPMENT/TOOL LIST

a. Digital voltmeter--(acceptable type/equivalent: Fluke No. 8000A).

b. Oscilloscope--(acceptable type/equivalent: Tektronix No. 465).

c. Heavy duty screw driver with insulated handle (WL No. 726-9411).

d. Small slot screwdriver with insulated handle (WL No. 726-9406).

4.2 DIAGNOSTICS

Refer to documentation category IV.C.1 for information concerning disk diagnostics.

4.3 PREVENTIVE MAINTENANCE

To ensure trouble-free operation, the 2280 DPU must have periodic preventive maintenance, consisting of inspection, cleaning, and adjustments. The following preventive maintenance routine should be performed once every six months. This maintenance schedule assumes a clean operating environment and a normal operating time during the standard five-day, 40-hour weeks. A dusty environment or any substantial increase in system operating time will require that the preventive maintenance be scheduled at closer intervals. In addition, this preventive maintenance routine should be performed during each unscheduled service call.

a. Check the unit cooling fan for proper operation.

b. Set the DPU ac power switch OFF.

c. Remove the screws securing the top cover and remove the cover (see Section 4.5).

d. Remove each circuit board from the DPU and clean the finger connectors with an ink eraser.

e. Check to see that all circuit boards are at the latest electronic revision (E-REV). Refer to Mandatory Update Bulletin in documentation category I.B.0 for ECO implementation procedures.

f. Use a soft-bristle brush and a vacuum cleaner (WL No. 726-9518) to remove dust from the inside of the DPU.

g. Reinstall all circuit boards in the appropriate locations (see section 2.5.3).

h. Set the ac power switch ON.

NOTES:

1. Before making any adjustment, be certain the measuring instrument is properly calibrated.

2. Electrical adjustments should be performed only when the parameter measured is out of tolerance. Do not make electrical adjustments indiscriminately.

i. Check and adjust, if necessary, the DPU power supply voltages according to the procedure given in section 4.4.

j. Run the 2280 disk diagnostics (see section 4.2) to confirm proper operation of the DPU and then replace the top cover.

k. Use a mild detergent and a soft cloth or sponge to remove dirt and grime from the DPU chassis. Do not use abrasive or corrosive chemicals.

4.4 POWER SUPPLY VOLTAGE ADJUSTMENT

a. Set the ac power switch OFF.

b. Remove the top cover of the unit. (see section 4.5).

c. Set the ac power switch ON.

d. Check the dc voltages with a digital voltmeter for the values listed in table 4-1. (The test points for monitoring the voltages are also given in table 4-1.) Adjust the trimpots where indicated in figure 4-1 to obtain correct voltage levels where necessary.

NOTE:

Be sure to connect the common lead of the voltmeter to a ±0V connection, NOT the chassis or I/O controller rail. Erroneous readings will result if chassis ground is used as the voltmeter reference. The oscilloscope ground clip should also be connected to ±0V, NOT chassis ground.

e. Using an oscilloscope with the vertical sensitivity set at 1V/cm and a X1 probe, measure the ripple at the points indicated in table 4-1. AC ripple must not exceed the limits specified.

TABLE 4-1 DC VOLTAGE SPECIFICATIONS

VOLTAGE	L567 TEST POINT	L567 ADJUST	LIMITS	
			VOLTAGE	RIPPLE
+5VRM	Pin 1_1	R17	+4.90 to +5.10	15 mv p-p
+5VRL	Pin 2_1	R2	+4.90 to +5.10	15 mv p-p
+8VR	Pin 12_1	R13	+8.50 to +8.80	20 mv p-p
+12VR	Pin 15_1	R30	+11.80 to +12.20	15 mv p-p
-12VR	Pin 5_2	R34	-11.80 to -12.20	15 mv p-p
-15VR	Pin 6_2	R40	-14.80 to -15.20	25 mv p-p

4.5 REMOVAL/REPLACEMENT PROCEDURES

4.5.1 Top Cover

Remove the four screws that secure the top cover (see figure 4-2) and remove the cover from the unit.

4.5.2 Bottom Cover

Remove the four screws that secure the bottom cover (see figure 4-3) and remove the cover from the unit.

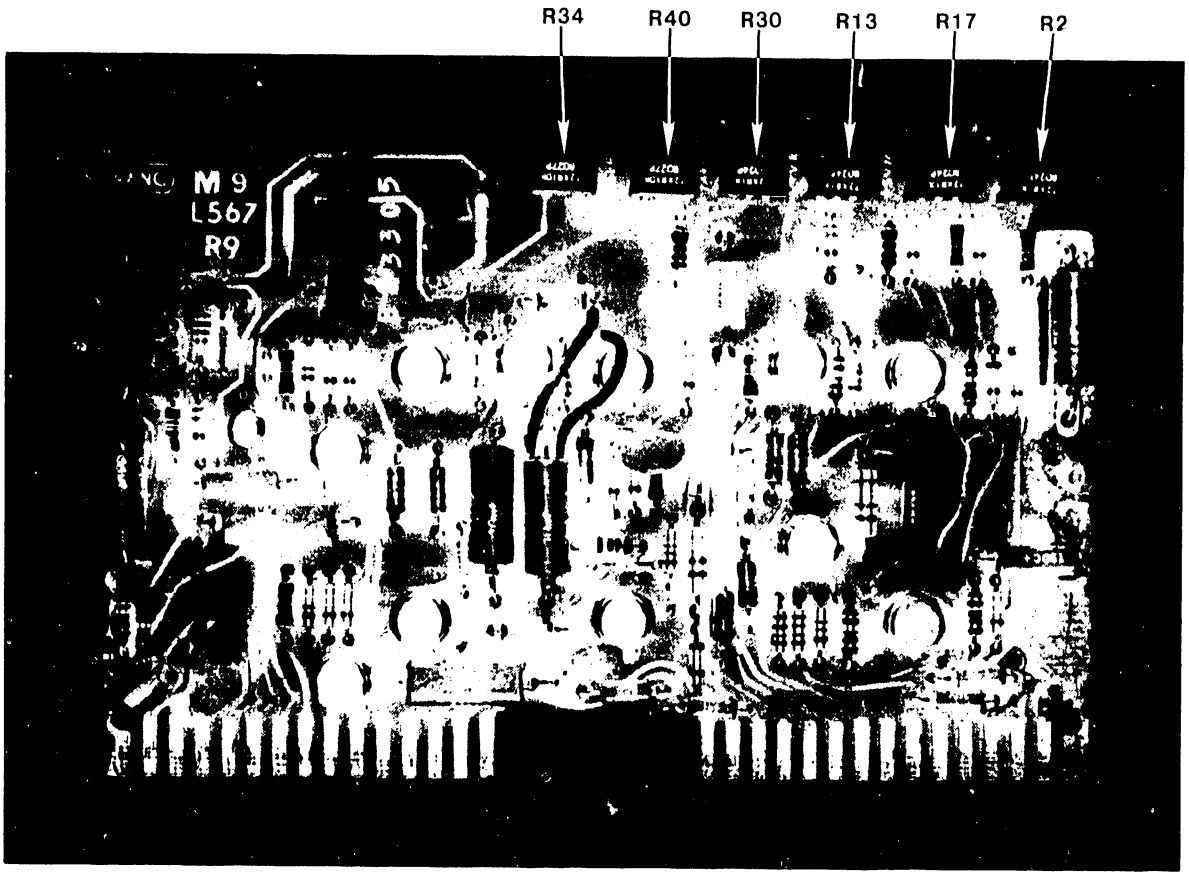


Figure 4-1. WL No. 210-L567 Regulator Board Potentiometers

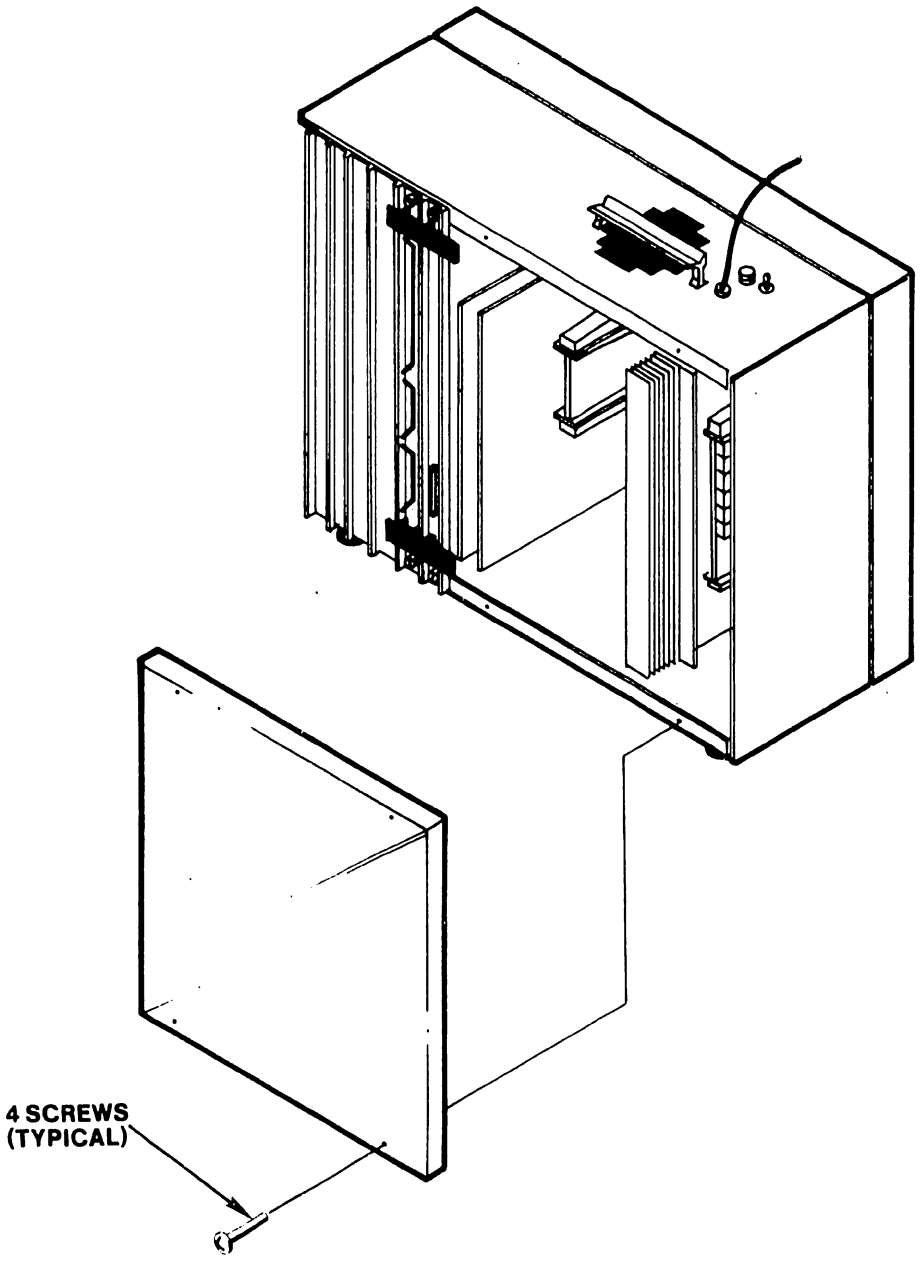


Figure 4-2. Top Cover Removal

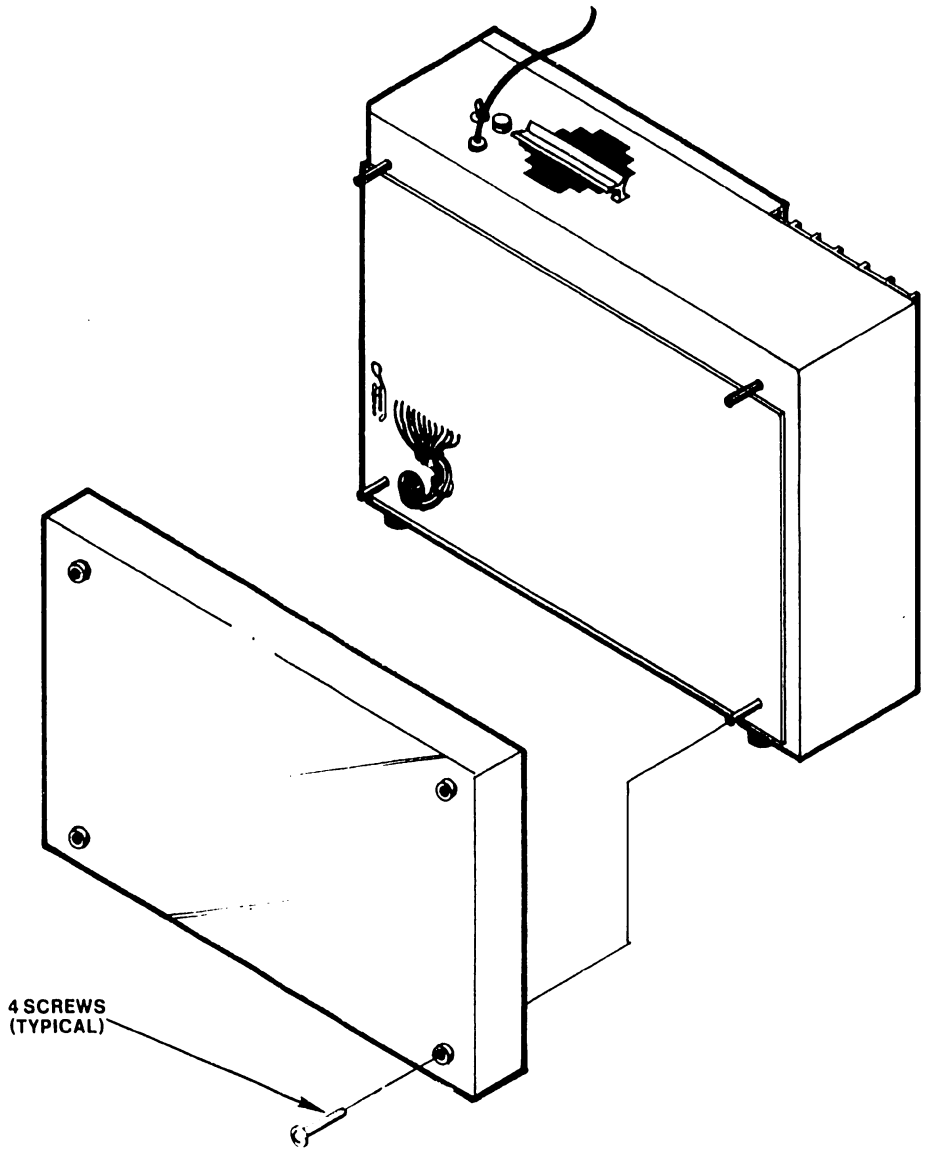


Figure 4-3. Bottom Cover Removal

4.6 DISK ERROR CODES

ERR I90 -- Disk Hardware Error

The disk did not properly respond to the system at the beginning of a read or write operation.

ERR I91 -- Disk Hardware Error

The disk is not in a "ready" condition.

ERR I92 -- Timeout Error

The disk did not respond to the system in the proper amount of time during a read or write operation.

ERR I93 -- Format Error

The disk media is not properly formatted.

ERR I94 -- Format Key Engaged

Not applicable for the 2280 DPU.

ERR I95 -- Seek Error

The specified sector could not be found on the disk.

ERR I96 -- Cyclic Redundancy Check Error

The data in a sector was read (or written) incorrectly.

ERR I97 -- Longitudinal Redundancy Error

The data was not transmitted to the CPU correctly during a read operation.

ERR I98 -- Illegal Sector Address

The sector address is greater than that allowed for the specific disk capacity.

ERR I99 -- Read After Write Error

The data read did not compare to that that was written during a read after write operation.

SECTION 5 THEORY OF OPERATION

CHAPTER 5

THEORY OF OPERATION

5.1 BLOCK LEVEL

This section consists of a brief explanation of the circuitry that comprises the four major logic boards in the DPU. The section is divided into five subsections--one for each logic board.

5.1.1 WL No. 210-7423-A RAM/PROM Control Board (see figure 5-1)

5.1.1.1 Clock (see timing chart, figure 5-2) -- The clock circuit produces 16 clock cycles, each 100 nsec in duration. This results in a machine-cycle speed of 1.6 usec (1600 nsec). The clock cycles are applied to a bcd-to-decimal (4-to-10) decoder which generates 8 clock pulses that are used in the DPU. These clock pulses and the events that occur at that specific time are listed below.

T0 - Clocks instruction through Rom Bit Latch as R_{0-15}.
Clocks Status Register 0.

T2 - Clocks data into the A and K Registers.

T3 - Clocks data into Memory Register.

T4 - Clocks Instruction Counter.
Loads/clears Memory Address Register.
Generates A and K Register Strobes.
Combines with CNTRL-1 to generate CNTRL14 which--
Clocks Read/Write/Format Latch.
Fires Strobe One-Shot.
Sets/resets Busy F/F.
Clocks ECC Shift Register.
Combines with CNTRL-3 to generate CNTRL34 which--
Clocks Tag Latches.
Clocks Select Latches.

T5 - Increments/decrements Memory Address Register.

T8 - Clocks Carry F/F.
Clocks Equal F/F.

T9 - Strobes data from RAM through Memory Register.

T2-5 - Generates RAM write pulse.

5.1.1.2 Programmable Read Only Memory (PROM) -- The PROM contains the microprogram that controls the operations of the DPU. The 2280 DPU utilizes four INTEL 2716 PROM chips. Each PROM contains a 2K x 8-bit matrix. Since the DPU instruction set requires 16-bit words, two PROM's are selected at the same time to provide the instruction. With this requirement, the total read only memory capacity is 4096 words or instructions.

The PROM output bits are clocked through D-type latches at time T0 as ROM bits R_{0-15}.

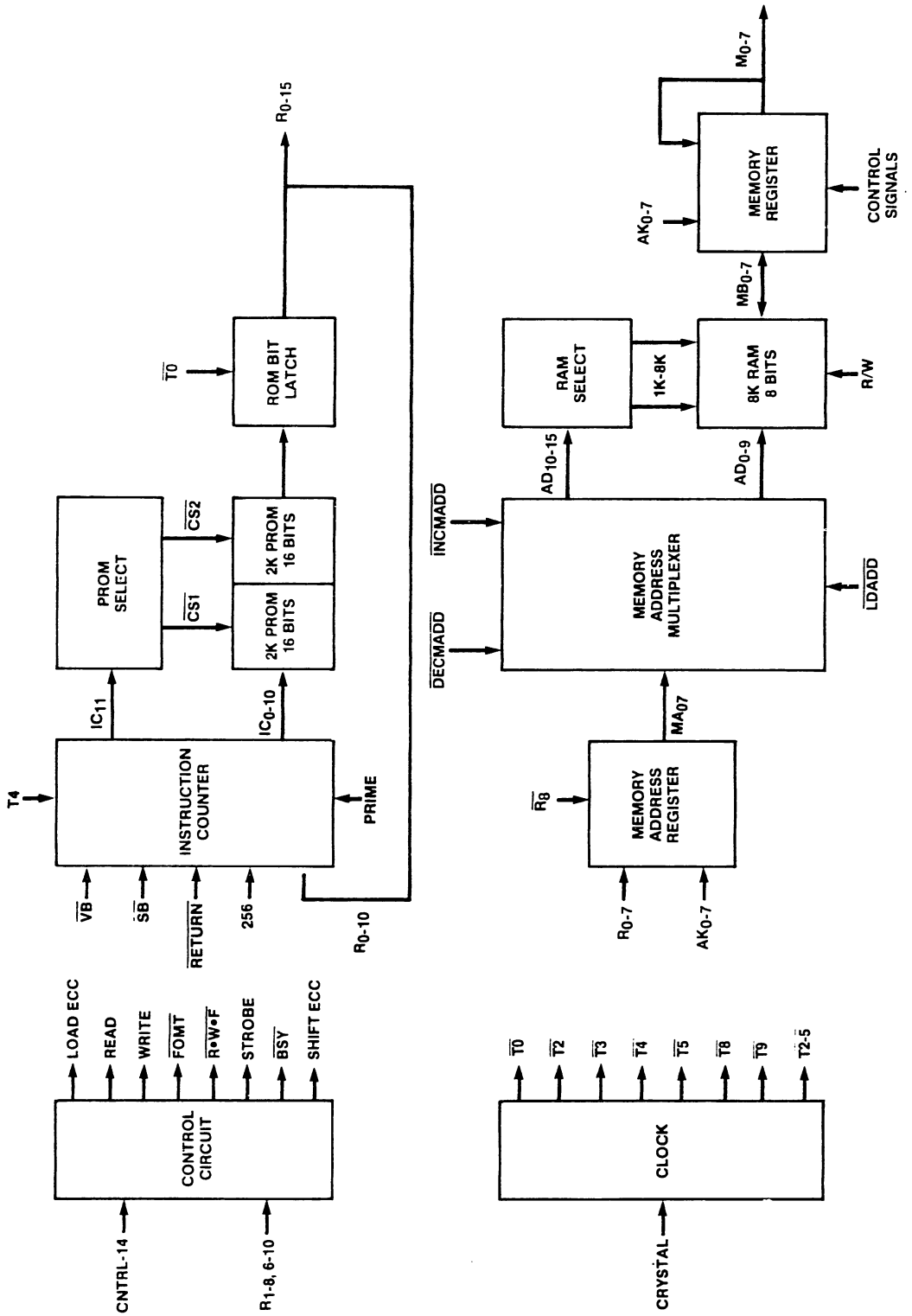


Figure 5-1. WL No. 210-7423-A RAM/PROM Control Block Diagram

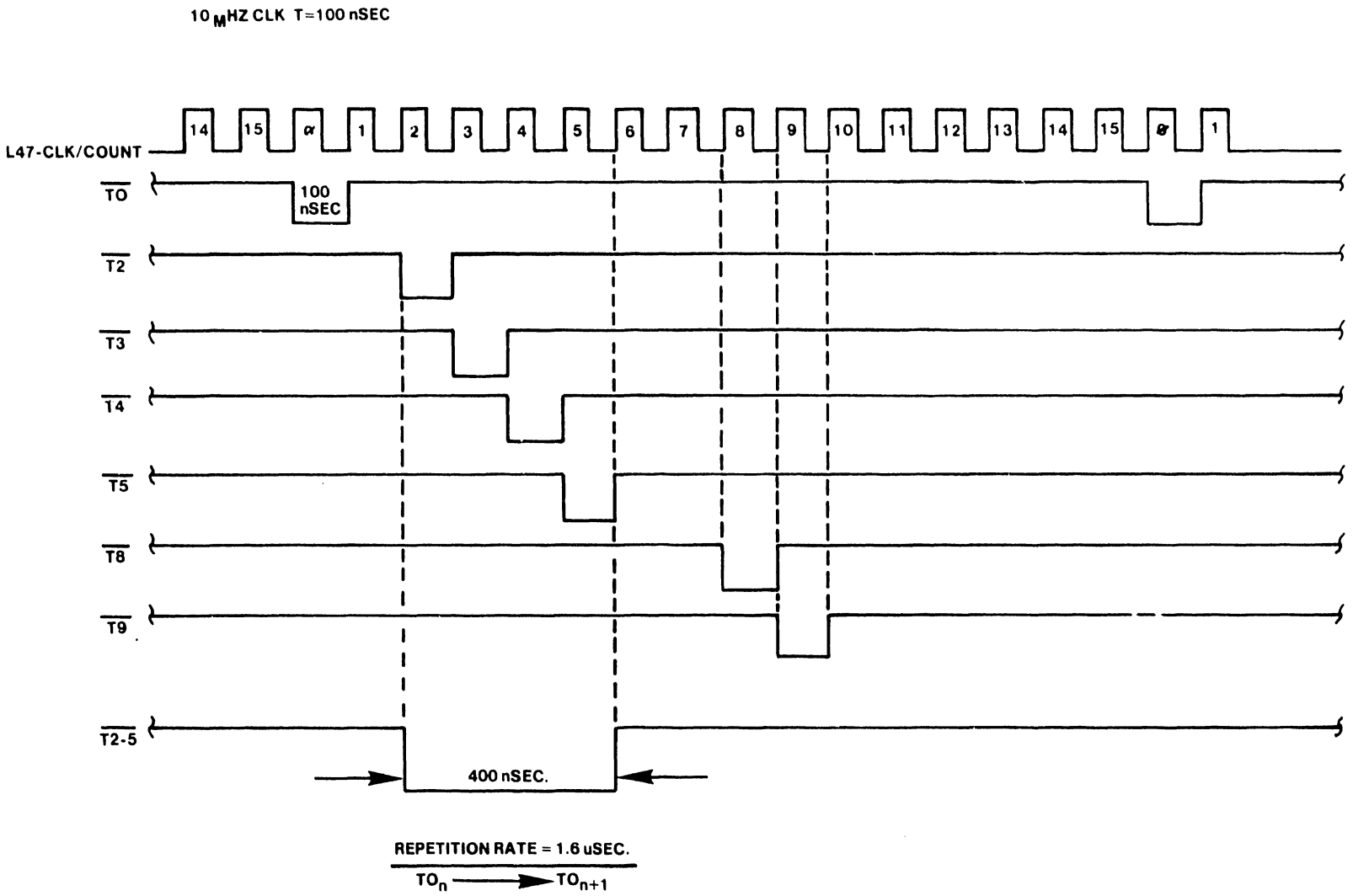


Figure 5-2. Timing Chart

The PROM is addressed by an Instruction Counter composed of three AM2911 microprogram sequencer chips. Twelve bits (IC_{0-11}) are applied to the PROM by the instruction counter; IC_{0-10} provide the addressing and IC_{11} produces the appropriate chip select (CS_{1-2}) signal. CS_1 selects the lower 2K of PROM and CS_2 selects the higher 2K. The PROM space is allocated as follows.

0K-2K = main body of microprogram
2K-3K = alternate sector routine, copy write error routine, error correction routine, and diagnostics
3K-4K = diagnostics

Normally the instruction counter increments by one at time T4. However, during execution of the microprogram, it is necessary to jump (branch) to a location other than that immediately following. Three signals are provided to accomplish the jump (branch): UB--Unconditional Branch, SB--Subroutine Branch, and 256--256 step branch.

5.1.1.3 Random Access Memory (RAM) -- The RAM is used to store flags, pointers, and status information required for execution of the microprogram as well as the data that is to be exchanged between disk and CPU. The RAM consists of eighteen 2114-L integrated circuits with a capacity of 1024 x 4 bits resulting in a total storage capacity of 9,216 bytes.

The Memory Address Register (MAR) provides 16 bits (AD_{0-15}) for the addressing of the RAM. AD_{0-9} supply the actual RAM address while AD_{10-15} generate the appropriate chip select (1K-8K) signal. The MAR increments or decrements at time T5. It can also be loaded (preset to a certain address) or cleared (reset to an address of zero) at time T4. The address to which the MAR can be loaded is provided through the Memory Address Multiplexer (MA_{0-7}). The inputs to the multiplexer that can be selected to provide the address are either ROM bits 0-7 (R_{0-7}) or the A and K Register bus (AK_{0-7}).

Data is transferred to/from RAM through the Memory Register (MB_{0-7}). The 2280 DPU utilizes two AM2905 Bus Transceiver chips for the MAR. Data that is to be written into RAM is input to the Memory Register from the A bus or the Memory Register bus (M_{0-7}). Data that is read from RAM is applied to the Memory Register bus (M_{0-7}). RAM space is allocated as follows.

1st 1/4K (256 bytes) = flags and pointers
Next 2K = cache for read
Next 4K = cache for multi-sector write
Next 8K = read/write buffer for COPY
2nd page of last 'K' = alternate sector RAM

READ -- 256-1K-1K
WRITE -- 256-1K-1K-1K-1K
COPY -- 256-1K-1K-1K-1K-1K-1K-1K-1K

The Error Check Circuitry (ECC) in the RAM functions as a 35-shift polynomial in a similar manner as that found in the OIS/VS systems.

5.1.1.4 Control Circuit -- Refer to section 5.3 (Instruction Set) for information concerning the control circuitry on the 210-7420-A board.

5.1.2 WL No. 210-7421-A ALU/MUX Interface Board (see figure 5-2)

5.1.2.1 Arithmetic/Logic Unit (ALU) -- Two 74181 integrated circuits, designed to perform specific arithmetic or logical operations as directed by the microprogram, comprise the ALU.

The ALU data inputs are referred to as the A-bus and the B-bus. The A-bus inputs are from the A or K Registers (AK_{0-7}). The B-bus is the output of a multiplexer, incorporating memory (M_{0-7}) and ROM bits (R_{0-7}) as selectable inputs.

The ALU output is the C-bus (C_{0-7}). Data on this bus can be input to the A Register of K Register.

5.1.2.2 A Register -- The general purpose A-Register stores data from: 1) the CPU, 2) Status Register 0, 3) the ECC Shift Register, or 4) the ALU. The contents of the A-Register can be processed by the ALU, stored in memory, or input to the Track, Head, or Sector Registers (THS_{0-7}).

5.1.2.3 K-Register -- The general purpose K-Register stores data from the ALU or acts as Status Register 1. The contents of the K-Register can be processed by the ALU or stored in memory.

5.1.2.4 Status Register 0 (ST0) -- ST0 stores seven CPU/DPU conditions which can be input to the A-Register, via the BO_{0-7} bus, for monitoring or testing. The conditions are as follows:

*REQ (Bit 0)	--	When active, indicates the Output Bus Buffer has received a byte of data from the CPU.
*CAB (Bit 1)	--	When active, indicates a carry resulted from a preceding ALU arithmetic operation or from the execution of a "Set Carry" instruction.
*GKBD (Bit 2)	--	When active, indicates the CPU is ready to receive input from the DPU.
REINIT (Bit 3)	--	When active, indicates the CPU is sending address information next. When inactive, indicates the CPU is sending data next.
DN #3 (Bit 4)	--	When active, indicates that selection of drive 2 in a daisy-chain configuration is desired.
A=B (Bit 5)	--	When active, indicates the data on the ALU A-bus is equal to that on the B-bus.
AD7 (Bit 6)	--	The eigth (2_8 = 128) RAM address bit.

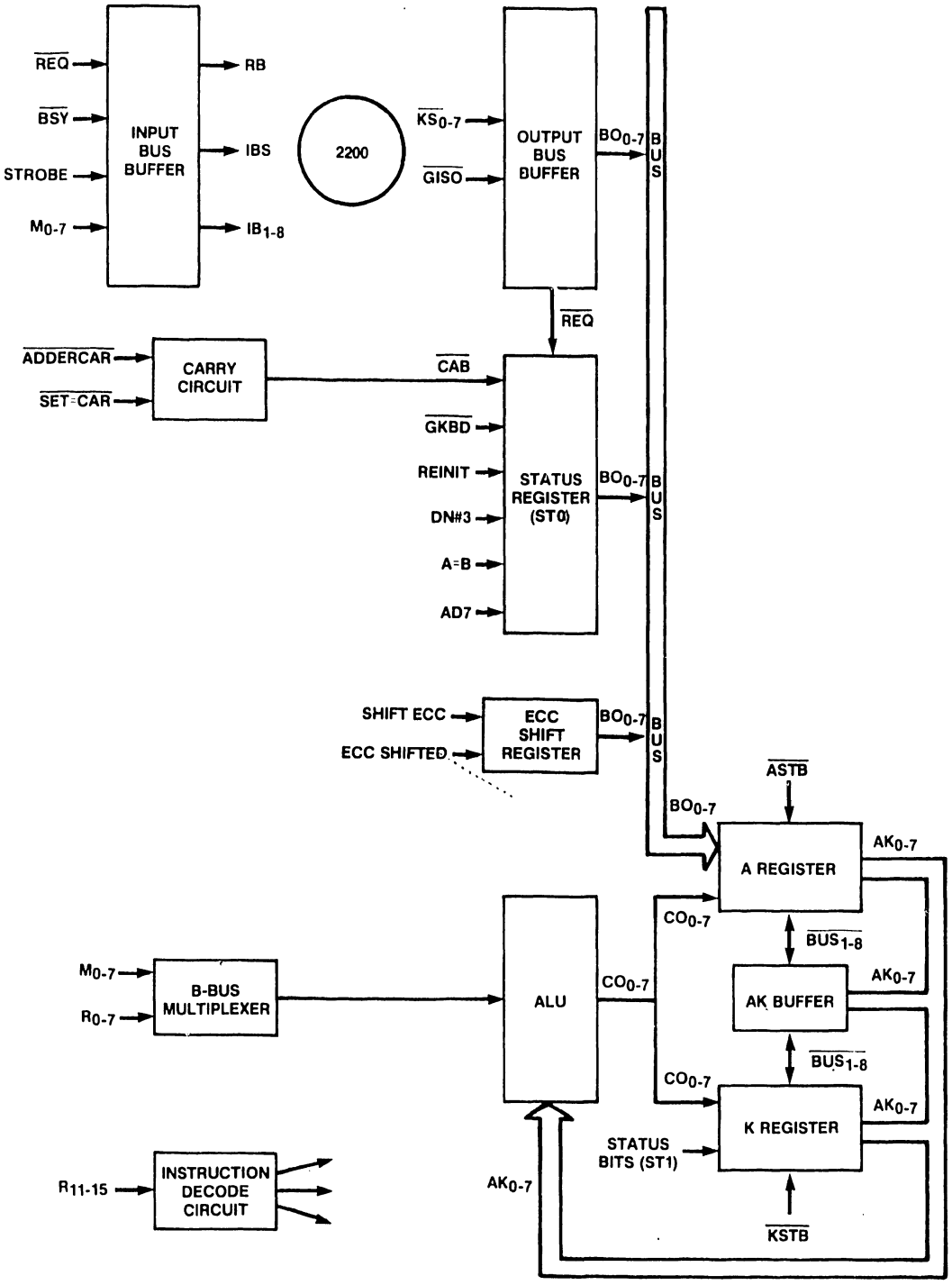


Figure 5-3. WL No. 210-7421-A ALU/MUX Interface Block Diagram

5.1.2.5 Status Register 1 (ST1) -- The K-Register acts as ST1. Seven bits representing DPU/disk drive conditions can be selected as inputs to the K-Register. Once in the register, the bits can be tested for the various conditions. The bit representation is as follows:

W/P (Bit 1)	--	When active, indicates the disk drive is write protected.
ERROR (Bit 2)	--	When active, indicates an address error was detected.
DERROR (Bit 3)	--	When active, indicates a disk drive fault occurred or a seek error was detected by the disk drive.
*DONE (Bit 4)	--	When active, indicates 256 bytes of data have been transferred to/from the disk.
*NULL (Bit 5)	--	(Not Used)
READY (Bit 6)	--	When active, indicates the disk drive is "on cylinder" and "ready".
SECTOR (Bit 7)	--	When active, indicates the sector counter is equal to the desired sector, which is present on the THS (Track/Head/Sector) bus.

5.1.2.6 Input Bus Buffer -- The Input Bus Buffer provides the interface for data being sent to the CPU from the DPU. Data is input to the buffer from the Memory Register (M_{0-7}).

5.1.2.7 Output Bus Buffer -- The Output Bus Buffer provides the interface for data being sent to the DPU from the CPU. Data is output from the buffer to the A-Register via BO_{0-7}. When the buffer receives a byte of data, it generates a request (REQ) signal. REQ is monitored by the DPU, and when the signal is active, the microprogram causes the hardware to read in the data.

5.1.2.8 Instruction Decode Circuit -- ROM bits R_{11-15} are applied to a 74154 one-of-sixteen decoder which produces the control signals necessary for execution of the microinstructions by the hardware.

5.1.3 WL No. 210-7424 I/O Controller Board (see figure 5-4)

5.1.3.1 Track Register -- The Track Register holds the desired track (cylinder) address as input from the AK bus. The address is ouput to a buffer, via the THS bus, from where it is sent to the disk drive.

5.1.3.2 Head Register -- The Head Register holds the desired head number and volume select bit as input from the AK bus. The head/volume select information is output to a buffer, via the THS bus, from where it is sent to the disk drive.

5.1.3.3 Sector Register -- The Sector Register holds the desired sector number as input from the AK bus. The number is output to the Sector Comparator, via the THS bus, where is checked against the output of the Sector Counter.

5.1.3.4 Command Register -- The Command Register holds the disk drive control select bits (for example, write gate, read gate, and return to zero). The control information is output to a differential buffer to be sent to the disk drive.

5.1.3.5 Bit/Byte Counter -- The Bit/Byte Counter keeps track of the number of bytes of data transferred between DPU and disk. The counter generates certain control signals depending on the number of bits/bytes that have been counted.

5.1.3.6 Serial-to-Parallel, Parallel-to-Serial (SP/PS) Converter -- The SP/PS accepts eight parallel bits of data from the Memory Register (M_{0-7}) and converts the information to serial and adds clock pulses between data bits. The serial data is then transmitted to the disk drive.

The converter also accepts serial Read Data and changes it to eight parallel bits of data. If the data that is read is address information, it is input to the Address Comparator; otherwise, the data is sent to memory.

5.1.3.7 Address Comparator -- The Address Comparator checks the address read from the disk with the desired address that is present on the THS bus. If the two are not the same, the comparator flags an error.

5.1.3.8 Control Circuit -- Refer to section 5.3 (Instruction Set) for information concerning the control circuitry on the WL No. 210-7424 board.

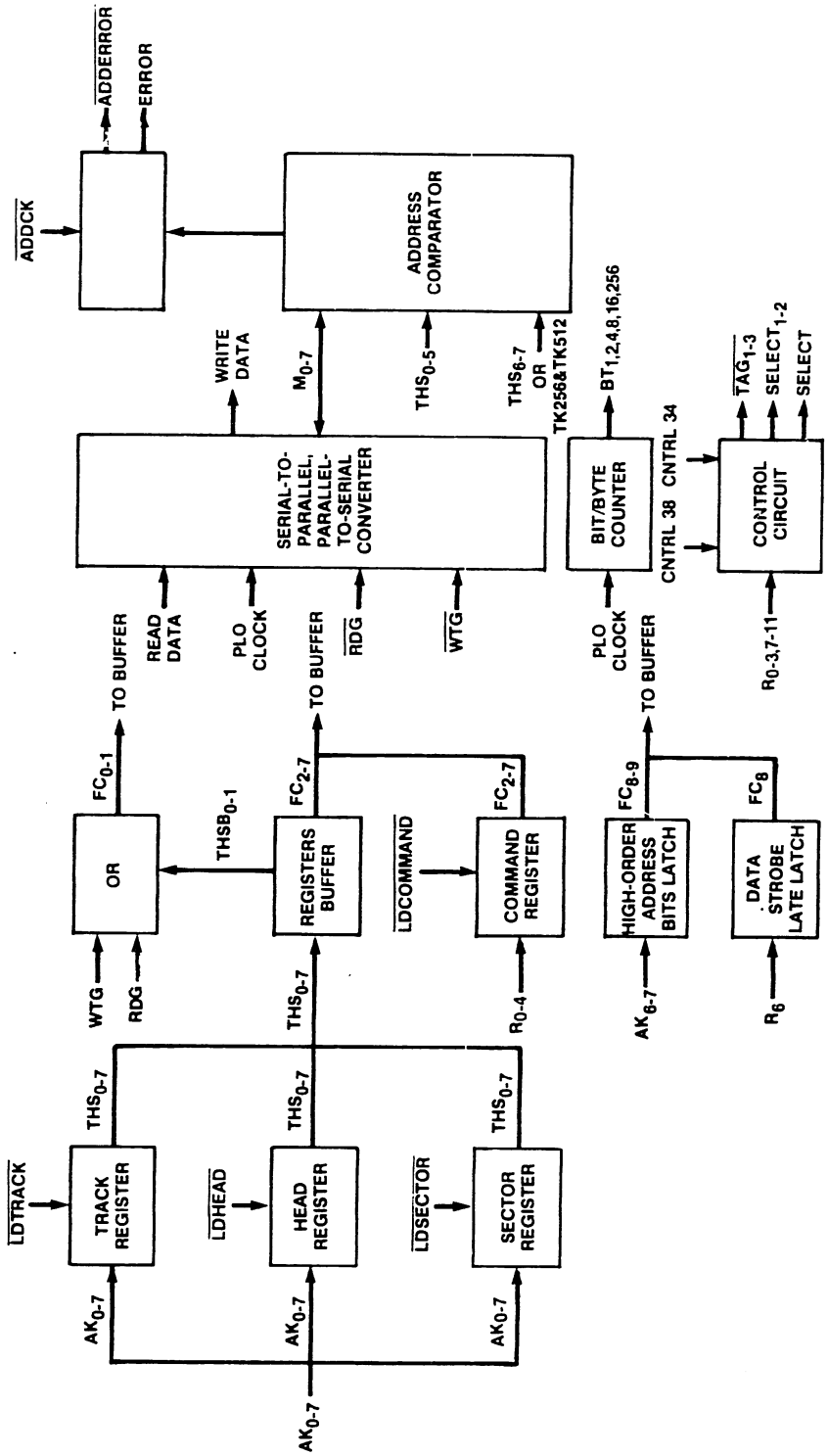


Figure 5-4. WL No. 210-7424 I/O Controller Block Diagram

5.1.4 WL No. 210-7422 ECC/Device Interface Board (see figure 5-5)

5.1.4.1 Differential Buffers -- The Differential Buffers provide the interface between DPU and disk drive. The buffers convert TTL voltage levels to differential voltage levels and vice versa.

5.1.4.2 Sector Counter -- The Sector Counter increments every time a sector mark pulse is received from the disk drive. It is reset (cleared) when the index pulse is received.

5.1.4.3 Sector Comparator -- The Sector Comparator checks the desired sector number that is present on the THS bus against the count from the sector counter. When the two are equal, indicating the correct disk sector is under the read/write head, an EQUAL signal is generated to inform the microprogram.

5.1.4.4 ECC -- The Error Correction Circuit along with an ECC routine in the microcode is responsible for detecting and correcting any single-bit errors that occur during a read operation. Figure 5-6 is a detailed flowchart illustrating the ECC code handling routine.

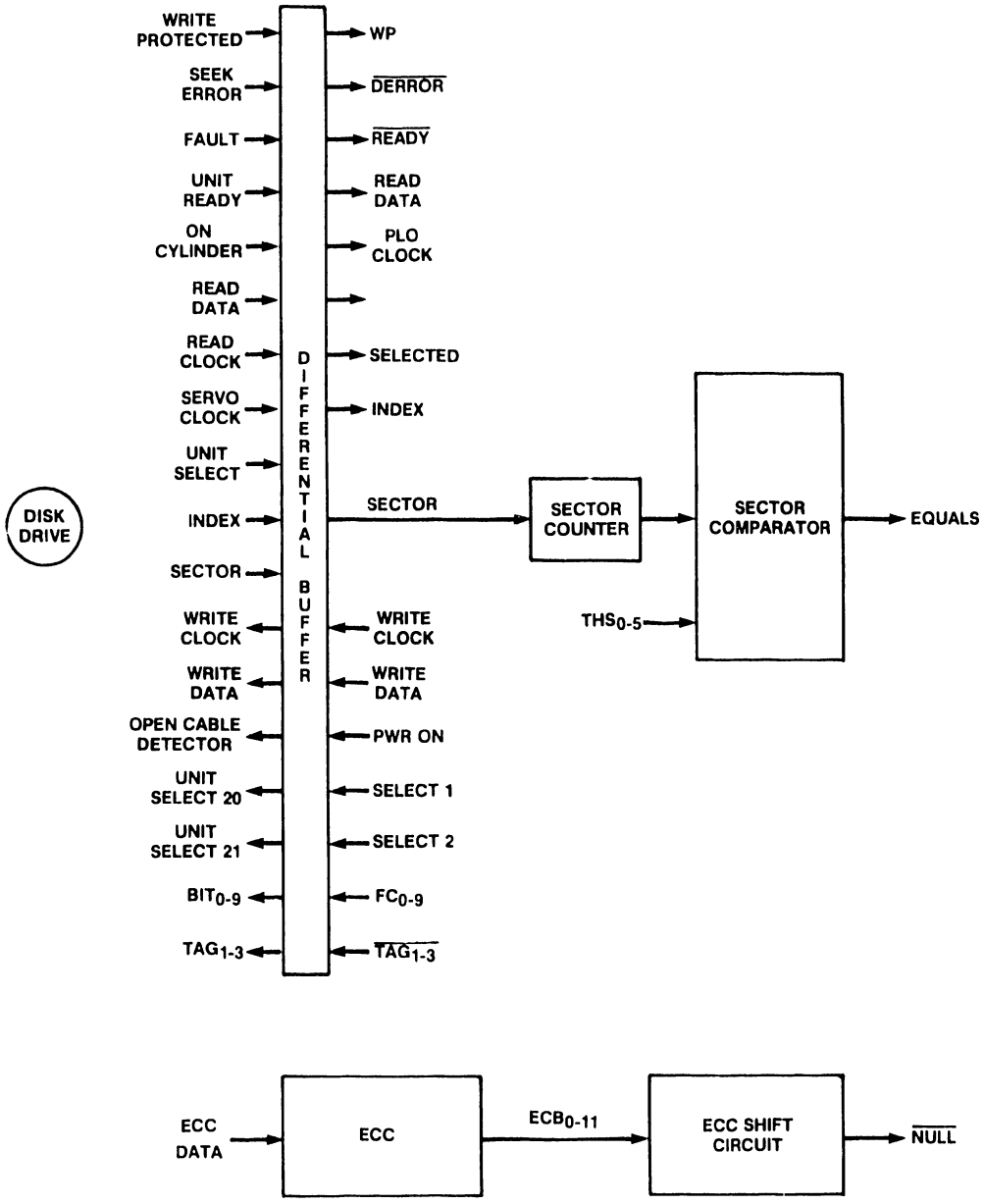


Figure 5-5. WL No. 210-7422 ECC/Device Interface Block Diagram

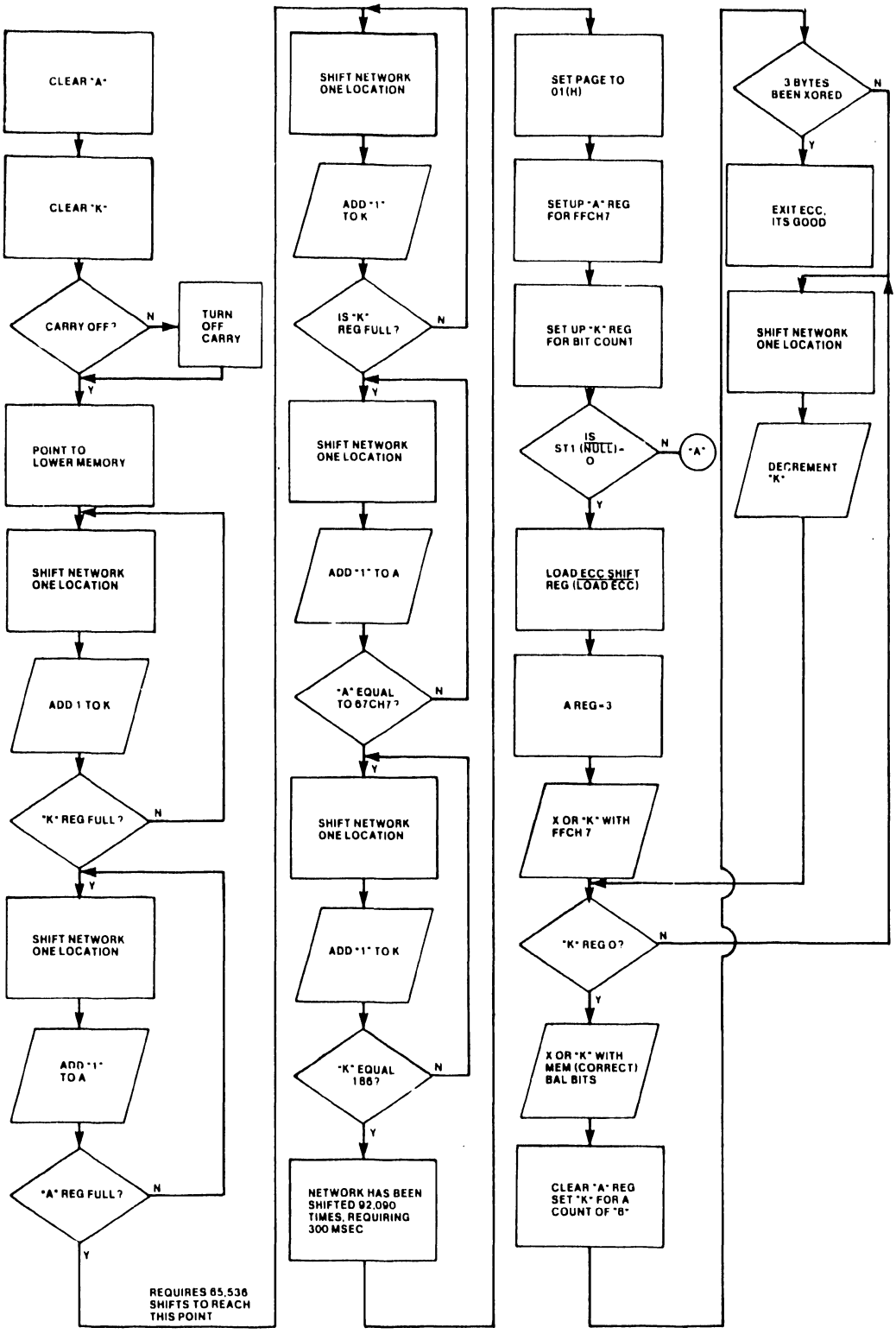


Figure 5-6. ECC Code Handling Flowchart

5.1.5 WL No. 210-L567 Regulator Board (see schematic)

There are six regulated voltages in the DPU power supply, each independently variable. All six supplies are of the series pass variety, each controlled by an IC voltage regulator. There are four transformer generated, full wave unregulated supplies which provide the necessary voltages for the regulators.

The six regulated supplies are +5VRL for the TTL logic and +5VRM, +8VR, +12VR, -12VR, and -15VR for the PROM's and RAM's. As all regulators operate in the same manner, only the +5VRL supply is discussed here.

The heart of the regulated supply is the voltage regulator (L4). Unregulated +14V is applied to L4 pin 8 to provide the operating voltage for the IC. Pin 4 of the regulator is the output from a reference amplifier in the IC. The output of this amplifier is applied to the voltage divider network R1, R2, and R3. The reference amplifier contains a current source and temperature compensator to prevent drifting.

The voltage present at the wiper of potentiometer R2 is applied to the non-inverting input of the error amplifier (regulator pin 3). By varying the voltage at the non-inverting input, the output voltage changes.

Since the IC regulator cannot supply large output currents, external circuitry must be provided for this purpose. Pin 7 of the regulator is the collector output of the internal series pass transistor which provides the necessary drive for transistor Q5. Q5 provides the necessary current for driver X8, which in turn controls the series pass transistors X6 and X7.

The error amplifier constantly monitors the regulated output voltage by sampling the output voltage at the inverting input (regulator pin 2). Voltage regulation is performed as follows.

If the output voltage tries to go more positive, the inverting input (pin 2) also follows positive. This results in a more negative input to the internal series pass transistor, causing it to conduct less thus increasing the positive voltage at pin 7. (The voltage drop across R4 is less due to the decrease in current; hence Q5 base tends toward +14V.) Q5 conducts less, driver Q8 controlled by Q5 conducts less, and finally the series pass transistors conduct less, decreasing the output voltage. In a similar manner, the output voltage is increased when a negative output change is detected. Note that no regulation can take place unless there is a change in the output voltage to initiate a correction; therefore, the regulation is less than perfect.

The regulators also employ foldback current limiting as follows.

Resistors R5, R7, and R8 form the external current sensing network. As the current in the external circuit increases, the voltage drop across the sensing network changes, until the internal current limiter transistor is turned off. The output voltage drops to zero and the output current remains at a safe value when the output current exceeds the predetermined value.

Capacitor C8 compensates the internal error amplifier to avoid instability. As mentioned previously, all other regulator circuits operate in the same manner.

Diode D2 connected between L5 pin 1 and L1 pin 1 prevents the +5VRM supply from ever becoming more positive than the +8VR supply. This is necessary to prevent damage to the memory. Also diode D1 prevents the +8VR supply from rising above +14.2V, again to prevent damage to the memory.

5.2 READ/WRITE DATA FLOW

5.2.1 Write Data Flow

Figure 5-5 is a write data flow diagram illustrating the hardware involved when data is read from the 2200, processed through the 2280 DPU, and written onto the disk. The following theory references schematic diagrams located in Appendix D at the end of this document.

Parallel write data enters the 2280 DPU at 7421-2 (KS_{0-7} to BO_{0-7}) where it goes through the A register as AK_{0-7}. The data is sent via 7423-2 to L40 and L41 (M_{0-7}) and to the RAM. From the RAM the data goes through L40 and L41 (M_{0-7}) to 7424-1 and to L47 (serializer/de-serializer). The data goes out as WDATA to 7424-2 through L32 and L42 and emerges as WRITE DATA (serial) and to the drive.

5.2.2 Read Data Flow

Figure 5-6 is a read data flow diagram illustrating the hardware involved when data is read from the disk, processed through the 2280 DPU, and written into the 2200. The theory discription presented below references schematic diagrams located in Appendix D at the end of this document.

Serial read data from the disk drive enters the 2280 DPU at 7424-1 where is is applied to L47 (serializer/de-serialaizer). The parallel data output from the serializer/de-serializer is sent via 7423-2 to L40 and L41 and to the RAM. From the RAM, it goes to L40 and L41 and to 7421-1. It is now sent via L4 and L11 to the 2200 as IB_{0-7}.

5.3 MICROPROGRAM FLOWCHARTS

Figures 5-9 thru 5-15 are flowcharts of each individual microprogram sequence for the 2280 DPU functional modes of operation.

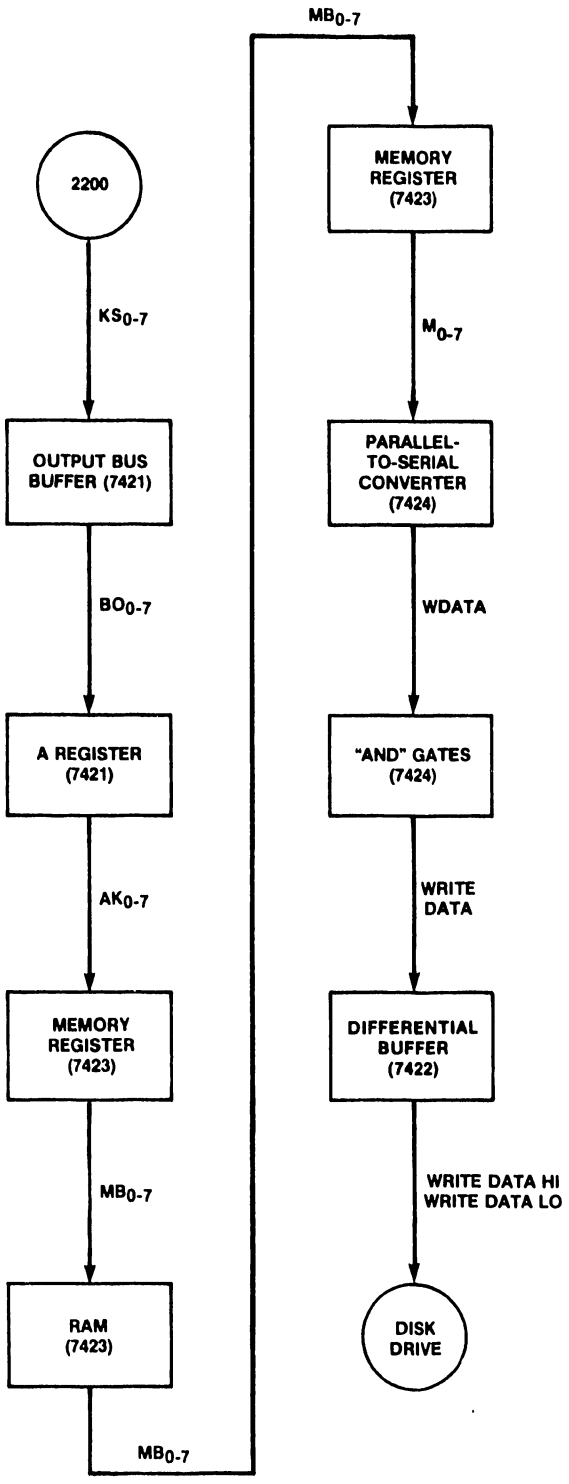


Figure 5-7. Write Data Flow

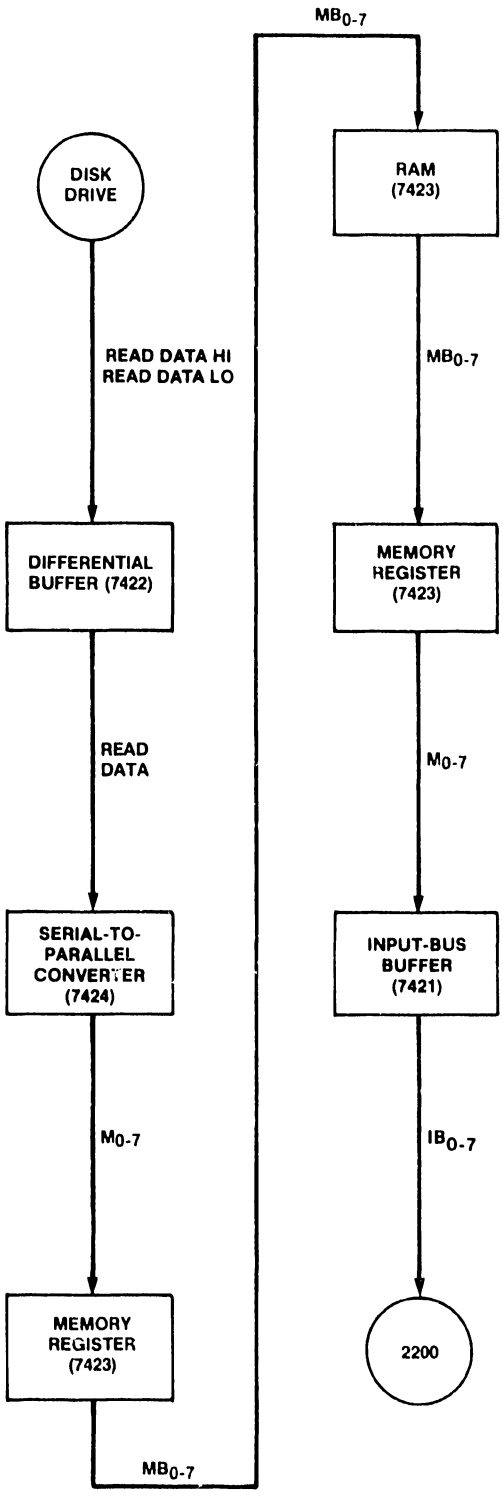


Figure 5-8. Read Data Flow

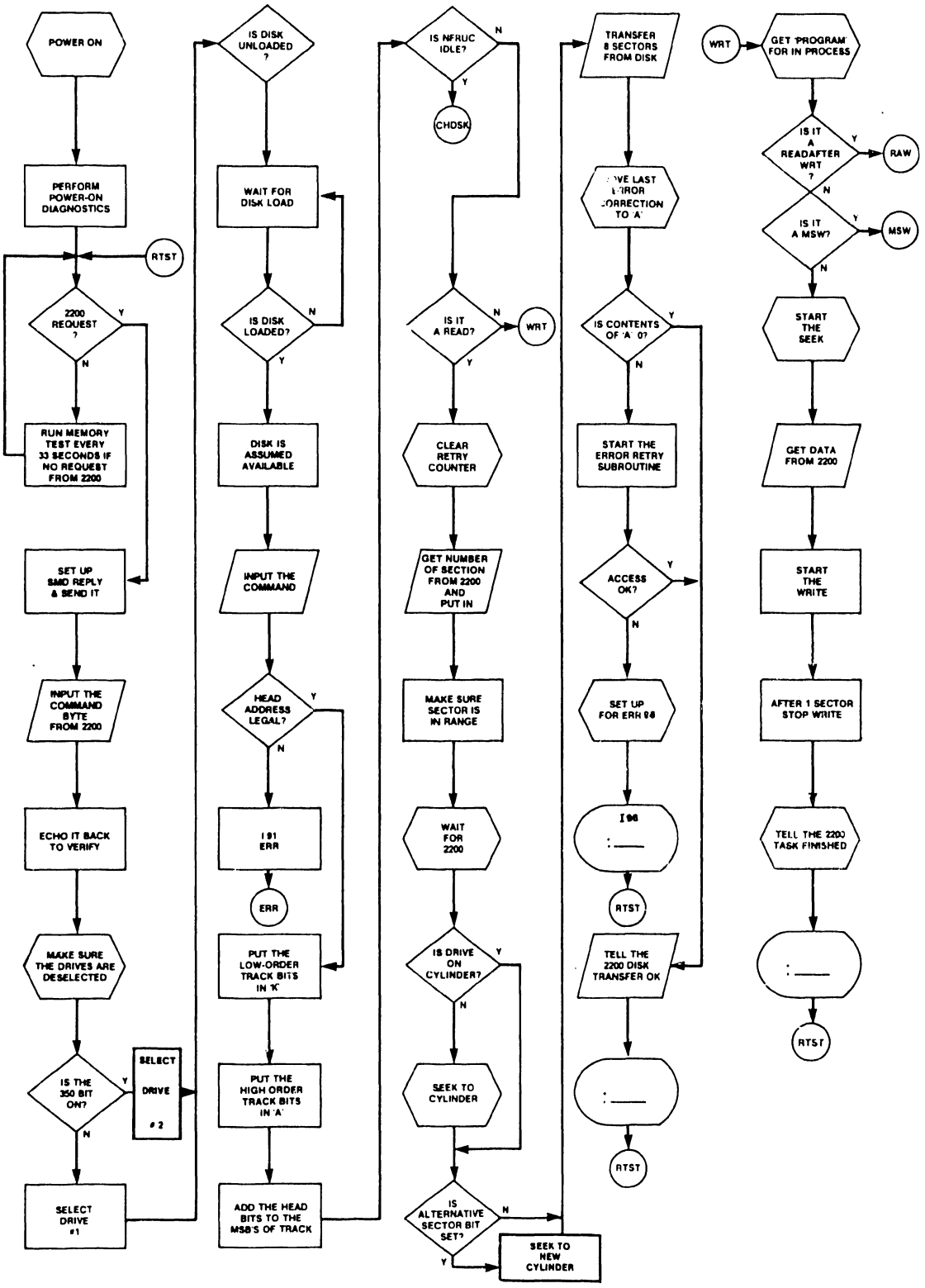


Figure 5-9. 2280 DPU Microprogram Flowchart (Sheet 1 of 2)

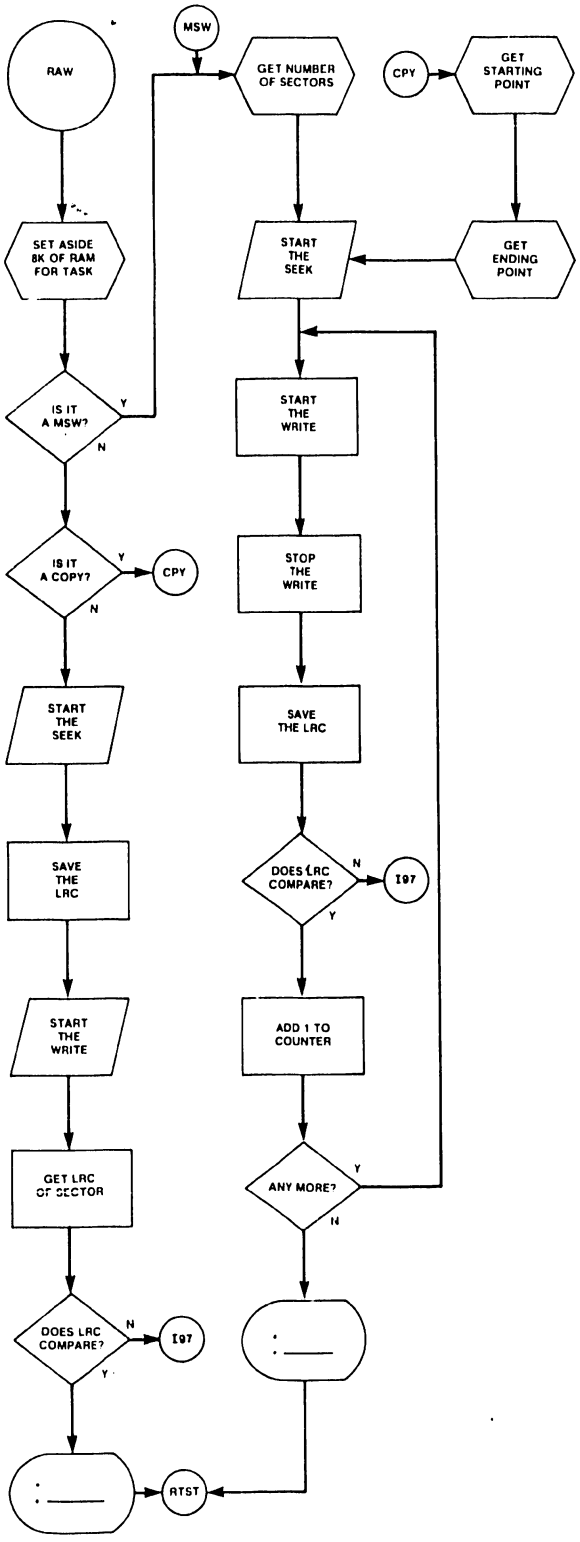


Figure 5-9. 2280 DPU Microporgram Flowchart (Sheet 2 of 2)

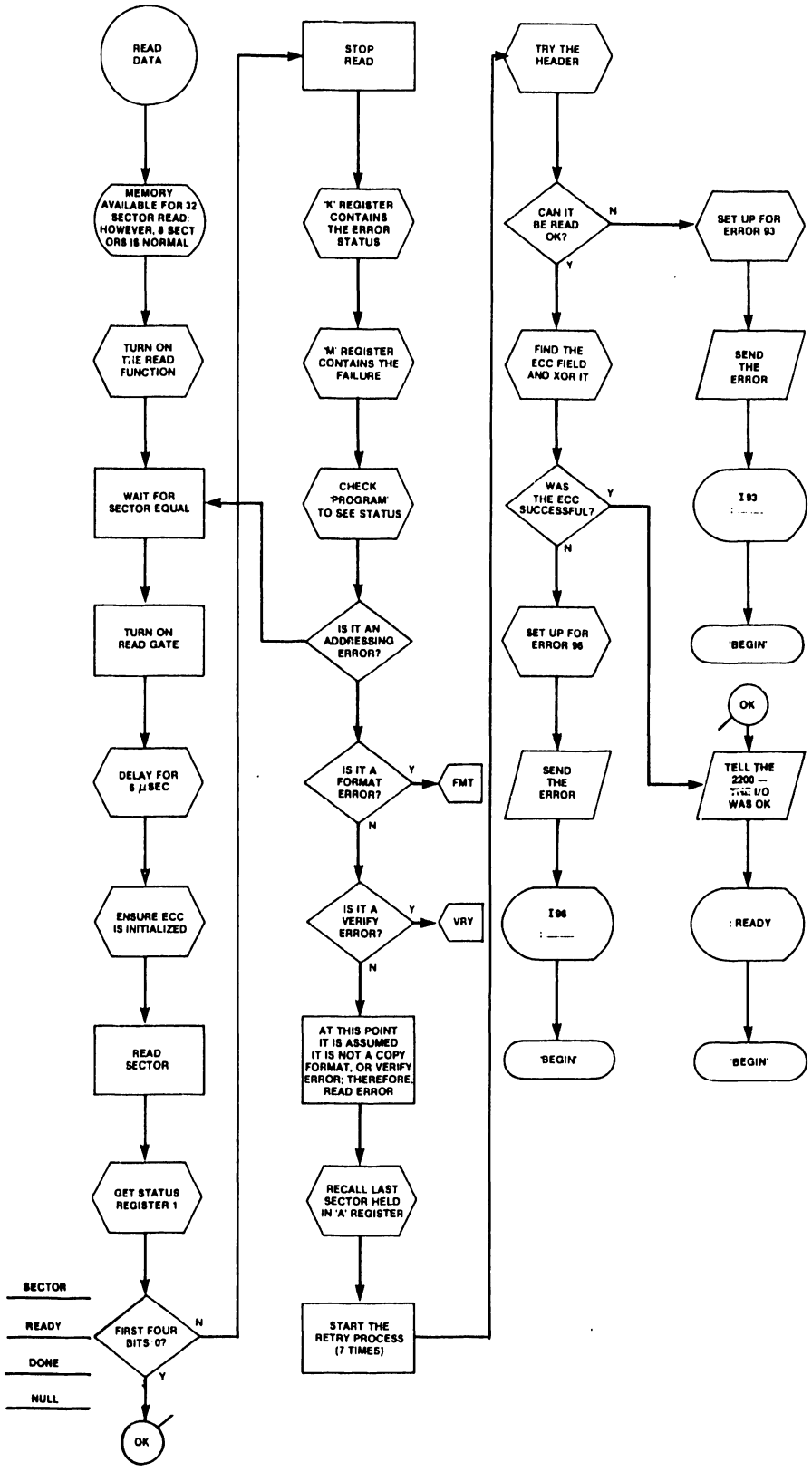


Figure 5-10. 2280 DPU Microprogram Flowchart - Read Data

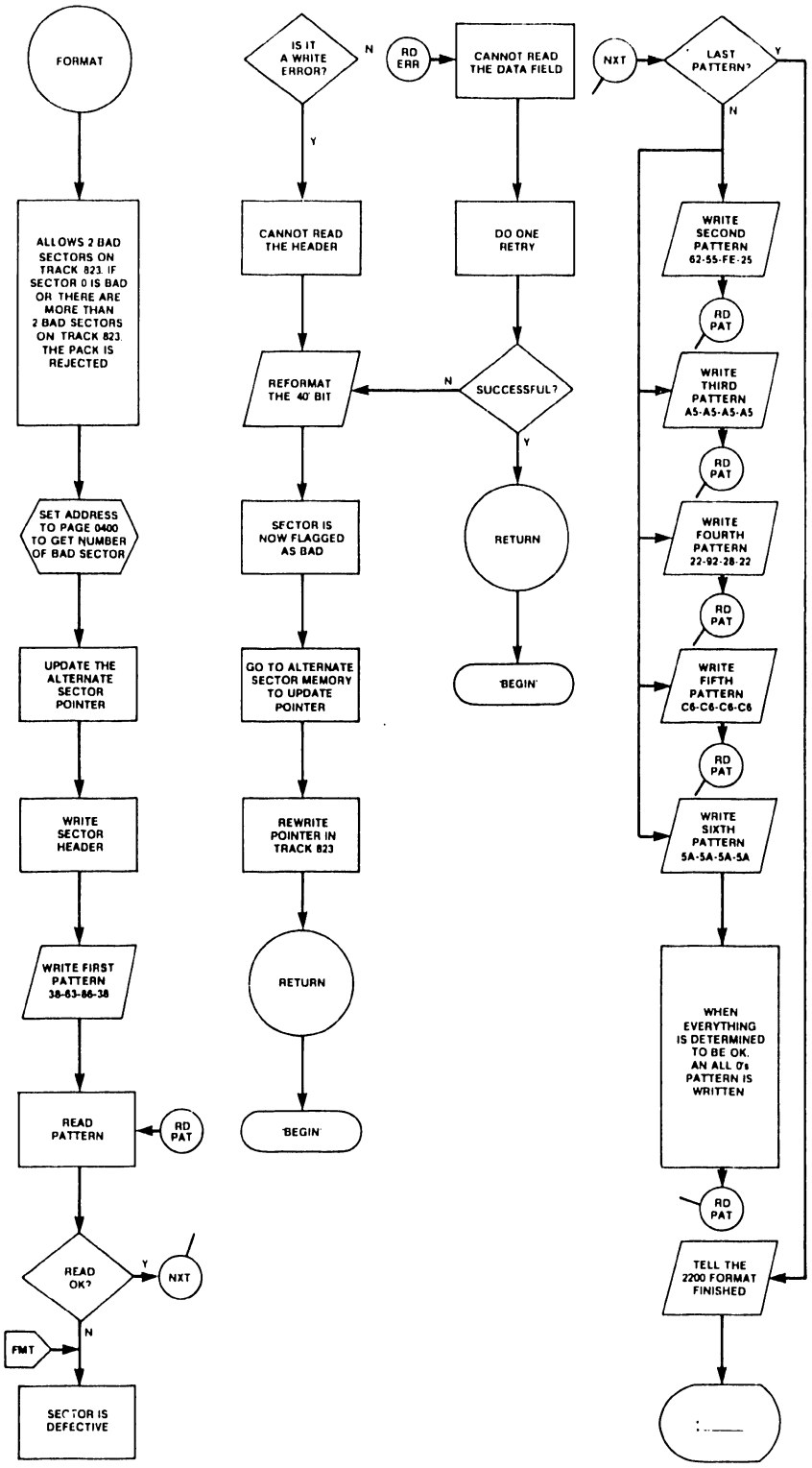


Figure 5-11. 2280 DPU Microprogram Flowchart - Format

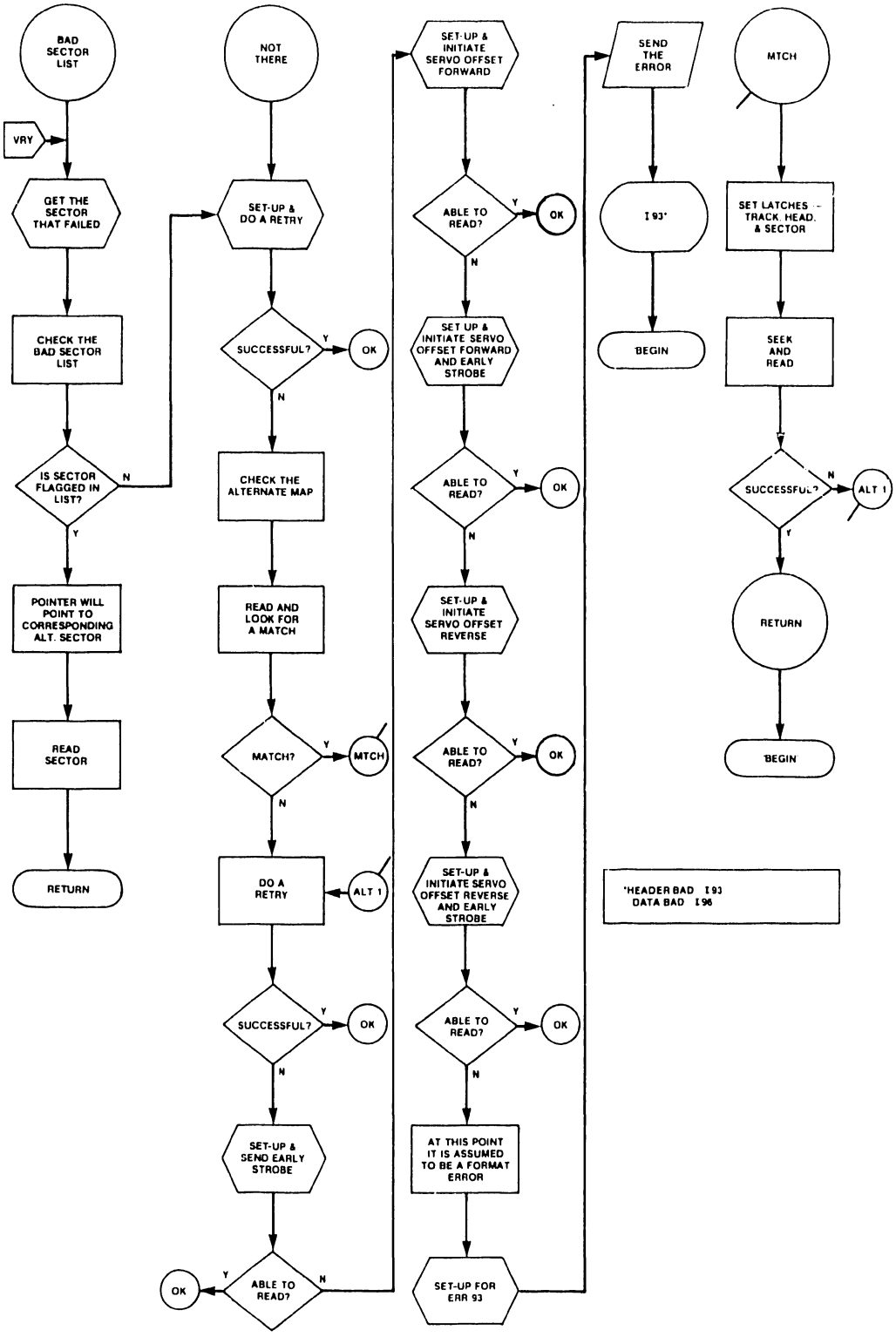


Figure 5-12. 2280 DPU Microprogram Flowchart - Verify

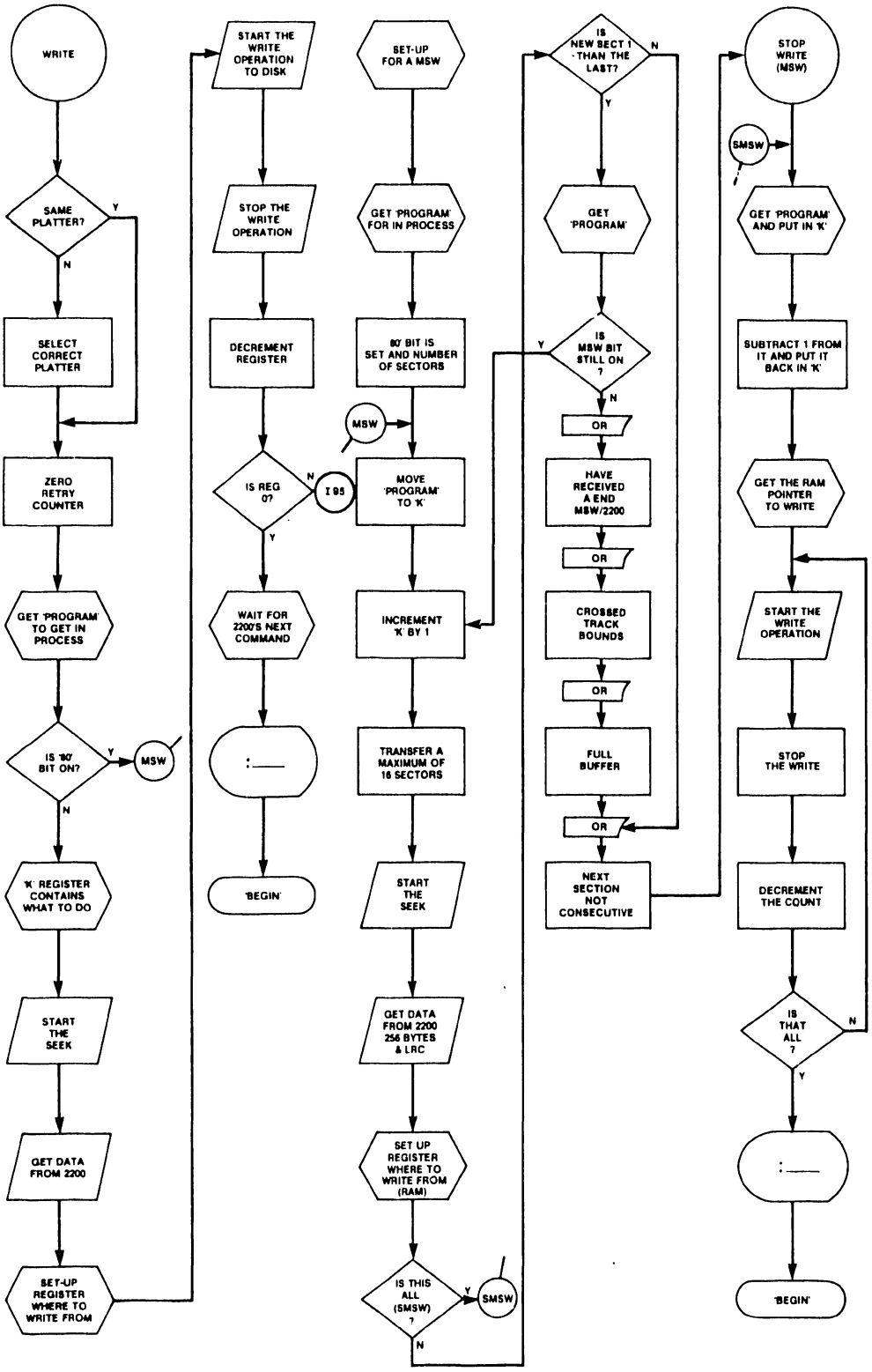


Figure 5-13. 2280 DPU Microprogram Flowchart - Write/Start MSW/Stop MSW

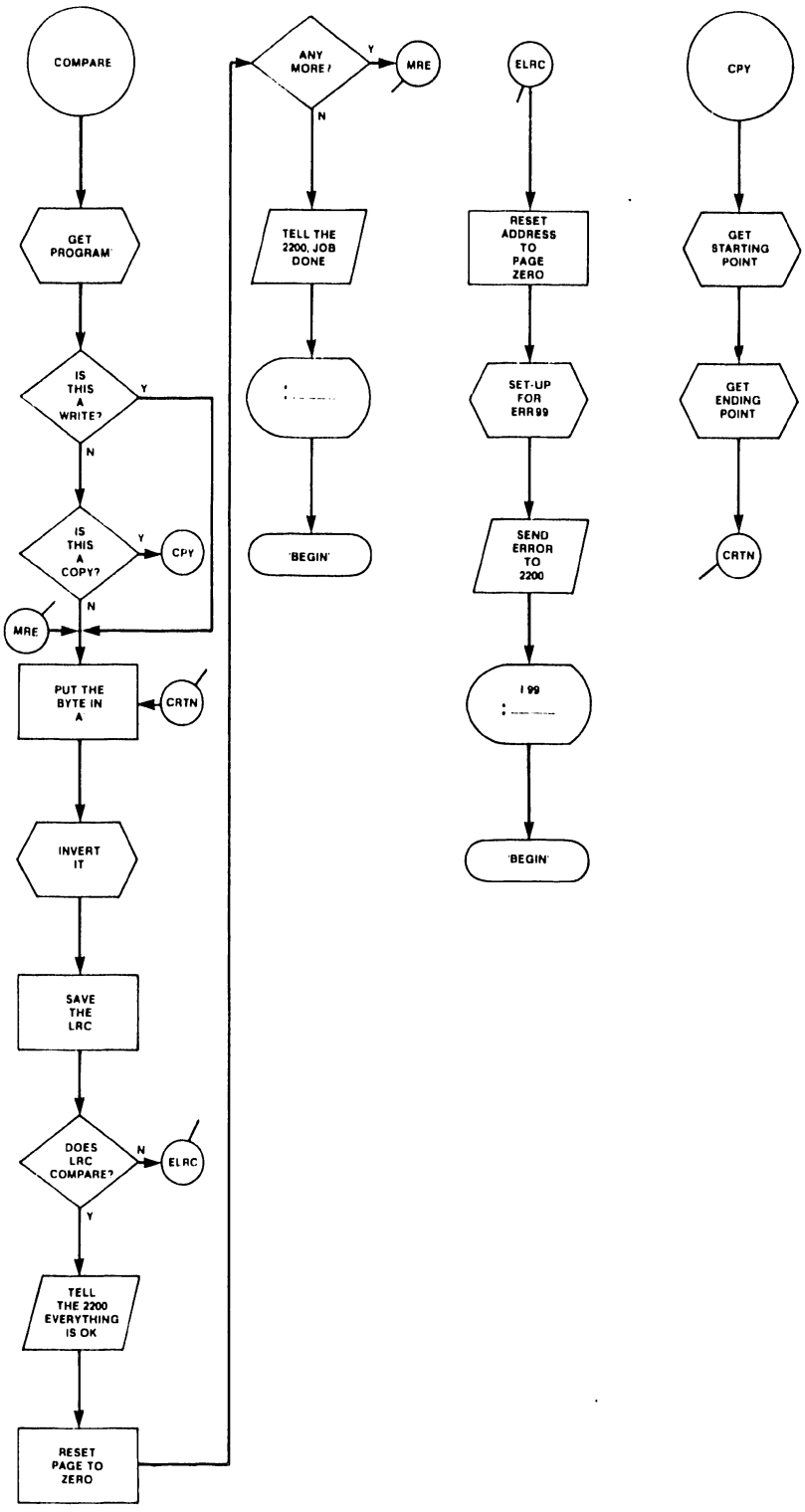


Figure 5-14. 2280 DPU Microprogram Flowchart - Compare

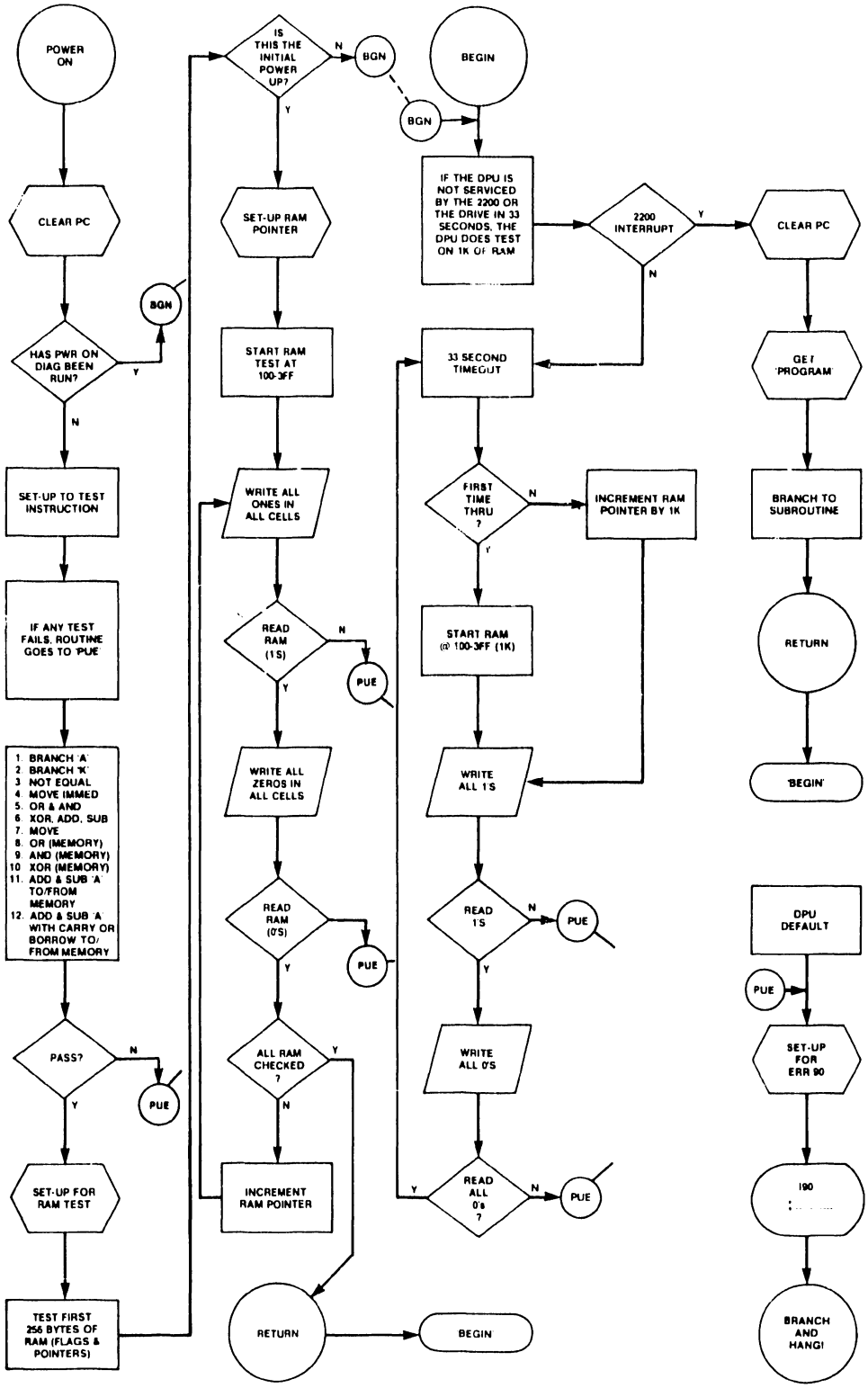


Figure 5-15. 2280 DPU Microprogram Flowchart - Power-On Diagram/Begin

APPENDIX A

DISK ERROR CODES

APPENDIX A

DISK ERROR CODES

ERR D80

Error: File Not Open

Cause: The file was not opened.

Recovery: Open the file before attempting to read from it or write to it.

ERR D81

Error: File Full

Cause: The file is full; no more information may be written into the file.

Recovery: Correct the program, or use MOVE to move the file to another platter and reserve additional space for it.

ERR D82

Error: File not in Catalog

Cause: A non-existing file name was specified, or an attempt was made to load a data file as a program file.

Recovery: Make sure the correct file name is being used, the proper disk is mounted, and that the proper disk drive is being accessed.

ERR D83

Error: File Already Cataloged

Cause: An attempt was made to catalog a file with a name that already exists in the Catalog Index.

Recovery: Use a different name, or catalog the file or a different platter.

ERR D84

Error: File Not Scratched

Cause: An attempt was made to rename, or write over a file that has not been scratching.

Recovery: Scratch the file before renaming it.

ERR D85

Error: Catalog Index Full

Cause: There is no more room in the Catalog Index for a new name.

Recovery: Scratch any unwanted files and compress the catalog using a MOVE statement, or mount a new disk platter and create a new catalog.

ERR D86

Error: Catalog End Error

Cause: The end of the catalog area is defined to fall within the catalog index, or an attempt has been made to move the end of the catalog area to fall within the area already occupied by cataloged files (with MOVE END), or there is not room left in the Catalog Area to store more information.

Recovery: Correct the SCRATCH DISK or MOVE END statement, or increase the size of the Catalog Area with MOVE END, or scratch unwanted files and compress the catalog with MOVE, or open a new catalog on a separate platter.

ERR D87

Error: No End of File

Cause: No end-of-file record was recorded in the file (with DATASAVE DC END or DATASAVE DA END), and therefore none could be found by the DSKIP END statement.

Recovery: Correct the file by writing an end-of-file trailer after the last data record.

ERR D88

Error: Wrong Record Type

Cause: A program record was encountered when a data record was expected, or vice versa.

Recovery: Correct program. Be sure the proper platter is mounted and be sure the proper drive is being accessed.

ERR D89

Error: Sector Address Beyond End of File

Cause: The sector address being accessed by the DATALOAD DC or DATASAVE DC operation is beyond the end-of-file. This error can be caused by a bad disk platter.

Recovery: Run the program again. If error persists, use a differrent platter or reformat the platter. If error still exists, contact your Wang Service Representative.

ERR I90

Error: Disk Hardware Error

Cause: The disk did not recognize or properly respond to the System at the beginning of a read or write operation (the read or write has not been performed).

Recovery: Run the program again. If error persists, contact your Wang Service Representative.

ERR I91

Error: Disk Hardware Error

Cause: A disk hardware error occurred, e.g., the disk is not in file-ready position. This could occur, for example, if the disk is in LOAD mode or power is not turned on.

Recovery: Ensure disk is turned on and properly set up for operation. Set the disk into LOAD mode and then back into RUN mode with the RUN/LOAD selection switch. The check light should then go out. If error persists, call your Wang Service Representative. (Note: disk must never be left in LOAD mode when turned on.)

ERR I92

Error: Time-out Error

Cause: The disk did not respond to the system during a read or write operation in the proper amount of time (time-out).

Recovery: Run program again. If error persists, reinitialize disk - if error still occurs, contact your Wang Service Representative.

ERR I93

Error: Disk Format Error

Cause: A disk format error was detected during a disk read or write. The disk is not properly formatted. The error can be either in the disk platter or the disk hardware.

Recovery: Format the disk again; if error persists, call your Wang Service Representative.

ERR I94

Error: Format Key Engaged

Cause: The disk format key is engaged (the key should be engaged only when formatiing a disk).

Recovery: Turn off the format key.

ERR I95

Error: Seek Error, or Platter Protected

Cause: A disk-seek error occurred; the specified sector could not be found on the disk. This error may indicate a bad format, or it may result from an attempt to write to a protected platter.

Recovery: Run program again. If error persists, reinitialize (reformat) the disk. If error still occurs, call your Wang Service Representative.

ERR I96

Error: Cyclic Read Error

Cause: A cyclic redundancy check (CRC) error occurred during a disk read operation; the sector being addressed has never been written to or was incorrectly written.

Recovery: If not formatted, format the disk. If the disk was formatted, rewrite the bad sector. If error persists, use a different disk platter. If error persists on a fixed platter, call your Wang Service Representative.

ERR I97

Error: LRC Error

Cause: A disk longitudinal redundancy check (LRC) error occured when reading a sector. This usually indicates a data transmission error occured when the sector was read or written.

Recovery: If error persists, rewrite the sector. If the error still persists, call your Wang Service Representative.

ERR I98

Error: Illegal Sector Address or Platter Not Mounted

Cause: The disk sector being addressed is not on the disk or the disk platter is not mounted. (Maximum Legal sector address depends upon the model of disk used.)

Recovery: Correct the program statement in error, or mount a platter in the specified drive.

ERR I99

Error: Read After Write Error

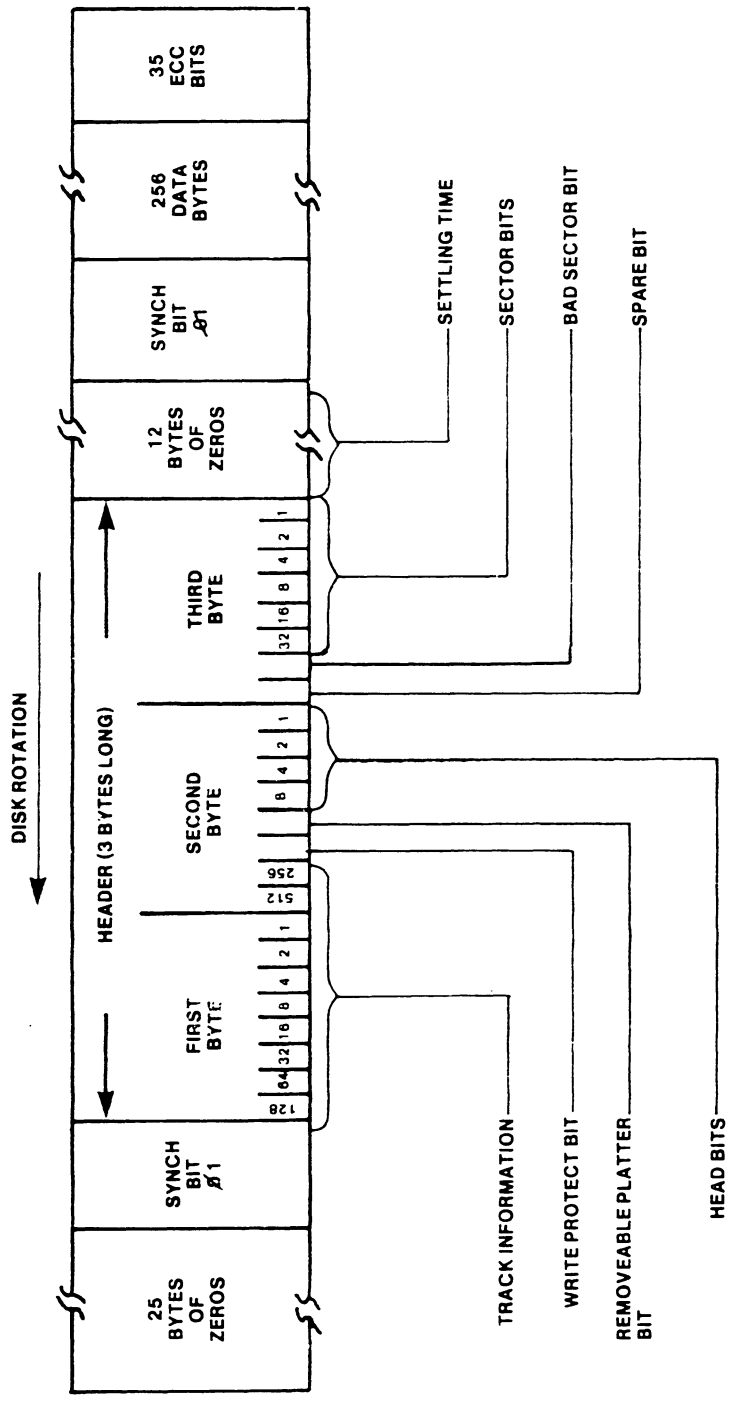
Cause: The comparison of read after write to a disk sector failed, indicating that the information was not written properly. This error usually indicates a bad disk platter.

Recovery: Write the information again. If error persists, try a new platter; if error still persists, call your Wang Service Representative.

APPENDIX B
DISK SECTOR LAYOUT

APPENDIX B

DISK SECTOR LAYOUT



APPENDIX C

BILL OF MATERIALS

APPENDIX C

BILL OF MATERIALS

A Bill of Materials for the 2280 DPU starts on the following page.

ASSEMBLY PART NUMBER 127-2200-80- -
ASSEMBLY DESCRIPTION 2200 DISK PROCESSOR UNIT

LEGEND
1: PHPHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
1		IN		187-2200-80- -	MFI 2280 DISK TO VP/MVP INTFC		1.0000	EACH	00010
2		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		2.4610		00000
2		IN		000-0011- - -	LABOR QUALITY CONTROL		.4920		00000
2		IN		210-L567- - -	PCA 2200A/B/C/S/T PS REGULATOR		1.0000	EACH	00023
3		IN		000-0003- - -	LABOR CALCULATING SYSTEMS		1.0000		00000
3		IN		000-0011- - -	LABOR QUALITY CONTROL		.2000		00000
3		IN		000-9999- - -	OTHER DIRECT COST		14.3880	EACH	00000
3		IN		300-1082- - -	CAP 82 PF 10% 500 V CERAMIC DISC		1.0000	EACH	
3		IN		300-1100- - -	CAP 100 PF 10% 500 V CERAMIC DISC		1.0000	EACH	
3		IN		300-1906- - -	CAP .001 UF 10% 500 V CERAMIC DISC		2.0000	EACH	
3		FS		300-4000-R - -	CAP 1.0 UF 35V 10% TANT AXIAL T&R	E15765	11.0000	EACH	
3		FS		300-4001-R - -	CAP .47 UF 35V 10% TANT AXIAL T&R	E15765	2.0000	EACH	
3		FS		300-4002-R - -	CAP .1 UF 35V 10% TANT AXIAL T&R	E15765	1.0000	EACH	
3		FS		300-4013-R - -	CAP 1.2 UF 35V 10% TANT AXIAL T&R	E15765	1.0000	EACH	
3		FS		300-4014-R - -	CAP 2.2 UF 20V 10% TANT AXIAL T&R	E15765	1.0000	EACH	
3		FS		300-4018-R - -	CAP 10.0 UF 15V 10% TANT AXIAL T&R	E15765	1.0000	EACH	
3		IN		300-4019- - -	CAP 33.0 UF 15 V 10% TANT AXIAL		1.0000	EACH	
3		IN		300-4020- - -	CAP 47.0 UF 15 V 10% TANT AXIAL		1.0000	EACH	
3		IN		300-4032- - -	CAP 10.0 UF 35 V 10% TANT AXIAL		4.0000	EACH	
3		FS		330-1027- - -	RES 27 OHM 1/4W 10% FIXED COMP	E15765	2.0000	EACH	
3		FS		330-2010- - -	RES 100 OHM 1/4W 10% FIXED COMP	E15765	1.0000	EACH	
3		FS	*	330-2022- - -	RES 220 OHM 1/4W 10% FIXED COMP		4.0000	EACH	
3		FS		330-2033- - -	RES 330 OHM 1/4W 10% FIXED COMP	E15765	1.0000	EACH	
3		FS		330-2047- - -	RES 470 OHM 1/4W 10% FIXED COMP	E15765	2.0000	EACH	
3		FS		330-2056- - -	RES 560 OHM 1/4W 10% FIXED COMP	E15765	2.0000	EACH	
3		FS		330-2068- - -	RES 680 OHM 1/4W 10% FIXED COMP	E15765	2.0000	EACH	
3		FS	*	330-3010- - -	RES 1K OHM 1/4W 10% FIXED COMP	E15765	8.0000	EACH	
3		FS	*	330-3015- - -	RES 1.5K OHM 1/4W 10% FIXED COMP		7.0000	EACH	
3		FS	*	330-3022- - -	RES 2.2K OHM 1/4W 10% FIXED COMP	E16778	2.0000	EACH	
3		FS		330-3033- - -	RES 3.3K OHM 1/4W 10% FIXED COMP	E16778	2.0000	EACH	
3		FS		330-3047- - -	RES 4.7K OHM 1/4W 10% FIXED COMP	E15765	2.0000	EACH	
3		FS		330-3068- - -	RES 6.8K OHM 1/4W 10% FIXED COMP	E15765	1.0000	EACH	
3		FS		330-3083- - -	RES 8.2K OHM 1/4W 5% FIXED COMP	E15765	2.0000	EACH	
3		FS		330-4012- - -	RES 12K OHM 1/4W 10% FIXED COMP	E15765	1.0000	EACH	
3		FS		330-4015- - -	RES 15K OHM 1/4W 10% FIXED COMP	E15765	1.0000	EACH	
3		FS		330-4040- - -	RES 39K OHM 1/4W 5% FIXED COMP	E15765	1.0000	EACH	
3		FS		331-0010-R - -	RES 1 OHM 1/2W 10% FIXD COMP T&R	E15765	1.0000	EACH	
3		FS		331-2015-R - -	RES 150 OHM 1/2W 10% FIXD COMP T&R	E15765	1.0000	EACH	
3		FS		333-0053-R - -	RES 2.37K OHM 1/8W 1% FIX FILM T+R	E15765	2.0000	EACH	
3		IN		336-1014- - -	RES 1K OHM VAR TRIM SIDE ADJ SQ		4.0000	EACH	
3		IN		336-1015- - -	RES 10K OHM VAR TRIM SIDE ADJ SQ	EC4859	2.0000	EACH	
3		IN		375-0317- - -	TSTR 2N3014 360MW 40V SM NPN S 52		1.0000	EACH	
3		IN		375-0018- - -	TSTR 2N4037 1.0W 40V S PNP S		5.0000	EACH	
3		IN		375-9001- - -	TRANSIPAD 8977887-1 LARGE		5.0000	EACH	
3		IN		375-9004- - -	TRANSIPAD TO-18 (SMALL)		1.0000	EACH	
3		IN		376-0066- - -	IC 723 VOLTAGE REGULATOR		4.0000	EACH	
3		IN		376-0134- - -	IC LM304 NEG VOLTAGE REGULATOR		2.0000	EACH	
3		FS		380-1001-R - -	DIO35 SIL DIODE 30V, 100MA AT 1V T&R	E15765	2.0000	EACH	
3		FS	*	380-1004-R - -	DIO35 SIL DIODE 40V, 250MA AT 1V -R		3.0000	EACH	
3		FS		380-2033-R - -	DIO ZEN 1N746A 3.3V 400MW SD07 T+R	E15765	1.0000	EACH	
3		IN		380-3005- - -	1N5823 / MBD5300		1.0000	EACH	
3		IN		510-L567- - -	PCB 2200A/B/C/S/T PS REGULATOR		1.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-80- -
ASSEMBLY DESCRIPTION 2280 DISK PROCESSOR UNIT

LEGEND
1: P=PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
3	P	FS		600-1002- - -	WIRE 22 GA RED	E16826	.3333	FEET	
4		FS		600-1009- - -	WIRE 22 GA WHITE		1.0000	FEET	
3	P	FS		600-7000- - -	16 GA BLACK STRANDED WIRE	E16826	.0833	FEET	
4		FS		600-7009- - -	16 GA WHITE STRANDED WIRE		1.0000	FEET	
2		IN		210-7415- - -	PCA 2200SMD PRIME CIRCUIT		1.0000	EACH	00023
3		IN		000-0001- - -	LABOR CIRCUIT SYSTEMS		.6890		00000
3		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		1.6680		00000
3		IN		000-0011- - -	LABOR QUALITY CONTROL		.4150		00000
3		IN		300-1931- - -	1 UF CERAMIC CAPACITOR(HIGH FREQ)		2.0000	EACH	
3		IN		300-4021- - -	CAP 100.0 UF 15 V 10% TANT AXIAL		2.0000	EACH	
3		FS		330-3022- - -	RES 2.2K OHM 1/4W 10% FIXED COMP		1.0000	EACH	
3		FS		331-2010-R - -	RES 100 OHM 1/2W 10% FIXD COMP T&R	E15690	2.0000	EACH	
3		FS		333-0060-R - -	RES 4.02K OHM 1/8W 1% FIX FL T+R	E15690	4.0000	EACH	
3		IN		333-0061- - -	RES 9.09K OHM 1/8W 1% FIXED FILM		2.0000	EACH	
3		IN		333-0069- - -	RES 6.19K OHM 1/8W 1% FIXED FILM		2.0000	EACH	
3.		FS		333-0090-R - -	RES 10 K OHM 1/8W 1% FIX FILM T+R	E15690	6.0000	EACH	
*		IN		334-0002- - -	15 OHM 11W FIXED RESISTOR		1.0000	EACH	
3		IN		374-0002- - -	IC REG UA 7905 -5V TO-220		1.0000	EACH	
3		IN		376-0240- - -	IC LM339 4 COMPARATOR		1.0000	EACH	
3		FS		380-1001- - -	D035 SIL DIODE 30V 100 MA AT 1V T&R		3.0000	EACH	
3		FS		380-2062-R - -	DIO ZEN 1N753A 6.2V 400MW SD07 T+R	E15690	2.0000	EACH	
3		IN		510-7415- - -	PCB 2200SMD PRIME CIRCUIT		1.0000	EACH	
*		FS		650-3087- - -	SCR 6-32 1/4 PAN SLOT MS NYL	E12099	1.0000	EACH	
3		FS		652-3002- - -	NUT 6-32UNC HEX REG PAT NYLON	E12099	1.0000	EACH	
2		IN		210-7421-A - -	PCA 2200SMD ALU/MUX INTERFACE		1.0000	EACH	00023
3		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		.2740		00000
3		IN		000-0011- - -	LABOR QUALITY CONTROL		.0550		00000
3	P	IN		209-7421- - -	PCA 2200SMD ALU/MUX INTERFACE		1.0000	EACH	
4		IN		000-0001- - -	LABOR CIRCUIT SYSTEMS		2.1260		00000
4		IN		000-0011- - -	LABOR QUALITY CONTROL		.4250		00000
4		IN		300-1100- - -	CAP 100 PF 10% 500 V CERAMIC DISC	E10439	1.0000	EACH	
4		IN		300-1150- - -	CAP 150 PF 10% 500 V CERAMIC DISC	18091	1.0000	EACH	
4		FS		300-1966- - -	CAP .047 UF 50V+80-20% CERAMIC MLD	E13726	20.0000	EACH	
4		IN		300-3011- - -	CAP 100 UF 16V -10+75% ELECT AXIAL		1.0000	EACH	
4		FS		300-4022-R - -	CAP 15.0 UF 20V 10% TANT AXIAL T&R	E15690	2.0000	EACH	
4		FS		330-2025- - -	RES 240 OHM 1/4W 5% FIXED COMP	E15690	1.0000	EACH	
4		FS		330-2033- - -	RES 330 OHM 1/4W 10% FIXED COMP	E12553	5.0000	EACH	
4		FS		330-2039- - -	RES 390 OHM 1/4W 10% FIXED COMP	E15690	8.0000	EACH	
4		FS		330-2047- - -	RES 470 OHM 1/4W 10% FIXED COMP	18091	1.0000	EACH	
4		FS		330-3010- - -	RES 1K OHM 1/4W 10% FIXED COMP	18091	9.0000	EACH	
4		FS		330-5010- - -	RES 100K OHM 1/4W 10% FIXED COMP	E15690	1.0000	EACH	
4		FS		333-0057-R - -	RES 16.9K OHM 1/8W 1% FIX FILM T+R	E15690	1.0000	EACH	
4		IN		350-2066- - -	CONN RECEPT.36 SLD CUP W/O FLOAT	E12101	1.0000	EACH	
4		IN		376-0002- - -	IC 7400N 4 2 IN POS NAND GATE		1.0000	EACH	
4		IN		376-0003- - -	IC 7410N 3 3 IN POS NAND GATE		1.0000	EACH	
4		IN		376-0006- - -	IC 7474N 2 D EDGE TRIG FLIP-FLOP	E12101	1.0000	EACH	
4		IN		376-0007- - -	IC 7476N 2 JK MA-SLV F/F PRST CLEAR		1.0000	EACH	
4		IN		376-0010- - -	IC 7404N HEX INVERTER	E12079	1.0000	EACH	
4		IN		376-0012- - -	IC 7451N EXP 2 W 2 IN AND OR INV GT		1.0000	EACH	

ASSEMBLY PART NUMBER 376-0000-02- -
ASSEMBLY DESCRIPTION 2200 CPU PROCESSOR UNIT

LEGEND
I: PERMANENT; C: ITEM MASTER DELY CODE; *: *TAGGED OUT OF REFERENCED SITE)

POSITION STRUCTURE	IN 1	LEGEND 2	COMPONENT PART NUMBER	DESCRIPTION	F C N	QUANTITY PER ASSY	U/M	L/T
4	IN		376-0016- - -	IC 7402N 4 2 IN POS NOR GATE		1.0000	EACH	
4	IN		376-0048- - -	IC 74153 2 4-1 LINE DATA SEL MX	E12101	2.0000	EACH	
4	IN		376-0081- - -	IC 7408 4 2 IN POS AND GATE	E12101	3.0000	EACH	
4	IN		376-0082- - -	IC 74157 4 2 IN MX		2.0000	EACH	
4	IN		376-0083- - -	IC 7432 4 2 IN OR GATE		3.0000	EACH	
4	IN		376-0086- - -	IC 9321 2 1 OF 4 DECODER		1.0000	EACH	
4	IN		376-0104- - -	IC 9602 2 RETRIG RESET MONOSTBL MVB	E10439	1.0000	EACH	
4	IN		376-0139- - -	IC 7414 HEX SCHMITT TRIGGER	E12079	5.0000	EACH	
4	IN		376-0153- - -	IC 74LS368 HEX BUS DRIVER 3 STATE		2.0000	EACH	
4	IN		376-0154- - -	IC 7411 3 3 IN POS AND GATE	PATREL	1.0000	EACH	
4	IN		376-0286- - -	IC 74LS374 8 LATCHES W/TR ST OUTP		1.0000	EACH	
4	IN		376-0297- - -	IC 74LS240 OCTAL BUF/LINE DR/LN REC	PATREL	1.0000	EACH	
4	IN		376-0303- - -	IC 74LS299 SCHOTTKY 8 BIT UNIV REG		1.0000	EACH	
4	IN		376-9003- - -	IC 24 PIN SOCKET BURNDY	E12101	8.0000	EACH	
4	IN		376-9005- - -	IC 16 PIN SOCKET CAMBION	E12101	1.0000	EACH	
4	IN		376-9008- - -	IC 16 PIN TEKNA #4330	E12101	1.0000	EACH	
4	FS		380-1001-R - -	DI35 SIL DIODE 30V, 100MA AT 1V T&R	E15690	1.0000	EACH	
4	IN		449-0247- - -	HANDLE,FACEPLATE B6815-123	E11116	2.0000	EACH	
4	IN		452-2095-36- -	PC FACE PLATE (36 PIN) C6422-354	E11039	1.0000	EACH	
4	IN		461-3140- - -	SCREW CAP 8-32 B6422-231	E11039	2.0000	EACH	
4	IN		461-3141- - -	SCREW CAP HOUSING B6422-233	E11039	2.0000	EACH	
4	IN		462-0251- - -	STANDOFF,MALE/FEMALE B6815-56	E11039	2.0000	EACH	
4	IN		510-7421- - -	PCB 2200SMD ALU/MUX INTERFACE		1.0000	EACH	
4	FS		650-2120- - -	4-40 X 3/8 PAN HD PHL MS SS SEMS	E12101	3.0000	EACH	
4	FS		651-0030- - -	SCREW,SELF TAP T-B #4X1/2"L PNHD PH	E12101	4.0000	EACH	
4	FS		653-2000- - -	NO. 4 FLAT WASHER	E12101	3.0000	EACH	
4	FS		653-3002- - -	WASH 6 .141ID .250OD .062 FL NYL	E12553	3.0000	EACH	
3	IN		376-0050- - -	IC 74154 1 OF 16 DECODER DEMX E7758	E12101	1.0000	EACH	
3	IN		376-0099- - -	IC 74181 ARITHMETIC LOGIC UNITS	E12101	1.0000	EACH	
3	IN		376-0320- - -	IC 74 S412 MULTI-MODE BUFFRD LATCH	E12101	1.0000	EACH	
3	IN		377-0353- - -	AM2905 LOW PWR SCHOTTKY BUS TRNSCVR		4.0000	EACH	
2	IN		210-7422- - -	PCA 2200SMD ECC/DEVICE INTERFACE		1.0000	EACH	00023
3	IN		000-0001- - -	LABOR CIRCUIT SYSTEMS		1.9460		00000
3	IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		2.2680		00000
3	IN		000-0011- - -	LABOR QUALITY CONTROL		.8430		00000
3	FS		300-1966- - -	CAP .047 UF 50V+80-20% CERAMIC MLD	E13726	18.0000	EACH	
3	FS		300-4022-R - -	CAP 15.0 UF 20V 10% TANT AXIAL T&R	E15690	3.0000	EACH	
3	FS		330-1056- - -	RES 56 OHM 1/4W 10% FIXED COMP	E12648	96.0000	EACH	
3	FS		330-2068- - -	RES 680 OHM 1/4W 10% FIXED COMP	E15690	2.0000	EACH	
3	FS		330-3010- - -	RES 1K OHM 1/4W 10% FIXED COMP	E15690	2.0000	EACH	
3	FS		330-3022- - -	RES 2.2K OHM 1/4W 10% FIXED COMP	19476	5.0000	EACH	
3	FS		330-4021- - -	RES 20K OHM 1/4W 5% FIXED COMP	E15690	2.0000	EACH	
3	IN		350-0057- - -	60P 90 DEG HDR ASSY PCB LK & EJECT	E10865	1.0000	EACH	
3	IN		350-0058- - -	26P 90 DEG HDR CONN ASSY PCB LK EJT	E10865	2.0000	EACH	
3	IN		376-0002- - -	IC 7400N 4 2 IN POS NAND GATE	18092	3.0000	EACH	
3	IN		376-0003- - -	IC 7410N 3 3 IN POS NAND GATE	E12648	1.0000	EACH	
3	IN		376-0004- - -	IC 7420N 2 4 IN POS NAND GATE	E12648	1.0000	EACH	
3	IN		376-0010- - -	IC 7404N HEX INVERTER	E10865	2.0000	EACH	
3	IN		376-0016- - -	IC 7402N 4 2 IN POS NOR GATE		1.0000	EACH	
3	IN		376-0031- - -	IC 7430 8 I POS NAND GATE	E10865	3.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-40- -
ASSEMBLY DESCRIPTION 2200 DISK PROCESSOR UNIT

LEGEND
1: PHANTOM; 2: ITEM MASTER DELY CODE; 3: **TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
3		IN		376-0036- - -	IC 7486N 4 2 IN EXCLUSIVE OR GATE		4.0000	EACH	
3		IN		376-0061- - -	IC 7408 4 2 IN POS AND GATE		2.0000	EACH	
3		IN		376-0082- - -	IC 74157 4 2 IN MX		1.0000	EACH	
3		IN		376-0094- - -	IC 74161 SYNCHRONOUS 4 BIT COUNTER		4.0000	EACH	
3		IN		376-0098- - -	IC 74174 HEX D TYPE FLIP FLOP	PATREL	2.0000	EACH	
3		IN		376-0119- - -	IC 74175 4 D TYPE EDGE TRIG F/F		6.0000	EACH	
3		IN		376-0202- - -	IC 74S74 2 D TYPE F F W PRESET CLER		1.0000	EACH	
3		IN		376-0205- - -	IC 74S32 4 2 IN POS OR GATE		1.0000	EACH	
3		IN		376-0206- - -	IC 74S260 2 5 IN POS NOR GATE		1.0000	EACH	
3		IN		376-0238- - -	IC 74S10 3 3 IN POS NAND GATE		1.0000	EACH	
3		IN		376-0256- - -	IC 75110 2 LINE DRIVER	PATREL	2.0000	EACH	
3		IN		376-0274- - -	IC MC3453L4 LINE DRIVER		5.0000	EACH	
3		IN		376-0275- - -	IC MC3450P 4 LINE RECEIVER		6.0000	EACH	
3		IN		376-0303- - -	IC 74LS299 SCHOTTKY 8 BIT UNIV RES		2.0000	EACH	
3		IN		376-0317- - -	IC 25LS2521 8-BIT EQUAL TO CMPRTR		2.0000	EACH	
3		IN		449-0247- - -	HANDLE,FACEPLATE B6815-123	E11770	2.0000	EACH	
3		IN		452-2295-35- -	FACE PLATE 2200 PHOENIX D6422-348	E10865	1.0000	EACH	
3		IN		461-3140- - -	SCREW CAP 8-32 B6422-231	E10865	2.0000	EACH	
3		IN		461-3141- - -	SCREW CAP HOUSING B6422-233	E10865	2.0000	EACH	
3		IN		510-7422- - -	PCB 2200SMD ECC/DEVICE INTERFACE		1.0000	EACH	
3		FS		650-1120- - -	SCR 3-48 3/8 SLOT PH MS SS	E10865	1.0000	EACH	
3		FS		650-1160- - -	SCR 3-48 1/2 SLOT PH MS SS	E10865	6.0000	EACH	
3		FS		651-0030- - -	SCREW,SELF TAP T-B #4X1/2"L FNHD PH	E12648	4.0000	EACH	
2		IN		210-7423-A - -	PCA 2200SMD RAM/PROM CNTL		1.0000	EACH	00023
3		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		2.5730		00000
3		IN		000-0011- - -	LABOR QUALITY CONTROL		.5150		00000
3	P	IN		209-7423- - -	PCA 2200SMD RAM/PROM CNTL		1.0000	EACH	
4		IN		000-0001- - -	LABOR CIRCUIT SYSTEMS		1.2760		00000
4		IN		000-0011- - -	LABOR QUALITY CONTROL		.2550		00000
4		IN		300-1010- - -	CAP 10 PF 10% 500 V CERAMIC DISC		1.0000	EACH	
4		IN		300-1220- - -	CAP 220 PF 10% 500 V CERAMIC DISC	E11204	1.0000	EACH	
4		IN		300-1906- - -	CAP .001 UF 10% 500 V CERAMIC DISC		1.0000	EACH	
4		FS		300-1966- - -	CAP .047 UF 50V+80-20% CERAMIC MLD	E13726	24.0000	EACH	
4		FS		300-4022-R - -	CAP 15.0 UF 20V 10% TANT AXIAL TRR	E15690	4.0000	EACH	
4		IN		321-0008- - -	CRYSTAL 10.0 5 % QUARTZ HC-18/U		1.0000	EACH	
4		FS		330-2022- - -	RES 220 OHM 1/4W 10% FIXED COMP	20200	1.0000	EACH	
4		FS		330-2033- - -	RES 330 OHM 1/4W 10% FIXED COMP	E15690	1.0000	EACH	
4		FS		330-2047- - -	RES 470 OHM 1/4W 10% FIXED COMP	20200	8.0000	EACH	
4		FS		330-3018- - -	RES 1.8K OHM 1/4W 10% FIXED COMP	E15690	1.0000	EACH	
4		FS		330-3022- - -	RES 2.2K OHM 1/4W 10% FIXED COMP	E12634	6.0000	EACH	
4		FS		333-0061-R - -	RES 16.2K OHM 1/8W 1% FIX FL T+R	E15690	1.0000	EACH	
4		IN		376-0002- - -	IC 7400N 4 2 IN POS NAND GATE		1.0000	EACH	
4		IN		376-0006- - -	IC 7474N 2 D EDGE TRIG FLIP-FLOP	E10675	2.0000	EACH	
4		IN		376-0008- - -	IC 7442N 4 LINE-10 LINE DECODER	E12634	1.0000	EACH	
4		IN		376-0010- - -	IC 7404N HEX INVERTER		3.0000	EACH	
4		IN		376-0012- - -	IC 7451N EXP 2 W 2 IN AND OR INV GT		1.0000	EACH	
4		IN		376-0016- - -	IC 7402N 4 2 IN POS NOR GATE	E10675	1.0000	EACH	
4		IN		376-0044- - -	IC 74153 2 4-1 LINE DATA SEL MX		1.0000	EACH	
4		IN		376-0053- - -	IC 74193 SYN 4 BIT UP DOWN COUNTER	E10675	4.0000	EACH	
4		IN		376-0061- - -	IC 7408 4 2 IN POS AND GATE		2.0000	EACH	
4		IN		376-0082- - -	IC 74157 4 2 IN MX	E10675	2.0000	EACH	

ASSEMBLY PART NUMBER 172-2220-50- -
ASSEMBLY DESCRIPTION 2250 DISK PROCESSOR UNIT

LEGEND
1: PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION STRUCTURE	IN 1	LEGEND 2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
4		IN		376-0093- - -	IC 7432 4 2 IN OR GATE	E10679	5.0000	EACH	
4		IN		376-0096- - -	IC 9321 2 1 OF 4 DECODER		1.0000	EACH	
4		IN		376-0097- - -	IC 74195 4 BIT PAR ACCESS SHIFT REG	E12634	1.0000	EACH	
4		IN		376-0098- - -	IC 74174 HEX D TYPE FLIP FLOP		3.0000	EACH	
4		IN		376-0104- - -	IC 9602 2 RETRIG RESET MONOSTBL MVB		1.0000	EACH	
4		IN		376-0125- - -	IC 7427 3 3 IN NOR GATE		1.0000	EACH	
4		IN		376-0139- - -	IC 7414 HEX SCHMITT TRIGGER	E10679	1.0000	EACH	
4		IN		376-0191- - -	IC 74160 SYN 4 BIT CTR	E10679	1.0000	EACH	
4		IN		376-0294- - -	IC 74LS138 3-8 LINE DECODER/MPX	E10679	1.0000	EACH	
4		IN		376-9002- - -	IC 16 PIN SOCKET BURNDY	E10679	2.0000	EACH	
4		IN		376-9003- - -	IC 24 PIN SOCKET BURNDY	E10679	6.0000	EACH	
4		IN		376-9014- - -	IC 18 PIN SOCKET	E10679	18.0000	EACH	
4		IN		376-9020- - -	IC 20PIN SOCKET DIL LOW PROFILE	E10679	3.0000	EACH	
4		IN		510-7423- - -	PCB 2200SMD RAM/PROM CNTL		1.0000	EACH	
3		IN		377-0341-L - -	2114L 1KX4 STATIC RAM 450NS L PWR	E11118	18.0000	EACH	
3		IN		377-0347- - -	2911 BIPOLAR MICROPRGRM SEQUENCES		3.0000	EACH	
3		IN		377-0353- - -	AM2905 LOW PWR SCHOTTKY BUS TRNSCVR		2.0000	EACH	
3		FS		378-4083-R7- -	2280 DPU MICROCODE CHIP #4 L13	18418	1.0000	EACH	00003
4		IN		377-0348- - -	TMS2716 2KX8 EPROM 12V		1.0000	EACH	
3		FS		378-4084-R7- -	2280 DPU MICROCODE CHIP #3 L14	18418	1.0000	EACH	00003
4		IN		377-0348- - -	TMS2716 2KX8 EPROM 12V		1.0000	EACH	
3		FS		378-4085-R7- -	2280 DPU MICROCODE CHIP #1 L15	18418	1.0000	EACH	00003
4		IN		377-0348- - -	TMS2716 2KX8 EPROM 12V		1.0000	EACH	
3		FS		378-4086-R7- -	2280 DPU MICROCODE CHIP #2 L16	18418	1.0000	EACH	00003
4		IN		377-0348- - -	TMS2716 2KX8 EPROM 12V		1.0000	EACH	
2		IN		210-7424- - -	PCA 2200SMD I/O CONTROLLER		1.0000	EACH	00023
3		IN		000-0001- - -	LABOR CIRCUIT SYSTEMS		.9510		00000
3		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		1.4020		00000
3		IN		000-0011- - -	LABOR QUALITY CONTROL		.6710		00000
3		IN		300-1220- - -	CAP 220 PF 10% 500 V CERAMIC DISC	E12563	1.0000	EACH	
3		IN		300-1470- - -	CAP 470 PF 10% 500 V CERAMIC DISC	E12231	3.0000	EACH	
3		FS		300-1966- - -	CAP .047 UF 50V+80-20% CERAMIC MLD	E13726	17.0000	EACH	
3		FS		300-4022-R - -	CAP 15.0 UF 20V 10% TANT AXIAL TRR	E15690	2.0000	EACH	
3		FS		330-3022- - -	RES 2.2K OHM 1/4W 10% FIXED COMP	E15690	3.0000	EACH	
3		IN		376-0002- - -	IC 7400N 4 2 IN POS NAND GATE		2.0000	EACH	
3		IN		376-0004- - -	IC 7420N 2 4 IN POS NAND GATE	F12490	2.0000	EACH	
3		IN		376-0014- - -	IC 7474N 2 D EDGE TRIG FLIP-FLOP		6.0000	EACH	
3		IN		376-0010- - -	IC 7404N HEX INVERTER	18094	3.0000	EACH	
3		IN		376-0012- - -	IC 7451N EXP 2 W 2 IN AND OR INV GT		4.0000	EACH	
3		IN		376-0016- - -	IC 7402N 4 2 IN POS NOR GATE	E12563	2.0000	EACH	
3		IN		376-0053- - -	IC 74193 SYN 4 BIT UP DOWN COUNTER		3.0000	EACH	
3		IN		376-0081- - -	IC 7408 4 2 IN POS AND GATE		5.0000	EACH	
3		IN		376-0093- - -	IC 7432 4 2 IN OR GATE	E12563	2.0000	EACH	
3		IN		376-0096- - -	IC 9321 2 1 OF 4 DECODER		2.0000	EACH	
3		IN		376-0139- - -	IC 7414 HEX SCHMITT TRIGGER	18094	1.0000	EACH	
3		IN		376-0194- - -	IC 7411 3 3 IN POS AND GATE		4.0000	EACH	
3		IN		376-0238- - -	IC 74S10 3 3 IN POS NAND GATE	E10725	2.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-80- -
ASSEMBLY DESCRIPTION 2280 DISK PROCESSOR UNIT

LEGEND
1: P=PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1 2 3	COMPONENT PART NUMBER	DESCRIPTION	F C N	QUANTITY PER ASSY	U/M	L/T
3	IN	376-0286- - -	IC 74LS374 8 LATCHES W/TR ST OUTP		4.0000	EACH	
3	IN	376-0288- - -	IC 74LS244 OCTUAL BUF/LINE DR 3 OUT		1.0000	EACH	
3	IN	376-0298- - -	IC 74S138 3 TO 8 LINE DECODER/MPX		1.0000	EACH	
3	IN	376-0303- - -	IC 74LS299 SCHOTTKY 8 BIT UNIV RES		1.0000	EACH	
3	IN	376-0317- - -	IC 25LS2521 8-BIT EQUAL TO CMPRTR		1.0000	EACH	
3	IN	376-0318- - -	IC 74276 QUAD J-K FLIP FLOPS		3.0000	EACH	
3	IN	510-7424- - -	PCB 2200/MD I/O CONTROLLER		1.0000	EACH	
3	FS	600-9012- - -	24 GA YELLOW SOLID TEFLON WIRE	17991	.1042	FEET	
2	IN	220-0138- - -	12"EXTENSION CABLE(36C)B6482-16		1.0000	EACH	00010
3	IN	000-0004- - -	LABOR SUB-SYSTEMS		.6980	EACH	00000
3	IN	000-0011- - -	LABOR QUALITY CONTROL		.1400		00000
3	IN	350-2082- - -	CONN 18-36 CABLE TO PANEL PLUG	EC6407	2.0000	EACH	
3	IN	350-4228-G - -	STRAIN RELIEF CVR 36 POS 180DEG GRV	EC8484	2.0000	EACH	
3	IN	350-4228-T - -	STRAIN RELIEF CVR 36 POS 180DEG TNG	EC8484	2.0000	EACH	
3	IN	350-4234- - -	4-40X3/8 CAPT SCR FOR SCR MT CONNS.	EC6407	4.0000	EACH	
3	FS	420-0054- - -	36 COND 26 GA SHIELDED CABLE	EC6407	13.0000	FEET	
3	IN	458-0361- - -	GROUND STRAP C6815-28	EC6407	2.0000	EACH	
3	IN	605-1011- - -	TY-WRAP IDENT MARKER	E15816	1.0000	EACH	
2	IN	220-3032- - -	30 PAIR FLAT CA ASSY(5') D6482-188		1.0000	EACH	00010
3	IN	000-0004- - -	LABOR SUB-SYSTEMS		.2370	EACH	00000
3	IN	000-0011- - -	LABOR QUALITY CONTROL		.0470		00000
3	IN	350-0414- - -	30-60 RECEPT CONN .100	EC8371	2.0000	EACH	
3	IN	350-4120- - -	PULL TAB FOR FLAT CABLE	EC8371	2.0000	EACH	
3	FS *	420-0070- - -	30 TWISTED PAIR/FLAT RIBBON CABLE		5.0000	FEET	
3	FS	660-0156- - -	GLUE,HOTMELT(.750DX1.375LG)	EC8371	.0100	EACH	
2	IN	220-3033-5 - -	26 COND.SHIELDED FLT CBLE C6482-189		1.0000	EACH	00010
3	IN	000-0004- - -	LABOR SUB-SYSTEMS		.4770	EACH	00000
3	IN	000-0011- - -	LABOR QUALITY CONTROL		.0950		00000
3	IN	350-0413- - -	13-26 RECEPT CONN .100		2.0000	EACH	
3	IN	350-4119- - -	PULL TAB FOR FLAT CABLE		1.0000	EACH	
3	FS	420-0069- - -	26 COND FLAT CABLE W/GRND PLANE		5.0000	FEET	
3	FS	660-0195- - -	HOT MELT GLUE	E13142	.0400	LB	
2	IN	270-0575- - -	PHOENIX DR INTFRC TC VPA/MVPA 2280		1.0000	EACH	00010
3	IN	000-0004- - -	LABOR SUB-SYSTEMS		3.0000	EACH	00000
3	IN	000-0005- - -	LABOR PRODUCTION SYSTEMS		.1210		00000
3	IN	000-0011- - -	LABOR QUALITY CONTROL		.6240		00000
3	IN	210-7416- - -	PCA 2200 SMD MOTHERBOARD	E15193	1.0000	EACH	00023
4	IN	000-0004- - -	LABOR SUB-SYSTEMS		1.3300	EACH	00000
4	IN	000-0011- - -	LABOR QUALITY CONTROL		.2660		00000
4	IN	300-4032- - -	CAP 10.0 UF 35 V 10% TANT AXIAL	E11283	1.0000	EACH	
4	IN	300-4041- - -	CAP 10.0 UF 35 V 5% TANT AXIAL	E12060	1.0000	EACH	
4	FS	331-3010-R - -	RES 1K OHM 1/2W 10% FIXD COMP TAR	E16370	4.0000	EACH	
4	IN	332-2010- - -	RES 100 OHM 1W 10% FIXED COMP		1.0000	EACH	
4	IN	334-0014- - -	1 OHM 2.5W 5% FIXED RESISTOR		1.0000	EACH	
4	IN	334-0016- - -	.6 OHM 4W 5% FIXED RESISTOR		2.0000	EACH	
4	IN	334-0023- - -	.15 OHM 10W 5% RESISTOR	PATREL	3.0000	EACH	
4	IN	350-0011- - -	225-21521-110 PC CONN SOLDER TYPE	E11215	15.0000	EACH	
4	IN	360-3002- - -	DIO 1N4719 50V 3A RECT S C60		4.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-00- -
ASSEMBLY DESCRIPTION 2200 DISK PROCESSOR UNIT

LEGEND
PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	LEGEND 2	LEGEND 3	COMPONENT PART NUMBER	DESCRIPTION	ECN	QUANTITY PER ASSY	U/M	L/T
4		IN		510-7416- - -	PCB 2200 SMD MOTHERBOARD		1.0000	EACH	
4		IN		654-1172- - -	12 POS PIN HEADER ASSY AMP 350213-1	E11683	1.0000	EACH	
4		IN		654-1177- - -	16 POS PC PIN HEADER ASY AMP3502141	E11683	1.0000	EACH	
4		IN		654-1158- - -	2 POS PIN HEADER ASSY AMP 350209-1	E11683	1.0000	EACH	
3		IN		270-0256- - -	2200S HEAT SINK ASSY 6627-8		1.0000	EACH	00030
4		IN		000-0005- - -	LABOR PRODUCTION SYSTEMS		.3750		00000
4		IN		000-0011- - -	LABOR QUALITY CONTROL		.0750		00000
4		IN		000-9999- - -	OTHER DIRECT COST		13.1490	EACH	00000
4		IN		270-3043- - -	2200S HEAT SINK HARNESS		1.0000	EACH	00010
5		IN		000-0004- - -	LABOR SUB-SYSTEMS		.4960	EACH	00000
5		IN		000-0011- - -	LABOR QUALITY CONTROL		.0990		00000
5	P	FS		600-0000- - -	WIRE 18 GA BLACK UL		.5800	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0001- - -	WIRE 18 GA BROWN UL		.5800	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0002- - -	WIRE 18 GA RED UL		1.4200	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0003- - -	WIRE 18 GA ORANGE UL		1.1700	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0004- - -	WIRE 18 GA YELLOW UL		1.1700	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0005- - -	WIRE 18 GA GREEN UL		.6700	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0006- - -	WIRE 18 GA BLUE UL		1.1700	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0007- - -	WIRE 18 GA VIOLET UL		.6700	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5		FS		600-0009- - -	WIRE 18 GA WHITE UL		.5800	FEET	
5	P	FS		600-0050- - -	WIRE 18 GA WH/BLK		1.0000	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-0052- - -	18 GA WIRE WH/RED	ECR399	1.0400	FEET	
6		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2005- - -	WIRE 24 GA GREEN UL	W/CFF-76	1.0000	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.1700	FEET	
5	P	FS		600-2050- - -	WIRE 24 GA WH/BLK UL		.5800	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2051- - -	WIRE 24 GA WH/BRN UL		.5800	FEET	
		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	

ASSEMBLY PART NUMBER 177-2200-80- -
ASSEMBLY DESCRIPTION 2200 DISK PROCESSOR UNIT

LEGEND
1: P=PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
5	P	FS		600-2092- - -	WIRE 24 GA WH/RED UL	EC8399	1.1700	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2093- - -	WIRE 24 GA WH/ORN UL		1.1700	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2094- - -	WIRE 24 GA WH/YEL UL	RE2285	1.0400	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2095- - -	WIRE 24 GA WH/GRN UL		.6700	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-2097- - -	WIRE 24 GA WH/VIO UL		.6700	FEET	
6		FS		600-2009- - -	WIRE 24 GA WHITE UL		1.0000	FEET	
5	P	FS		600-7002- - -	16 GA RED STRANDED WIRE		.9200	FEET	
6		FS		600-7009- - -	16 GA WHITE STRANDED WIRE		1.0000	FEET	
5	P	FS		600-7003- - -	16 GA ORANGE STRANDED WIRE		1.1700	FEET	
6		FS		600-7009- - -	16 GA WHITE STRANDED WIRE		1.0000	FEET	
5	P	FS		600-7006- - -	16 GA BLUE STRANDED WIRE		1.7500	FEET	
6		FS		600-7009- - -	16 GA WHITE STRANDED WIRE		1.0000	FEET	
5		FS	*	605-1004- - -	CABLE TYE, PAN-TY PLTIM-M		15.0000	EACH	
5		IN		606-3043- - -	3/4" DIA WHT SHRINK BLK NU 270-3043	E12826	1.0000	EACH	CC001
5		FS	*	654-1163-R - -	SOCKET 20-14 GA.(REEL) AMP 61117-4		16.0000	EACH	
5		FS	*	654-1165-R - -	SOCKET 30-22 GA (REEL) AMP 350078-4		10.0000	EACH	
5		IN		654-1171- - -	12 POS SOCKET HOUSING AMP 1-4802870		1.0000	EACH	
5		IN		654-1176- - -	16 POS SOCKET HOUSING AMP 1480438-0		1.0000	EACH	
4		IN		375-1008- - -	40251 / MJ2801 TRANSISTOR	EC9826	1.0000	EACH	
4		IN		375-1022- - -	40250 / 2N4231A PWR TRANSISTOR		6.0000	EACH	
4		IN		375-1030- - -	2N5956 TRANSISTOR		2.0000	EACH	
4		IN		375-1072- - -	TRANSISTOR 2N5685 300W S NPN TO-3	EC9826	1.0000	EACH	
4		IN		375-9014- - -	INSULATOR XTOR MOUNT WECKESSER TM-1	10C280	3.0000	EACH	
4		IN		375-9015- - -	INSULATOR XTOR MOUNT WECKESSER TM-2		8.0000	EACH	
4		IN		375-9019- - -	MICA WSHR (SMALL) FOR POWER XISTORS	EC6584	8.0000	EACH	
4		IN		375-9020- - -	MICA WSHR (LARGE) FOR POWER XISTORS	EC6584	3.0000	EACH	
4		IN		380-3000- - -	DIO 1N1200A 100V 12A RECT S D04		2.0000	EACH	
4		IN		380-4003- - -	M-7110 MDA 970-1 RECTIFIER		1.0000	EACH	
4		IN		380-9002- - -	MICA WSHR .191DX.630DX.003THK(3000)	E15082	2.0000	EACH	
4		IN		478-0275- - -	HEATSINK,(2200S)D6627-11		1.0000	EACH	
4	P	FS	*	600-0097- - -	18 GA WIRE WH/VIOLET		.5100	FEET	
5		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
4		FS	*	610-9015- - -	WIRE 14 GA TINNED COPPER BUS (UL)		.2100	FEET	
4		FS	*	610-9018- - -	WIRE 18 GA TINNED COPPER BUS (UL)		.6100	FEET	
4		FS	*	605-0006- - -	TUBING NRB 12 CLEAR		.0800	FEET	
4		FS	*	605-0109- - -	TUBING NO 6 CLEAR		.1600	FEET	
4		FS		650-2163- - -	4-40 X 1/2 PAN HD PHL MS SS SEMS		1.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-00- -
ASSEMBLY DESCRIPTION 2200 DISK PROCESSOR UNIT

LEGEND
1: PHANTOM; 2: ITEM MASTER DFLY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	F C A	QUANTITY PER ASSY	U/M	L/T
4		FS		650-3160- - -	6-32 X 1/2 PAN HD PHL MS SS SEMS	100280	22.0000	EACH	
4		FS		652-3004- - -	NUT 6-32UNC HEX SMALL PAT SS	100280	22.0000	EACH	
4		FS		652-6000- - -	NUT 10-32UNC HEX REG PAT SS	E15082	2.0000	EACH	
4		FS		653-3000- - -	WASH 6 .149ID .375OD .016 FL SS	100280	23.0000	EACH	
4		FS		653-3001- - -	WASH 6 .150ID .280OD INT T ST	100280	11.0000	EACH	
4		FS		653-6000- - -	WASH 10 .203ID .438OD .032 FL SS	E15082	2.0000	EACH	
4		FS		653-6001- - -	WASH 10.204ID .381OD INT T ST	E15082	2.0000	EACH	
4		IN		654-0151- - -	SOLDER GROUND LUG DO-4	E15082	2.0000	EACH	
4		IN		654-1006- - -	#6 GROUND LUG	100280	11.0000	EACH	
4		IN		654-1319- - -	SHOULDER BUSHING DO-4	E15082	2.0000	EACH	
3		IN		300-3019- - -	6800 UF 20V ELECTROLYTIC CAPACITOR		2.0000	EACH	
3		IN		300-3049- - -	77000 UF 15V ELECTROLYTIC CAPACITOR		1.0000	EACH	
3		IN		300-3068- - -	8.2K UF 25V ELECTROLYTIC CAP		2.0000	EACH	
3		IN		300-5009- - -	CAP CLAMP 1 1/4 INCH 2 LUG CMC-22		2.0000	EACH	
3		IN		300-5022- - -	CAP CLAMP 2 1/16 INCH 3 LUG		1.0000	EACH	
3		IN		325-0023- - -	DPST TOGGLE SW 15 A 125V CH 7561K4		1.0000	EACH	
3		IN		360-0000- - -	FUSE HOLDER 90 DEGREE CONTACT		1.0000	EACH	
3		IN		360-5000- - -	RUBBER WSHR FOR 360-0000 / 360-0001		1.0000	EACH	
3		IN		360-5002- - -	HEX NUT FOR 360-0000 / 360-0001		1.0000	EACH	
3		IN		360-5003- - -	LOCK WSHR LF#9050231(FOR 360-0000/1)		1.0000	EACH	
3		IN		380-5000- - -	130 VOLT VARISTOR V130LA10	E11589	1.0000	EACH	
3		IN		400-1009- - -	FAN,WHISPER(SKELETON) ROTRON WR2A2	E17208	1.0000	EACH	
3		IN		410-0098- - -	XFMR LNR MDL 220S/220SE C5068-99		1.0000	EACH	
3		IN		420-1005- - -	POWER CORD ROTRON FAN 16415		1.0000	EACH	
3		IN		420-1096- - -	POWER CORD,10 FT 18AWG		1.0000	EACH	
3		IN		451-1065- - -	2200S CPU & PWR SUPPLY CHAS E6627-6		1.0000	EACH	
3		IN		451-2100- - -	2200S MOTHER BOARD COVER D6627-10		1.0000	EACH	
3		IN		458-0196- - -	2217 CARD HOLD DOWN (T-1)C5300-1060	E11212	4.0000	EACH	
3		IN		461-0132- - -	PLATE NUT (MODIFIED) C6800-113	E11837	2.0000	EACH	
3		IN		462-0105- - -	SPCR 4-40UNC .250 OD .250 L HX B	E12303	6.0000	EACH	
3		IN		462-0141- - -	SPCR, PHENOLIC CURRENT 4-250	E12303	1.0000	EACH	
3		IN		462-0243- - -	SPCR,HEX 6-32 X 1 3/4 B6800-110		4.0000	EACH	
3	P	FS		600-0000- - -	WIRE 18 GA BLACK UL		1.1700	FEET	
4		FS		600-0005- - -	WIRE 18 GA WHITE UL		1.0000	FEET	
3		FS		600-0009- - -	WIRE 18 GA WHITE UL		1.1700	FEET	
3		FS		600-9018- - -	WIRE 18 GA TINNED COPPER BUS (UL)		.2100	FEET	
3		FS		605-0010- - -	TUBING PVC #8 CLEAR	E16875	.1600	FEET	
3		FS		605-0015- - -	#3 CLEAR TUBING		2.3400	FEET	
3		FS		605-0103- - -	TUBING 3/8 BLACK		.8300	FEET	00000
3		FS		605-0109- - -	TUBING NO 6 CLEAR		.2100	FEET	
3		FS		605-0124- - -	TEFLON TUBING #20 PENNTUBE#1-5116	E11814	.0830	ROLL	
3		FS		605-1004- - -	CABLE TYE, PAN-TY PLTIM-M	E16875	3.0000	EACH	
3		FS		650-2121- - -	SCR 4-40 3/8 PHIL FLAT F MS SS	E11837	4.0000	EACH	
3		FS		650-2240- - -	4-40 X 3/4 PAN HD PHL MS SS SEMS	E16875	18.0000	EACH	
3		FS		650-3080- - -	6-32 X 1/4 PAN HD PHL MS SS SEMS		7.0000	EACH	
3		FS		650-3160- - -	6-32 X 1/2 PAN HD PHL MS SS SEMS		8.0000	EACH	
3		FS		650-3207- - -	SCR 6-32X5/8 PAN HD PHL SEMS MS SS	E16875	3.0000	EACH	
3		FS		650-3560- - -	SCR 6-32 1 3/4 SLOT PH MS SS	E16875	4.0000	EACH	
3		FS		650-4160- - -	8-32 X 1/2 PAN HD PHL MS SS SEMS		4.0000	EACH	
3		FS		650-5161- - -	SCR 10-24 1/2 PHIL PH MS SS		2.0000	EACH	

ASSEMBLY PART NUMBER 177-2200-80- -
ASSEMBLY DESCRIPTION 2280 DISK PROCESSOR UNIT

LEGEND
1: PHANTOM; 2: ITEM MASTER DFLY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1	2	3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T
3		FS		650-6160- - -	10-32 X 1/2 PAN HD PHL MS SS SEMS	E16875	10.0000	EACH	
3		FS		652-0029- - -	8-32 LOCK-NUT KEPS 511-081800-50		4.0000	EACH	
3		FS		652-0032- - -	6-32 LOCK-NUT KEPS 511-061800-00		3.0000	EACH	
3		FS		652-2002- - -	4-40 SQUARE NUT	E16875	4.0000	EACH	
3		FS		652-2005- - -	4-40 LOCK-NUT KEPS SS	E16875	15.0000	EACH	
3		IN		652-3000- - -	NUT 6-32UNC HEX REG PAT SS		1.0000	EACH	
3		FS		653-0003- - -	WASHER, NO.4 NYLON 1/8 ID X 3/8 OD	E16875	8.0000	EACH	
3		FS		653-2000- - -	NO. 4 FLAT WASHER		2.0000	EACH	
3		FS		653-2001- - -	NO. 4 FLAT WSHR 1/8ID 1/4OD	E16875	12.0000	EACH	
3		FS		653-2002- - -	WASH 4 .123ID .2650D INT T ST		2.0000	EACH	
3		FS		653-3000- - -	WASH 6 .149ID .3750D .016 FL SS	E16875	4.0000	EACH	
3		FS		653-3001- - -	WASH 6 .150ID .2880D INT T ST		8.0000	EACH	
3		FS		653-3003- - -	WASH 6 .141ID .2530D SPLIT SS		1.0000	EACH	
3		FS		653-4000- - -	WASH 8 .174ID .3750D .016 FL SS		4.0000	EACH	
3		FS		653-6001- - -	WASH 10.204ID .3810D INT T ST		2.0000	EACH	
3		IN		654-1006- - -	#6 GROUND LUG		1.0000	EACH	
3		IN		654-1010- - -	#10 GROUND LUG		6.0000	EACH	
3		IN		654-1238- - -	HEYCO STRAIN RELIEF SR5P-4		1.0000	EACH	
3		IN		654-1245- - -	SNAP BUSHING,HEYCO SB-1500-21		1.0000	EACH	
3		IN		655-0119- - -	2200 PS HANDLE B6422-108		1.0000	EACH	
3		IN		655-0203- - -	FEET BLACK GREENE BH 2096		4.0000	EACH	
3		IN		655-0208- - -	FEET WHITE GREENE BH-2184		4.0000	EACH	
2		IN		449-0056- - -	FACE PLATE,P.C.BLANK C6422-305	E15007	3.0000	EACH	
2		IN		449-0273- - -	BLANK FACE PLATE B 2280 D6884-1029	E15007	1.0000	EACH	
2		IN		450-0904- - -	WANG NAME TAG C6815-97		1.0000	EACH	
2		IN		451-2101- - -	2200S CPU COVER (6 I/O) D6627-9		1.0000	EACH	
2		FS		650-4165- - -	SCR 8-32 1/2 SLOT PH MS SS		8.0000	EACH	
2		FS		650-4480- - -	SCR 8-32 1 1/2 PHIL PH MS SS		4.0000	EACH	
2		FS		660-0058- - -	NEOPRENE SPONGE TP GREENE 2218 3/8"		1.0000	FEET	
2		IN		690-0312- - -	#5 SHIPPING BAG	E11690	3.0000	EACH	
1		IN		290-0015- - -	SHPG PKG BOM:F/R-DISK-DRIVE	18250	1.0000	EACH	00010
2		IN		685-0014- - -	TAPE 3" PAPER GUMMED NON-ASPH REINF		.0000	ROLL	
2		IN		685-0017- - -	STRAPPING STEEL .50 WD .015 THK		.0000	ROLL	
2		IN		685-0019- - -	BUCKLE #41 METAL .50 WIDE	18783	2.0000	EACH	
2		IN		685-0100- - -	EDGE PRTCTR 21/2X21/2X3 L-BOARD .06		4.0000	EACH	
2		IN		685-0286- - -	PALLET 40 X 32 CUSHIONED		1.0000	EACH	
2		IN		685-0287- - -	HSC 500# DW 39 1/4 X 32 1/4 X 25		1.0000	EACH	
2		IN		685-0307- - -	RSC 20 X 20 X 22 DW275	20010	.0000	EACH	
2		IN		685-0332- - -	FOAM-IN-PLACE "A" CHEMICAL .5 PCF	20010	.0000	EACH	
2		IN		685-0333- - -	FOAM-IN-PLACE "B" CHEMICAL .5 PCF	20010	.0000	EACH	

END OF REPORT MB0080-A

APPENDIX D SCHE-MATICS

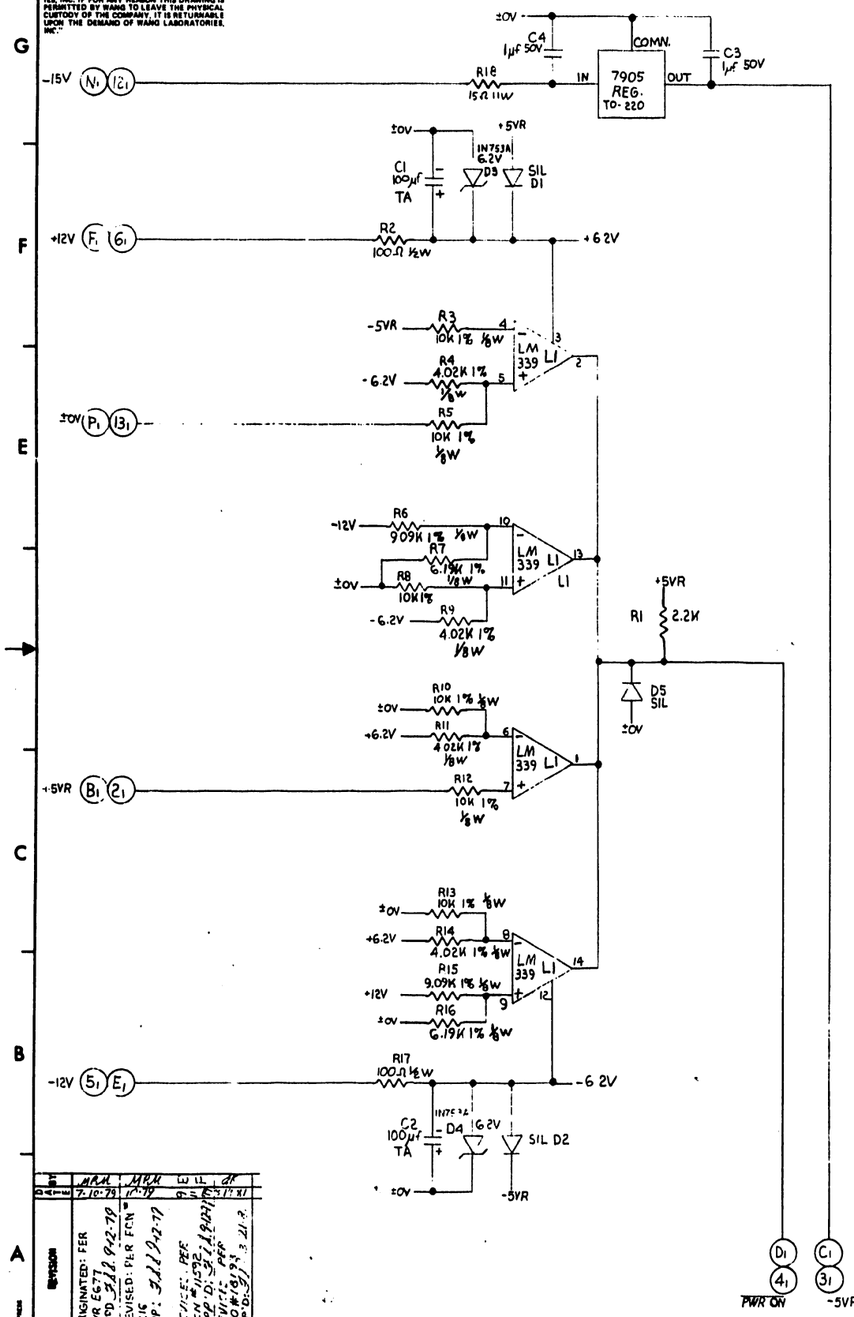
APPENDIX D

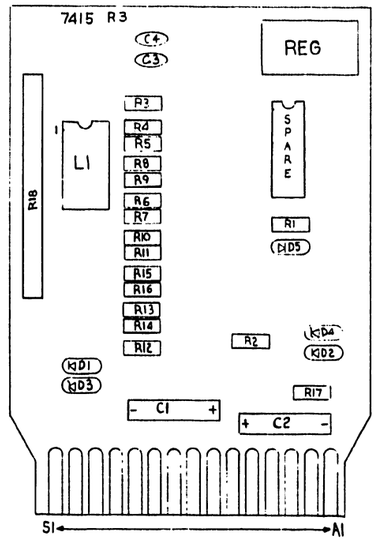
SCHEMATICS

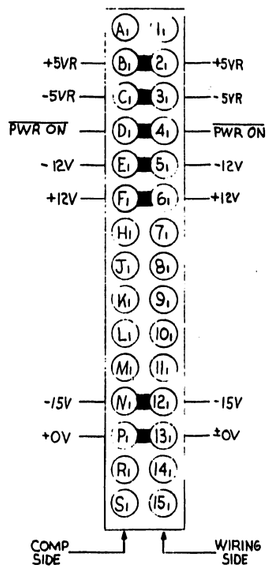
This appendix contains all of the pertinent schematics relating to the 2280 DPU. These are listed below as follows:

WL Number	Nomenclature
210-7415	Prime Circuit Board
210-7416	Motherboard
210-7421	ALU/MUX Interface Board
210-7422	ECC/Device Interface Board
210-7423	RAM/PROM Control Board
210-7424	I/O Controller Board
210-7715	2280 MUX Disk Conntoller
210-7716	Motherboard
210-7717	2280 MUX Master
210-7718	2280 MUX Slave
210-L567	Regulator Board

DO NOT SCALE







COMPONENT	WLI #	TYPE
R1	330-3022	2.2K ¼W 10%
R2,17	331-2010	100Ω ½W 10%
R3,5,8,10,12,13	333-0090	10K 1% ⅛W
R4,9,11,14	333-0060	4.02K ⅛W
R6,15	333-0061	9.09K 1% ⅛W
R7,16	333-0069	6.19K 1% ⅛W
R18	334-0002	15Ω 11W
C1,2	300-4021	100µf 15V (T)
C3,4	300-1931	1µf 50V CER
D1,2,5	380-1001	SIL DIODE
D3,4	380-2062	6.2V ZEN IN753A
REG	374-0002	ua 7905

LOCATION	W.L. PART NO.	TYPE
L1	376-0240	LM339
L2	SPARE	

NO.	REVISION	ORIGINATED	DWR	APPD
0	0	FER	7.10.79	
1	0	REVISED: PER ECN	11216	
2	0	REVISED: PER ECN #11532 AND D.S. 2.1.8		
3	0	REVISED: PER ECN #11933 AND D.S. 2.1.8		

E-REV 0

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
	DWN	7-7-79	E ENGR M. GREER	7-12-79
	CHK	9-12-79	M ENGR	
			MFG ENGR	
MATERIAL	MODEL NO. 2280		TITLE PRIME CIRCUIT	
	SEE ENGRG. SPECIFICATIONS No.			
FINISH	TOL EX AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH		210-7415	D 7415
	SCALE	SHT / OF /	WANG PART NUMBER	SIZE DRAWING NUMBER REV

NO.	REVISION	DATE	BY
	SEE SHT 4		

SIGNAL	INTERFACE 7422	ADD/MUX 7421	RAM/PROM 7423	I/O CONTROL 7424	SPARE	SPARE	REGULATOR 6439	J1	J2	J3	PRIME CRT 7415
AK0		11_2	11_2	11_2							
AK1		10_2	10_2	10_2							
AK2		R_2	R_2	14_2							
AK3		9_2	9_2	9_2							
AK4		12_2	12_2	12_2							
AK5		3_3	3_3	3_3							
AK6		4_3	4_3	4_3							
AK7		15_2	15_2	15_2							
AD7		F_3	F_3								
BD SECTOR		4_2									
$\overline{BSY}$		14_1	14_1								
$\overline{CAOM}$		5_3	5_3								
$\overline{CNTR\text{-}1}$		K_2	K_2								
$\overline{CNTR\text{-}2}$		M_2		M_2							
$\overline{CNTR\text{-}3}$		P_2		P_2							
$\overline{CRESET}$			D_1	D_1							
$\overline{C100}$			J_1	J_1							
C700			4_2	3_1							
$\overline{D\,ERROR}$	2_2	E_3		A_2							
DONE				6_1							
$\overline{DONE}$	R_2	14_2		R_2							
ECBØ	N_1			N_1							
ECC SHIFTED	9_3	K_3									
ECC DATA	7_1			7_1							
$\overline{EQUALS}$	13_2			13_2							
ERROR		J_3		J_3							
FCØ	F_3			F_3							
FC1	7_3			7_3							
FC2	H_3			H_3							
FC3	K_3			K_3							
FC4	L_3			L_3							
FC5	12_3			12_3							
FC6	N_3			N_3							
FC7	10_3			10_3							
FC8	5_3			5_3							
FC9	H_1			H_1							
$\overline{FOMT}$			R_1	R_1							
$\overline{INIT}$	B_2			B_2							
LAUX		N_2	N_2								
LOAD ELL	P_1		N_1								
MØ		S_1	S_1	S_1							
M1		C_2	C_2	C_2							
M2		D_2	D_2	D_2							
M3		11_1	11_1	11_1							
M4		2_2	2_2	2_2							
M5		5_2	5_2	5_2							
M6		12_1	12_1	12_1							
M7		10_1	10_1	10_1							
$\overline{NULL}$	15_1	B_3									
PLO CLOCK	14_1			14_1							
$\overline{PRIME}$	K_1		K_1	K_1							
$\overline{PWR\ ON}$	S_2		S_2								D_1 / 8_1
$\overline{PAØ}$		5_1	5_1								
RDG	A_2		A_2	L_2							
READ			13_1	13_1							
READ DATA	N_2			N_2							
$\overline{READ\ DATA}$	L_1			L_1							
$\overline{READY}$	3_3	C_3									
$\overline{RETURN}$		D_3	D_3								
RFM-CMP			F_1	F_1							
$\overline{RTG\text{-}WTG}$	P_3			P_3							
$\overline{RWF}$	10_1		L_1								
RØ		M_3	M_3	M_3							
R1		9_3	9_3	9_3							
R2		3_2	3_2	3_2							
R3		1_3	1_3	1_3							
R4		F_2	F_2	F_2							
R5		H_1	H_1								
R6		8_1	8_1	8_1							
R7		15_1	15_1	15_1							
R8		11_3	11_3	11_3							
R9		E_1	E_1	E_1							
R10		4_1	4_1	4_1							
R11		6_2	6_2								
R12		7_2	7_2								
R13		H_2	H_2								
R14		7_1	7_1								
R15		1_2	1_2								
$\overline{SB}$		J_2	J_2								
SECTOR		S_2		S_2							
SELECT	6_2			6_2							
SELECT1	H_2			H_2							
SELECT 2	7_2			7_2							
SHIFT ECC	M_3	L_3	L_3								
$\overline{SORI}$	4_2			4_2							
STROBE		12_3	12_3								
$\overline{TØ}$		H_3	H_3	1_2							
$\overline{T2}$		13_2	13_2								
$\overline{T2\text{-}5}$		N_3	N_3								
$\overline{T4}$		8_2	8_2	8_2							
$\overline{T8}$		A_3	A_3	A_3							
TAG-1	J_2			J_2							
TAG-2	K_2			K_2							
TAG-3	E_2			E_2							
THS Ø	6_3			6_3							
THS 1	2_3			2_3							
THS 2	D_3			D_3							
THS 3	E_3			E_3							
THS 4	C_3			C_3							
THS 5	B_3			B_3							
$\overline{UB}$		L_2	L_2								
W/P	J_3	8_3									
WRITE DATA	5_1			5_1							

DO NOT SCALE

MATERIAL	MODEL NO. 2200 SMD	DRWN	DATE
FINISH	SEE CONFIG SPECIFICATIONS	CHK	
TOL ES AS NOTED: FRAC ± 1/64, DEC ± .015, ANG ± 1°		M ENGR	
		MFG ENGR	
		APPROVED BY	DATE
NEXT ASSY	USED ON		
SCALE NONE	WEIGHT LBS OZS	SIZE D	DRAWING NUMBER 7416
NEXT ASSY	USED ON		
MAINT PARTS BULLETIN			REV 4

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

TITLE: MOTHER BOARD

210-7416

7416 D

DO NOT SCALE

SIGNAL	INTERFACE 7422	MUX/MUX 7421	RAM/FROM I/O 7423	I/O CONTROL 7424
WTG	D1		9,1	C1 9,1
WTM-CMP				
WRITE			P1	P1
WXFE ECC	B3			B3
WTR				
256		6,1	6,1	M1
7500			M1	
-5V R	A1		A1	
	I1		I1	
±0V	C1	C1	C1	B1 2,1
	3,1	3,1	3,1	C1 3,1
	R3 14,3	P3 13,3	P3 13,3	R3 14,3
+5VR	B1	B1	B1	A1 I1
	2,1	2,1	2,1	R3 S3
	S3 15,3	R3 14,3	R3 14,3	S3 15,3
+12VR		S3 15,3	S3 15,3	

	SIGNAL
B1 -15R	
B2 -15R	
-21V	
-18VU	
B1 +12R	
E1 +12R	
+18VU	
B2 -12R	
B1 -12R	
E1 +8R	
B1 +5M	
B2 +5M	
E2 +5M	
B1 +5L	
B1 +8R	
9.5V	
BLU	
BLU	
E2 +5L	
+15VR	
B2 +5L	
ORN	
ORN	
+5VRM	
-12VR	
-15VR	
14VAC	
74VAC	

BY	DATE	APPROVED BY	DATE
DWN R.J. Lunsky	7-25-74	E ENGR	
CHK		M ENGR	
		MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

MODEL NO. 2200SMD

SEE ENGRG SPECIFICATIONS

No.

FINISH

TOL EX AS NOTED
XX ± FRAC ±
XXX ± ANG ± FINISH √

SCALE — SHT 2 OF 4

TITLE MOTHERBOARD

210-7416 | D | 7416 | 4

WANG PART NUMBER | SIZE | DRAWING NUMBER | REV

REVISION	BY	DATE
SEE SHT 4		

D 7416

D5

DO NOT SCALE

NOTE:
LOAD 115/230 VAC
JUMPERS/VARISTER
FOR APPROPRATE
115/230 VAC OPERATION

VR1 V 230V
VR2 V 130V

SP BRN — 115 VAC — SP BLK — 230 VAC — SP BRN/YEL — 115 VAC — SP BLK/WHT

9.5 V

SP BLU — R1 100Ω 1W — C1 77K MF 15V — ± 0V
SP BLU/BLK
SP BL.

SP RED — D3 IN4719
SP RED/YEL — R2 1K ½W — C2 7K MF 35V — ± 0V
SP RED — D4 IN4719 — - 21V

SP GRN — D5 IN4719 — R3 1K ½W — C3 6K MF 20V — + 15VR
SP GRN/YEL — ± 0V
SP GRN — D6 IN4719 — 14VAC

SP ORN — + 18VU
SP ORN/BLK — ± 0V — R4 1K ½W — C4 6K MF 20V — 18V
R5 1K ½W — C5 7K MF 35V — - 18VU
SP ORN — 14V — 14V — + 18VU — - 18VU

+ 5V — + 5VR

R8 .15Ω 10W 5% — + 5VRM, E2 + 5M, E2 + 5M
R6 .15Ω 10W 5% — + 5VR
R7 .15Ω 10W 5% — E2 + 5L
+ 5VR
E2 + 5L
R9 .6Ω 4W 5% — - 12VR, - 12VR

± 0V
± 0V
- 21V
- 21V
14VAC
+ 15VR
+ 15VR
± 0V
± 0V

C7 10MF 35V (T) — ± 0V — B1 - 15R
14VAC

C6 10MF 35V (T) — ± 0V — B1 - 12R
+ 18VU
- 18VU
E1 + 12R
R10 1Ω 2.5W 5% — + 12VR
R11 .6Ω 4W 5% — - 15VR, - 15VR

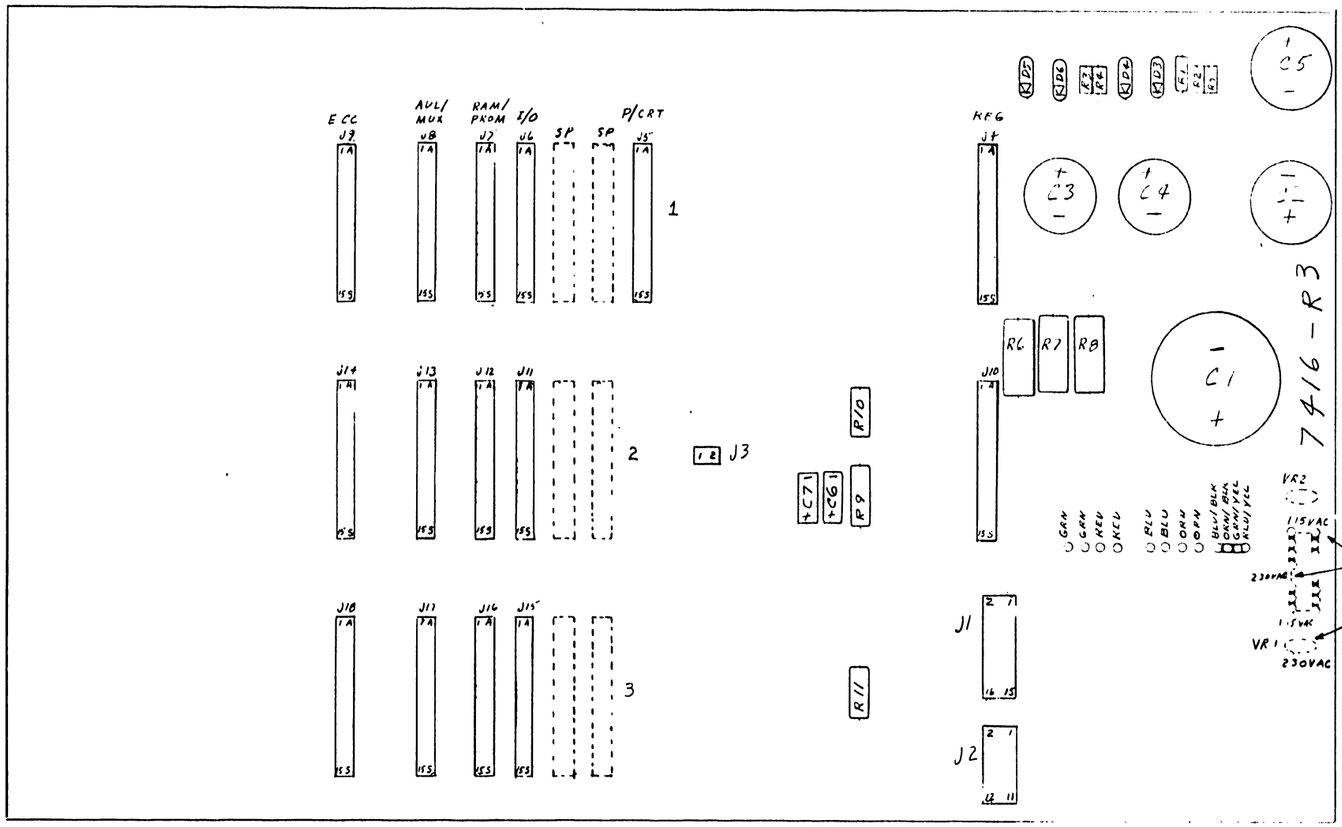
WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN	12/30	E ENGR	
		CHK		M ENGR	
MATERIAL	MODEL NO. 2200SMD			MFG ENGR	
	SEE ENGRG SPECIFICATIONS No.	TITLE MOTHERBOARD			
FINISH	TOL ES AS NOTED XX ± FRAC ± XXX ± ANG ± FINISH	210-7416	D	7416	
	SCALE 1/1 SHT 2 OF 4	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

NO.	REVISION	BY	DATE
	SEE SHT 4		

D 7416

J6

DO NOT SCALE



COMP.	W.L. PART NO	TYPE
R2, 3, 4, 5	331-3010	1K 1/2W 10%
R1	332-2010	100Ω 1W 10%
R6, 7, 8	334-0023	15Ω 1/2W 5%
R10	334-0014	1Ω 2.5W 5%
R9, 11	334-0010	.6Ω 4W 5%
C1	300-5049	7700μF 16V (E)
C2, 5	300-4	7K μF 35V (E)
C3, 4	300-	.1 μF 20V (E)
C7	300-4011	10μF 35V 5% (T)
J1	654-1177	16 PIN HEADER
J2	654-1172	12 PIN HEADER
J3	654-198	6 PIN HEADER
J4-18	356-0	
VR1	380-5021	250V VARISTOR
VR2	380-0	130V VARISTOR
D3, 4, 5, 6	380-3002	1N4719
C6	300-4032	10 μF 35V 10% (T)

7416-R3

MOUNT 115/230 VAC JUMPERS/VARISTER ON CIRCUIT SIDE FOR APPROPRIATE 115/230VAC OPERATION

VR1 AND 115/230VAC JUMPERS MOUNTED ON CIRCUIT SIDE

E-REV
2

REVISION	NO.	BY	DATE
[illegible]	1	[illegible]	[illegible]
REVISED PER ECN #12060 APP'D [illegible]	9/11	[illegible]	1-9-80
REVISED PER ECN #12213 APP'D [illegible]	10/12	[illegible]	1/30/80

	BY	DATE	APPROVED BY	DATE
DWN	[illegible]	4-7-79	E ENGR	[illegible]
CHK	[illegible]	[illegible]	M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

FINISH

MODEL NO. 2200SMV

SEE ENGRG SPECIFICATIONS

No.

TOL ES AS NOTED
.XX ± FRAC ±
.XXX ± ANG ± FINISH √

SCALE — SHT 4 OF 4

TITLE MOTHER [illegible]

210-7403	D	7416	4
WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D7

DO NOT SCALE

BK3 (2A5)

BO0 - BO7 (2F1)

SEC FOR: READY NULL DONE DIAG ERR OR I/P

REG BSY STROBE

* R28 AND C26 HAND WIRED PER ECO # 18091

ADDER CAR (2D11)

EQL (2B11)

RO, R1, R6, R7, R9, R10 (2E11)

AK0 AK1 AK2 AK3 AK4 AK5 AK6 AK7

R8 (2G11)

RA0 (2E11)

RA1 (2F11)

RA2 (2F11)

RA3 (2E11)

REG≠FLS (2A11)

REG≠MK (1D10)

REG≠MMSK (1C10)

REG=0 (2A11)

M=0 (1F10),(2B11)

REG=FLS (2A11)

CNTRL-1 (2C11)

CNTRL-1

CNTRL-2

CNTRL-3

SET SAR (2C11)

LAUX

UB

SF

RETURN

KSTB

ASTB

REVISION	BY	DATE	APPROVED BY	DATE
SEE SH. 4 FOR REV	DWN F.S.S.	5-8-74	E ENGR	
NO	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

FINISH

MODEL NO 2200 SMD

SEE ENGRG SPECIFICATIONS No.

TOL EX AS NOTED ± FRAC ± .XX ± ANG ± FINISH

SCALE SHT 1 OF 4

TITLE ALU/MUX INTERFACE WTH

WANG PART NUMBER 210-7421 | SIZE D | DRAWING NUMBER 7421 | REV —

DO NOT SCALE

ECC SHIFTED SHIFT ECC

CNTRL-1 (1C1)
RB (1A5)

RAO (1E1)
RO, R1, R6, R7, R9, R10 (1A10)
RA1 (1E1)
R13 (1D1)

ADDER CAR (1D8)
SET=CAR (1B1)
RAO (1E1)
T2, TA, T8, T2-5 (1C1C)
EQU (1E8)
RA2 (1D1)
M=0 (1C1)
REG=0 (1C1)
REG=FLS (1C1)
REG≠MSK (1C1)

ICAPM GISO C1 R13 16.9K 1% 1/8 W +5VR

KS0 KS1 KS2 KS3 KS4 KS5 KS6 KS7

IOB3 IOB1 TO GKBD DN*3 AD7

STB SEL1 SEL2 INT MODE CLR CK OC

BO0 BO1 BO2 BO3 BO4 BO5 BO6 BO7

REQ

REQ (1G3)
RC2 (1F7)
RD0-BD7 (1G7)
BK1 (1F9)
BK3 (1G10)
CAPM
256

D1 SIL C3 100μf 15V TA. A1 100K ±0V +5VR

RC2 R1 R10 A=B

REVISION	BY	DATE
SEE SH.# FOR REV.		

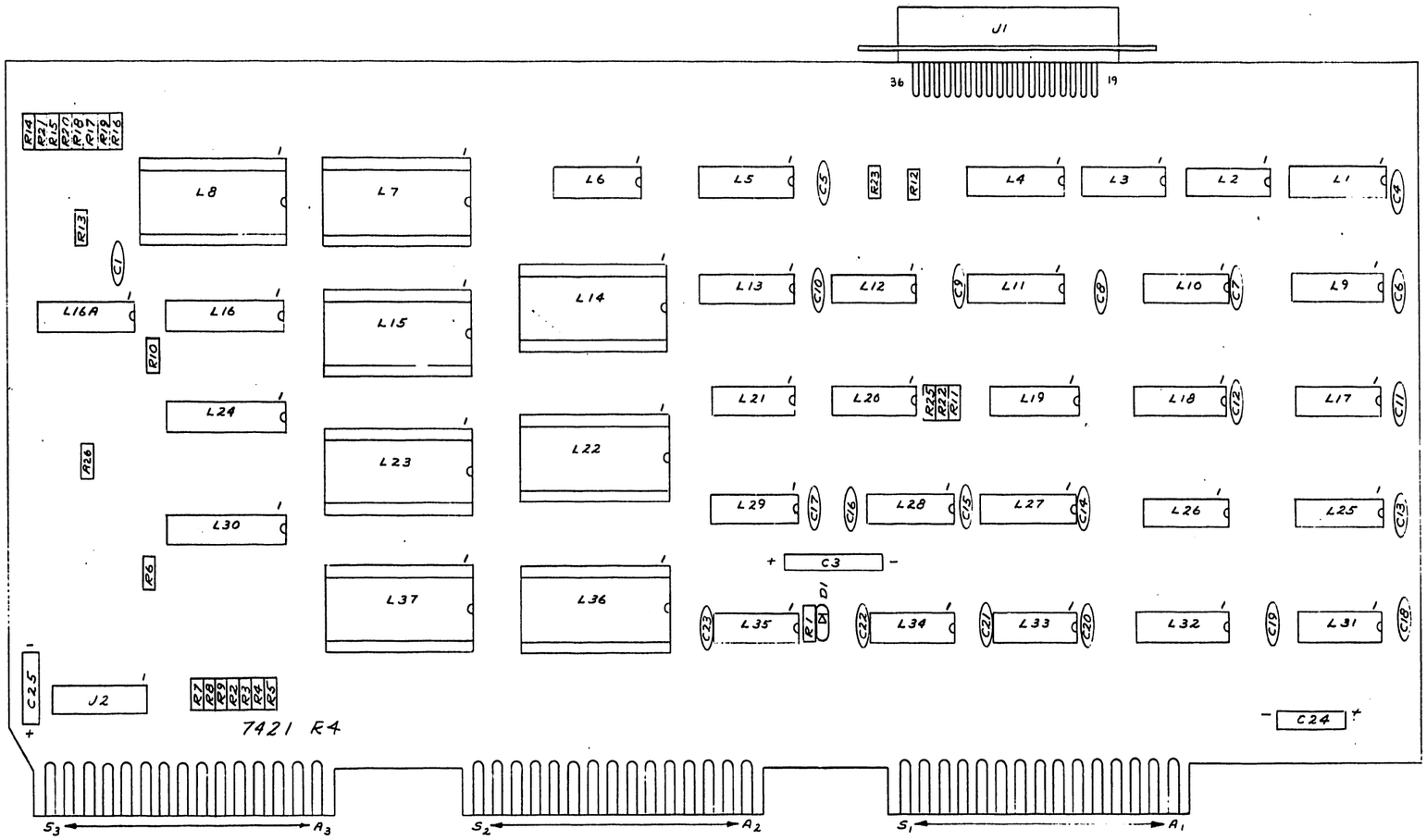
	BY	DATE	APPROVED BY	DATE
	DWN F.S.S.	5-18-79	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL	MODEL NO. 2200 SMD	TITLE	ALU/MUX INTERFACE MTH	
	SEE ENGRG. SPECIFICATIONS No.			
FINISH	TOL. EX. AS NOTED .XX ± .XXX ± FRAC ± ANG ± FINISH √	210-7421	D	7421
	SCALE	SHT 2 OF 4	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV.

7421

DO NOT SCALE



REVISION	BY	DATE
SEE SH.4 FOR REV.		

	BY	DATE	APPROVED BY	DATE
	DWN F. S. S.	5-1979	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

MODEL NO. 2200 SMD

SEE ENGRG. SPECIFICATIONS

No.

TITLE ALU/MUX INTERFACE MTH

FINISH

TOL. EX. AS NOTED
XX ± FRAC ±
XXX ± ANG. ± FINISH √

210-7421	D	7421	7
WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

SCALE SHT 3 OF 4

D 7421

D10

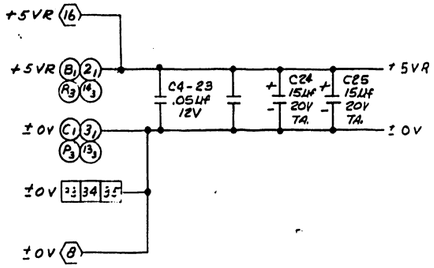
DO NOT SCALE

I.C. LOCATION	TYPE	W.L.NO.
L1	7476	376-0007
L2,19,21	7432	376-0093
L6	7404	376-0010
L9,11	74LS362	376-0193
L5,13	7415?	376-0082
L7,15,23,27	AM 29C5	377-0353
L8	745412	376-0320
L9	7400	376-0002
L10	7411	376-0194
L12,29,31	7408	376-0081
L18,22	74181	376-0099
L16	74LS299	376-0303
L16A	9602	376-0104
L3,17,20,33,35	7414	376-0135
L18	9321	376-0096
L24	74LS374	376-0286
L25	7451	376-0012
L26	7410	376-0003
L27,32	74153	376-0048
L28	7474	376-0006
L30	74LS240	376-0297
L34	7402	376-0016
L36	74154	376-0090
L7,8,14,15,22,23,36,37	24 PIN SKT.	376-9003

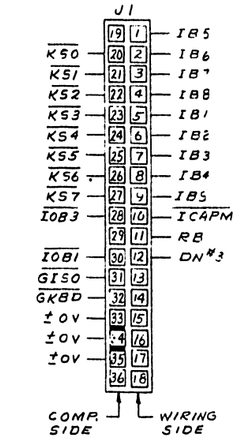
COMPONENT	TYPE	W.L. NO.
R1	100K, 1/4W, 10%	330-5010
R2-10	1K 1/4 W 10%	330-3010
R11,12,22,23,25	332Ω 1/8W 10%	330-2033
R13	16.9K 1/8 W 1%	333-0097
R14-21	390Ω 1/4W 10%	330-2039
R26	240Ω 1/4W 5%	330-2025
R28	470Ω 1/4W 10%	330-2047
C1	100pf 500V	300-1100
C3	100uf, 16V(E)	300-3011
C4-23	.05μf 12V	300-1500
C24,25	15μf 20V TA.	300-4022
C26	150PF 500V	300-1150
D1 ↓	SIL.	380-1001
J1	36 PIN CONN	350-2096
J2	16 PIN SKT.	376-9005

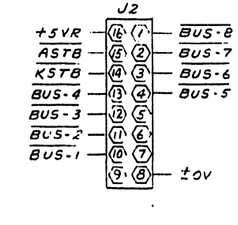
MNEMONIC	COORD.
AD7	2G1
AK0-AK7	1A8
$\overline{AST8}$	1A1
$\overline{BUS-1}$ - $\overline{BUS-8}$	1B11
$\overline{BSY}$	1G2
$\overline{CAPM}$	2E1
$\overline{CNTRL-1,2,3}$	1C1
DERROR	1G5
$\overline{DONE}$	1G5
DN#3	2G2
ECC SHIFTED	2G9
ERROR	1G5
$\overline{GIS0}$	2G7
$\overline{GKBD}$	2G2
IB1-IB8	1G1
IB5	1F1
$\overline{ICAPM}$	2G8
$\overline{IOB1}$, $\overline{IOB3}$	2G3
$\overline{K50}$ - $\overline{K57}$	2G6
$\overline{KST8}$	1B1
$\overline{LAUX}$	1B1
M0-M7	1G11
$\overline{NULL}$	1G5

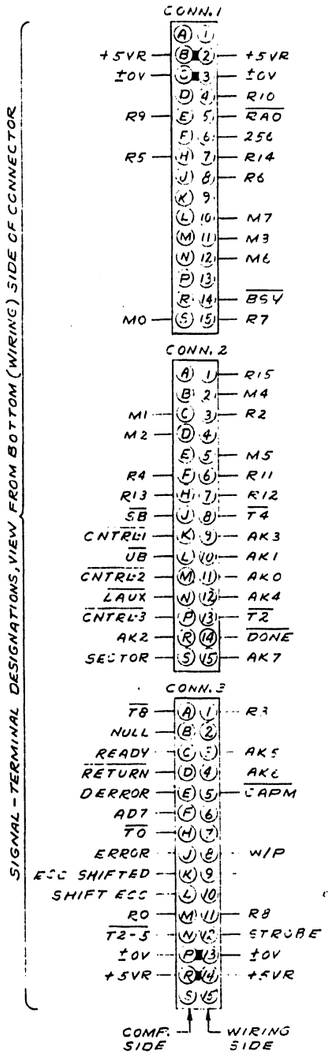
MNEMONIC	COORD.
R0-R15	1G11
$\overline{RA0}$	1E1
RB	1E1
READY	1G5
$\overline{RETURN}$	1B1
$\overline{SB}$	1B1
SECTOR	1G5
SHIFT ECC	2G9
STROBE	1G2
$\overline{T0}$	2G2
$\overline{T2,T4,T8,T2-5}$	1C11
$\overline{UB}$	1B1
W/P	1G4
256	2A5



I.C. LOCATION	TYPE	SPARES
L3	1414	2
L16 A	9602	1
L17	7414	1
L21	7432	2
L29	7408	1
L31		1
L34	7402	2
L35	7414	5







NO.	REVISION	BY	DATE
0	ORIGINATED PER DWG #2200-SMD-1	F.S.S. 5211	11-7-71
1	REVISED: ECN #10439 ADDED MNEMONICS	F.S.S. 5227	5-16-72
2	REVISED: ECN #11805 ADDED MNEMONICS	F.S.S. 5227	5-16-72
3	REVISED: ECN #11805 ADDED MNEMONICS	F.S.S. 5227	5-16-72
4	REVISED: ECN # 12864 ADDED MNEMONICS	W.L. 5-16-72	11-7-72
5	REVISED PER ECN # 12864 ADDED MNEMONICS	W.L. 11-7-72	5-14-73
6	REVISED PER ECN# 13091 APPD: [illegible]	M.L.	10-27-73
7	REVISED PER ECO#18855 APPD: [illegible]	M.L.	10-27-73

E-REV 3

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
MATERIAL	DWN F.S.S.	5-21-73	E ENGR	
MODEL NO. 2200 SMD	CHK [illegible]	5-21-73	M ENGR	
SEE ENGRG. SPECIFICATIONS No.			MFG ENGR	
FINISH	TITLE: ALU/MUX INTERFACE MTH			
TOL EX. AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √	210-7421	D	7421	7
SCALE	SHT 4 OF 4	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

A11

DO NOT SCALE

ECC DATA (7I)

WXFER ECC (B3)

CLK (3B9)

INIT (B2)

INIT (1E1)

INIT (1E11)

L21 74175 L22 74175 L23 74175 L34 74175 L45 74175

L33 7430 → Z1(3C3)

L12 7430 → Z2(3C3)

L24 7430 → Z3(3C3)

L43 7486 → EC03, EC08, EC10

L32 7486 → EC12, EC15, EC17, EC20

L49 7486 → EC24

L41 7486 → EC01

L42 7486 → EC23, EC26, EC29, EC32

L26 7408

R1 1K +5VR

R2 1K +5VR

L36 74174 → ECB10(3F6), ECB8(3F3), ECB7(3G3), ECB6(3E1), ECB9(3E3), ECB5(3G3) ECB5

L35 74174 → ECB4(3E1), ECB3(3G2), ECB2(3E1), ECB0(3D1), ECB1 (3G3)

ECB11 (3E4)

ECB11

EC33

ECB0 (N1)

SEE SHT 5 FOR REV

ECN NO. PENDING 19476

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY / DATE	APPROVED BY / DATE
MATERIAL	MODEL NO. 2200 SMD SEE ENDRG SPECIFICATIONS No.	DWN C... 2-7-74	E ENGR
		CHK	M ENGR
			MFG ENGR
FINISH	TOL EX AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √	TITLE ECC / DEVICE INTERFACE	
	SCALE SHT OF	210-7422 WANG PART NUMBER	D SIZE 7422 DRAWING NUMBER REV

D12

DO NOT SCALE

READ DATA LO (3J2) · READ DATA HI (16J2) · READ CLOCK LO (5J2) · READ CLOCK HI (17J2) · SERVO CLOCK LO (2J2) · SERVO CLOCK HI (14J2)

READ DATA LO (3J1) · READ DATA HI (16J1) · READ CLOCK LO (5J1) · READ CLOCK HI (17J1) · SERVO CLOCK LO (2J1) · SERVO CLOCK HI (14J1)

WTG (D1) · DONE (A2)

RESERVED FOR INDEX LO (12J1) · RESERVED FOR INDEX HI (24J1) · RESERVED FOR SECTOR LO (13J1) · RESERVED FOR SECTOR HI (25J1) · UNIT SELECT HI (9J1) · UNIT SELECT LO (22J1)

RESERVED FOR INDEX LO (12J2) · RESERVED FOR INDEX HI (24J2) · RESERVED FOR SECTOR LO (13J2) · RESERVED FOR SECTOR HI (25J2) · UNIT SELECT HI (9J2) · UNIT SELECT LO (22J2)

±0V · -5VR

R3 56Ω · R4 56Ω · R5 56Ω · R6 56Ω · R7 56Ω · R8 56Ω · R9 56Ω · R10 56Ω

R11 56Ω · R12 56Ω · R13 56Ω · R14 56Ω · R15 56Ω · R16 56Ω · R17 56Ω · R18 56Ω

R19 56Ω · R20 56Ω · R21 56Ω · R22 56Ω · R23 56Ω · R24 56Ω · R25 56Ω · R26 56Ω

R27 56Ω · R28 56Ω · R29 56Ω · R30 56Ω · R31 56Ω · R32 56Ω

L4 3450 · L2 3450 · L1 3450 · L3 3450

A- A+ B- B+ C- C+ D- D+ · VEE · STB · Ao Bo Co Do

ION (3E4) · 2ON (3E5)

7404 (L51) → 1 SELECTED (3F7) · SELECTOR MARK 1 (3C11) · INDEX 1 (3G11)

7404 (L51) → 2 SELECTED

READ DATA (N2)

WRITE DATA (51) · ION (3E4) · RDG (A2) · PRIME (K1) · WT CLK (2C7) · 2ON (3E4)

R33 56Ω · R34 56Ω · R35 56Ω · R36 56Ω · R37 2.2K · R38 56Ω · R39 56Ω · R40 56Ω · R41 56Ω

+5VR · -5VR

L11 75110 · L13 75110 · VCC+ · VCC-

L46 7400 · L47 7438 · L5 7400

WT CLR (2B11) · PLO CLOCK (3B11)

WRITE CLOCK HI · WRITE CLOCK LO · WRITE DATA HI · WRITE DATA LO

READ DATA · PLO CLOCK

SECTOR MARK 2 (3D6) · INDEX 2 (3D6)

L50 74161 · L40 74161 · CK A B C D ENP ENT · CLR · LD · QA QB QC QD RCO

THS5 (3D10) · THS4 (3D10) · THS3 (3D10) · THS2 (3D10) · THS1 (3D10) · THSØ (3D10)

SELECT 2 (4G3)

R.W.F. (3B10)

L39 25LS2521 · A0 B0 A1 B1 A2 B2 A3 B3 A4 B4 A5 B5 A6 B6 A7 B7 · EIN · EOUT

BK1 (3D5)

2 SELECTED (3E7)

REVISION	BY	DATE	APPROVED BY	DATE
SEE CHT 6	DWN	6 7 79	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES INC. LOWELL, MASS. U.S.A.

MATERIAL · MODEL NO. 2200 SMD · SEE ENGRG SPECIFICATIONS · No.

FINISH · TOL EX AS NOTED · XX ± FRAC ± · XXX ± ANG ± · FINISH √

TITLE: ECC/DEVICE INTERFACE

210-7422 · D · 7422 · SCALE · SHT 2 OF 6 · WANG PART NUMBER · SIZE · DRAWING NUMBER · REV

D 7422

D13

DO NOT SCALE

INDEX 1 (2E1)

L19 74161 — L30 74161 — L29 25LS2521

LOAD ECC (P1)

SHIFT ECC (M3)

TP1 (P2)

SHIFT ECC (3B11)

L38 74LS299 — L37 74LS299

THS 5 (B3)
THS 4 (C3)
THS 3 (E3)
THS 2 (D3)
THS 1 (Z3)
THS Ø (A3)

THS 5 (2C5)
THS 4 (2C5)
THS 3 (2C5)
THS 2 (2B5)
THS 1 (2B5)
THS Ø (2B5)

1 SELECTED (2E1)
2 SELECTED (2B1)
SELECT 1 (4G3)
SELECT 2 (4G3)
1 ON (2E11)
1 ON (2D11)
2 ON (2E9)
2 ON (2B11)

ECB10 (1D4)
ECB8 (14C)
ECB5 (1C3)
ECB7 (1C4)
ECB1 (1B4)
ECB3 (1B4)
ECB0 (1B5)
ECB2 (1B4)
ECB4 (1B5)
ECB6 (1C4)
ECB11 (1D5)
ECB9 (1C3)
ECC SHIFTED (D3)

745260

SECTOR MARK 1 (2E1)
SELECTOR MARK 2 (2D5)
INDEX 2 (2D5)
BK1 (2B3)

L17 74157

STB

EQUALS (13)
SORT (42)

Z1 (1F8)
Z2 (1C8)
Z3 (1F4)

L25 7420 — NULL (15)

R. W. F. (2B5)
R. W. F. (10)
SHIFT ECC (3G4)
PLO CLOCK (2A6)
CLK (1F11) (1D2)

REVISION	BY	DATE	APPROVED BY	DATE
	DWN	6-7-77	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL MASS. U.S.A.

MATERIAL — MODEL NO. 2200 SMD — SEE ENGRG SPECIFICATIONS — No.

FINISH — TOL ER AS NOTED: XX ± FRAC ±; XXX ± ANG ± FINISH √

TITLE: ECC/DEVICE INTERFACE

SCALE — SHT 3 OF 6 — WANG PART NUMBER: 210-7422 — SIZE: D — DRAWING NUMBER: 7422 — REV

D 7422

D14

DO NOT SCALE

TAG 3 (E2)
TAG 2 (K2)
TAG 1 (J2)
FC 9 (H1)
FC 8 (53)
FC 7 (103)
FC 6 (N3)
FC 5 (123)
FC 4 (L3)
FC 3 (K3)
FC 2 (H3)
FC 1 (T3)
FC Ø (F3)
FCO
RDG WTG (P3)

7400 L20 (3) TAG3
7400 L20 (8) TAG2
7400 L20 (6) TAG1

ON CYLINDER LO (17)
ON CYLINDER HI (47)
UNIT READY LO (13)
UNIT BUSY HI (49)
FAULT LO (15)
FAULT HI (45)
SEEK ERROR LO (16)
SEEK ERROR HI (46)

L7 3450: A- A+ B- B+ C- C+ D- D+ | VEE 12 | STB 4 | A0 B0 C0 D0 (3 13 5 11) | -5VR | ±0V
L27 7402 (2 3 1) L26 7408 (10 9 8) L15 7400 (10 9 8)

WRITE PROTECTED LO (28)
WRITE PROTECTED HI (58)

L5 3450: A- A+ B- B+ C- C+ D- D+ | VEE 12 | STB 4 | A0 B0 C0 D0 (3 13 5 11) | -5VR | ±0V

SELECT 2 (72)
SELECT 1 (H2)
PWR ON (52)
SELECT (62)
+5VR
R58 2.2K
SELECT 2 (3E6)(2C2)
SELECT 1 (3F6)
L6 3453: 1A 1B 1C 1D INH | VEE 9 -5VR | AY AZ BY BZ CY CZ DY DZ (2 3 14 13 5 4 11 12)
UNIT SELECT 21 HI
UNIT SELECT 21 LO
UNIT SELECT 20 HI
UNIT SELECT 20 LO
OPEN CABLE DETECTOR HI
R66 20K +5VR
R64 20K -5VR

R59 R60 R61 R62 R63 R65 R67 R68 56Ω

OPEN CABLE DETECTOR HI (43)
OPEN CABLE DETECTOR LO (44)
UNIT SELECT 20 HI (53)
UNIT SELECT 20 LO (23)
UNIT SELECT 21 HI (54)
UNIT SELECT 21 LO (24)
UNIT SELECT TAG HI (52)
UNIT SELECT TAG LO (22)

L10 3453: 1A 1B 1C 1D INH | VEE 9 -5VR | AY AZ BY BZ CY CZ DY DZ (2 3 14 13 5 4 11 12)
R73 R74 R75 R76 R77 R78 R79 R80 56Ω → ±0V

UNIT SELECT 22 LO (26) R69 680Ω +5VR
UNIT SELECT 23 LO (27) R71 56Ω ±0V
UNIT SELECT 22 HI (56) R70 56Ω -5VR
UNIT SELECT 23 HI (57) R72 560Ω ±0V

L9 3453: 1A 1B 1C 1D INH | VEE 9 -5VR | AY AZ BY BZ CY CZ DY DZ (2 3 14 13 5 4 11 12)
FC4 FC3 FC2 FC1 +5VR
R81 R82 R83 R84 R85 R86 R87 R88 56Ω → ±0V

L8 3453: 1A 1B 1C 1D INH | VEE 9 -5VR | AY AZ BY BZ CY CZ DY DZ (2 3 14 13 5 4 11 12)
FC8 FC7 FC6 FC5 +5VR
R89 R90 R91 R92 R93 R94 R95 R96 56Ω → ±0V

L18 3453: 1A 1B 1C 1D INH | VEE 9 -5VR | AY AZ BY BZ CY CZ DY DZ (2 3 14 13 5 4 11 12)
FC9 +5VR
R97 R98 R99 R100 R101 R102 R103 R104 56Ω → ±0V

J3 (36) BIT Ø HI (43) BIT Ø LO (30) TAG 3 HI (33) TAG 3 LO (32) TAG 2 HI (23) TAG 2 LO (38) TAG 1 HI (13) TAG 1 LO
J3 (38) BIT 4 HI (8) BIT 4 LO (37) BIT 3 HI (7) BIT 3 LO (36) BIT 2 HI (6) BIT 2 LO (35) BIT 1 HI (5) BIT 1 LO
(33) READY (21) DERROR (31) WP
J3 (42) BIT 8 HI (12) BIT 8 LO (41) BIT 7 HI (11) BIT 7 LO (40) BIT 6 HI (10) BIT 6 LO (39) BIT 5 HI (9) BIT 5 LO
(43) BIT 9 HI (13) BIT 9 LO

REVISION	DATE	BY
SEE SHT 6		

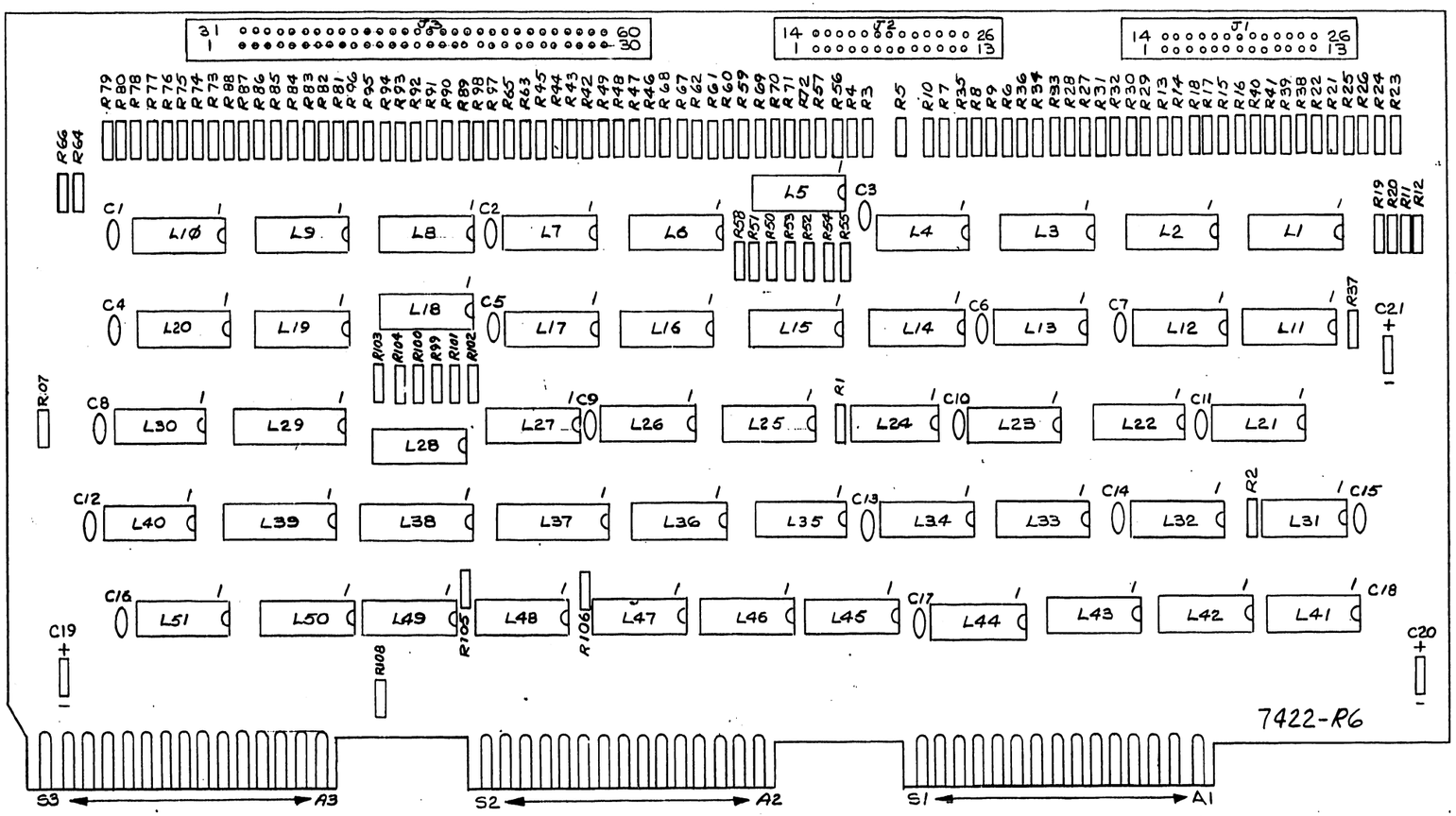
WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
DWN			E ENGR	
CHK			M ENGR	
			MFG ENGR	

MATERIAL
MODEL NO. 2200 SMD — SEE ENGRG. SPECIFICATIONS — No.
FINISH
TOL ER AS NOTED: XX ± FRAC ± ; XXX ± ANG ± ; FINISH √
SCALE — SHT 4 OF 6
TITLE: ECL/DEVICE INTERFACE
10-7422 | D | 7422 | (1)
WANG PART NUMBER | SIZE | DRAWING NUMBER | REV

D 7422

DO NOT SCALE



REVISION	BY	DATE
SEE SHT. 6		

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
	DWN [illegible]	6-7-77	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

MATERIAL	MODEL NO.	TITLE
	2200 SMD SEE ENGRG. SPECIFICATIONS No.	ECC/DEVICE INTERFACE
FINISH	TOL. EX. AS NOTED .XX ± FRAC. ± .XXX ± ANG. ± FINISH √	210-7422 / D / 7422
	SCALE / SHT 5 OF 6	WANG PART NUMBER / SIZE / DRAWING NUMBER / REV

D16

DO NOT SCALE

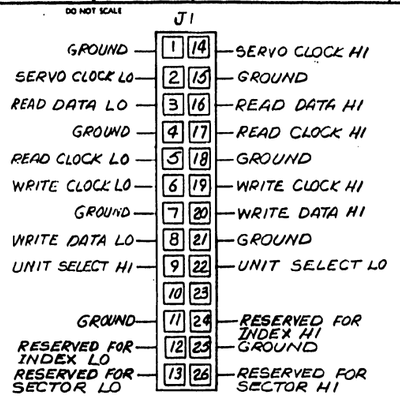
IC. LOCATION	TYPE	W.L. NO.
L1,2,3,4,5,7	3450	376-0275
L6,8,9,10,18	3453	376-0274
L11,13	75110	376-0255
L12,24,33	7430	376-0031
L14	7410	376-0003
L15, 20,46	7400	376-0002
L16,51	7404	376-0010
L17	74157	376-0092
L19,30,40,50	74161	376-0094
L21, 22,23,34 L44,45	74175	376-0119
L25	7420	376-0004
L26,28	7408	376-0081
L27	7402	376-0016
L29,39	25LS2521	376-0317
L31	74S74	376-0202
L32,41,42,43	7486	376-0096
L35,36	74174	376-0098
L37,38	74LS299	376-0303
L47	74S10	376-0238
L48	74S260	376-0206
L49	74S32	376-0205

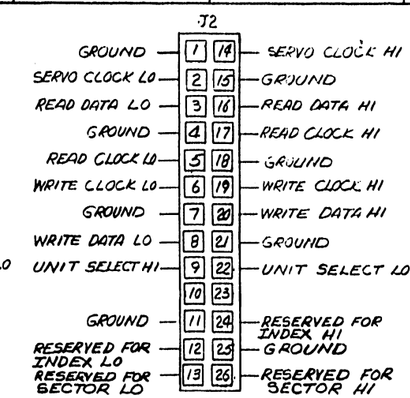
COMPONENT	TYPE	W.L. NO.
R1,R2	1K,1/4 10%	330-3010
R37, 58, 105, 106, 107, 108	2.2K 1/4W 10%	330-3022
R64,66,	20K,1/4W 10%	330-4020
R69, 72	680Ω,1/4W 1%	330-2068
R3-36 R38-57, R59-63 65, 67, 68, 70, 71, 73-104	56Ω 1/4W 10%	330-1056
C1-C18	.047UF 50V	300-1966
C19,21	15UF 20V TA	300-4022
J1,2	26 PIN CONN	350-0058
J3	60 PIN CONN	350-0057

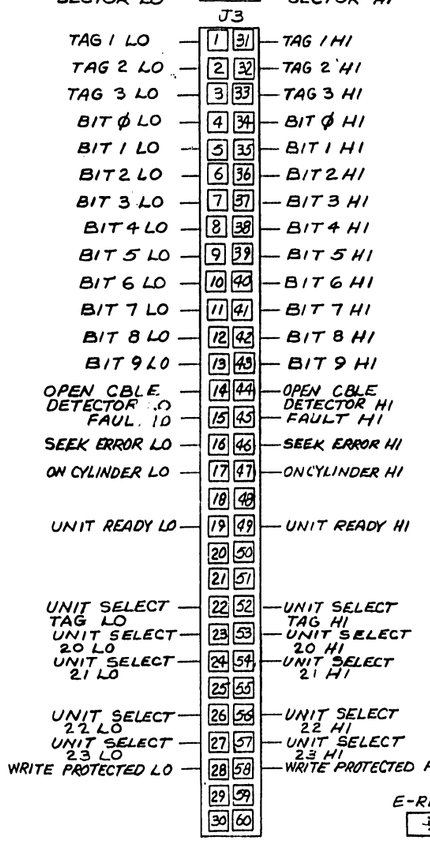
LOCATION	TYPE	SPARES
L1	3450	1
L2	3450	1
L3	3450	1
L4	3450	1
L5	3450	3
L14	7410	2
L15	7400	1
L20	7400	1
L25	7420	1
L26	7408	2
L27	7402	1
L28	7408	1
L31	74S74	1
L41	7486	2
L46	7400	1
L47	74S10	2
L49	74S32	3

MNEMONIC	COORD
BIT 0-9 LO	4A7
BIT 0-9 HI	4A7
DONE	2G6
DERROR	4A6
ECBØ	1A5
ECC DATA	1G3
ECC SHIFTED	3E1
EQUALS	3A4
FAULT HI	4G7
FAULT LO	4G7
FCØ-FC9	4F11
INIT	1F11
NULL	3C1
LOAD ECC	3G5
NULL	3C1
ON CYLINDER HI	4G8
ON CYLINDER LO	4G8
OPEN CABLE DETECTOR HI	4D1
OPEN CABLE DETECTOR LO	4D1
PLO CLOCK	2A6
PRIME	2C11
PWR ON	4G2
RDG	2C11
RDG-WTG	4G10
READ CLOCK HI	2G7,2G10
READ CLOCK LO	2G8,2G10
READ DATA	2A7
READ DATA HI	2G8,2G10
READ DATA LO	2G8,2G10
READY	4A6
RESERVED FOR INDEX HI	2G5

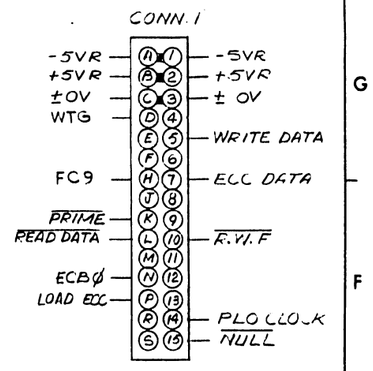
MNEMONIC	COORD
RESERVED FOR INDEX LO	2G5
R.W.F	3B11
RESERVED FOR SECTOR HI	2G3,2G5
RESERVED FOR SECTOR LO	2G3,2G5
SEEK ERROR HI	4G7
SEEK ERROR LO	4G7
SELECT	4G2
SELECT 1,2	4G2
SERVO CLOCK HI	2G7,2G10
SERVO CLOCK LO	2G7,2G10
SHIFT ECC	3G4
SHIFTED	2G8
SOR I	3A4
TAG 1-3	4G11
TAG 1-3 HI	4A10
TAG 1-3 LO	4A10
THSØ-5	3E11
TPI	3G3
UNIT SELECT 20-21 HI,LO	4D2
UNIT SELECT 22,23 HI,LO	4D11
UNIT SELECT TAG HI,LO	4D1
UNIT READY HI,LO	4G8
WXFER ECC	1G1
WRITE CLOCK HI	2A8,2A9
WRITE CLOCK LO	2A8,2A9
WRITE DATA	2D11
WRITE DATA HI	2A8
WRITE DATA LO	2A8
WRITE PROTECTED HI,LO	4G5
WP	4A6
WTG	2G6

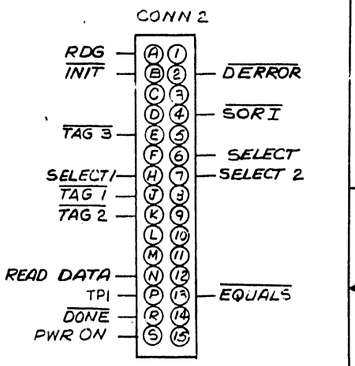


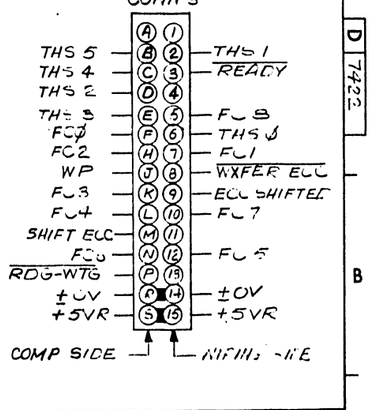


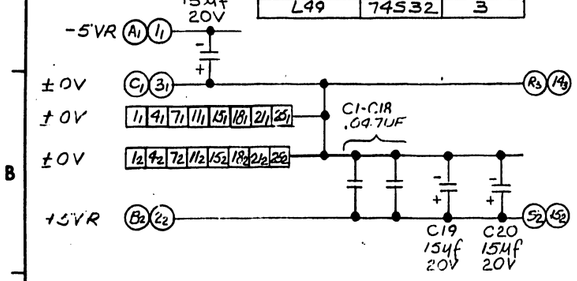


E-REV 4









NO.	REVISION	BY	DATE
0	ORIGINATED PER DWR E-545 APPD:		6-7-79
1	REVISED PER ECN #10864 APPD:		6-19-79
2	REVISED PER ECN #11170 APPD:		6-19-79
3	REVISED PER ECN #11193 APPD:		6-19-79
4	REVISED PER ECN #11623 APPD:		6-19-79
5	REVISED PER ECN 12283 APPD:		10-2-79
6	REVISED PER ECN #14568 APPD:		4-22-80
7	REVISED PER ECO #18810 APPD:		3-16-81
8	REVISED PER ECO #18910 APPD:		5/21/81

DWN		DATE	APPROVED BY
CHK			E ENGR M. GLEEK
			M ENGR
			MFG ENGR

WANG LABORATORIES, INC. LOWELL MASS U.S.A.

MATERIAL

MODEL NO. 2200 SMD
SEE ENGRG SPECIFICATIONS
No.

FINISH

TOL ER AS NOTED
XX ± FRAC ±
XXX ± ANG ±
FINISH √

TITLE ECC/DEVICE INTERFACE

SCALE	SHT 6 OF 6	210-7422	D	7422	8
		WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D17

DO NOT SCALE

ADØ-AD9 (4D1)

L1 L17 L2 L18 L3 L19 — 2114-L

C4 C13 C5 C14 C6 C15 .05μf ±0V +5VR

ADØ AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 R/W

7K (4D3) 5K (4D3) 3K (4D3)

L4 L20 L5 L21 L6 L22 — 2114-L

C7 C16 C8 C17 C9 C18 .05μf ±0V +5VR

1K (4D3) 8K (4C3) 6K (4D3)

MBØ - MB7 (2E1)

ADØ (14) AD1 (10) AD2 (9) AD3 (16) AD4 (15) AD5 (12) AD6 (8) AD7 (3) AD8 (6) AD9

R5 (3F1)
T2-5 (2D1)
RAØ (4C11)
T500
WTM (4A6)

L5 7402
L55 7404
L39 7451 → R/W (2E11)

T9 (2C4)
RFM (4A6)
L38 7414
L39 7451 → MREGCLK (2C11)

CRESET (D1) → CRESET (4B11)

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.			
MATERIAL —	MODEL NO. 2200SMD SEE ENGRG SPECIFICATIONS No.	TITLE RAM/PROM CONTROL	
FINISH —	TOL. EX AS NOTED .XX ± .XXX ± FRAC ± ANG ± FINISH √	SEE CHART	D 7435 1.1
	SCALE — SHT 1 OF 5	WANG PART NUMBER	SIZE DRAWING NUMBER REV

BY	DATE	APPROVED BY	DATE
DWN R.P.B	3/1/79	E ENGR	
CHK		M ENGR	
		MFG ENGR	

REVISION	BY	DATE
CHANGE PART NO.	RPB	3/1/79

SHEET 5

D18

DO NOT SCALE

AD0-AD9 (4D1)

C10 C19 C11 C20 C21 C12 .05MF

L7 L23 L8 L24 L25 L9 2114-L

4R (4D3) 2R (4D3)

R/W (1B8)

RDG (A1)

MB0-MB7 (1B11)

AK0-AK1 (4G11)

AK0 AK1 AK2 AK3 AK4 AK5 AK6 AK7

L41 L40 2905

MREG CLK (1A8)

LDWTM REG (4B8)

WTM (4A5)

MB0 R1 470Ω +5VR

R2 R3 R4 R5 R6 R7 R8 470Ω

L48 7442

T0 (3F3) (3C10)

T4 (3E11) (4G5) (4D11)

T3 (4B11)

T5 (4C11)

T9 (1A10)

T2-5 (3B1) (3D11)

L61 7404

L49 74174

L47 74160

L46 7408

T0 16K (4A4)

L56 7404

CLKG

C1 10 PF

R10 330Ω

R9 1.8K

R11 2.2K

R12 220Ω

XTAL 10 MHZ

+5VR R13 2.2K

BY	DATE	APPROVED BY	DATE
DWN		E ENGR	
CHK		M ENGR	
		MFG ENGR	

WANG LABORATORIES, INC. LOWELL MASS. U.S.A.

MATERIAL --- MODEL NO. 2200SMD SEE ENGRG SPECIFICATIONS

FINISH --- TOL EX AS NOTED .XX ± .XXX ± FRAC ± ANG ± FINISH

TITLE CONTRO

SCALE — SHT 2 OF 5

WANG PART NUMBER — SIZE D — DRAWING NUMBER — REV

NO.	REVISION	BY	DATE
	ENGR RELEASE		4/4/75

DO NOT SCALE

+5VR -5VR +12V ±0V

L29 2911 L30 2911 L31 2911

L13 L14 L15 L16 2716

L32 L33 L34 74174

CNTRL 14 (4F4)
R 5 (3F1)
256 (4B11)
256
T4 (2D4)
UB
SB
T2-5 (2D1)
RETURN
R/S
TØ (2D4)
PWRON
CAPN
PRIME (4F5)
PRIME
*ADDED HARDWIRE PER ECN # 19561
SEE SHT 5
R14 22K
R15 2.2K
R16 2.2K
C7 220PF
CS2
R0-R10
R0-R10 (4E11)
R5 (1B11) (3E11)
R6 (4G9) (4G4)
R2-R10

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
MATERIAL	DWN RPP	8/27	E ENGR	
MODEL NO. 2200-SMD SEE ENGRG SPECIFICATIONS No.	CHK		M ENGR	
FINISH	TOL EX AS NOTED .XX ± .XXX ± FRAC ± ANG ± FINISH		MFG ENGR	
TITLE R.A.M. CONTROL	SEE CHART	D	SIZE	1-4
SCALE	SHT 3 OF	WANG PART NUMBER	SIZE	DRAWING NUMBER REV

D20

DO NOT SCALE

R8 (3D2)

R0-R7

AK0-AK7 (2D7)

L12 74157

MA0 MA1 MA2 MA3

R0 R1 R2 R3

AK1 AK2 AK3

L28 74157

MA4 MA5 MA6 MA7

R4 R5 R6 R7

AK4 AK5 AK6 AK7

STB ±0V

R9

L56 7404

R10

L43 7432

T4 (2D4)

LAUX (N2)

LDADD (2G8)

L46 7408

L56 7404

R2 R3

L36 9321

RA0 (1B11)

RA0 (5J)

T5 (2C4)

L37 7432

DECMADD

L10 L11 L26 L27 74193

DN UP BOR CAR CLR LD

I.DADD (4D10)

L52 7432

AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD14 AD15

L42 74LS138

TO16K (2E5)

+5VR

IK (1C10) 2K (2E7) 3K (1E5) 4K (2E10) 5K (1E7) 6K (1C5) 7K (1E3) 8K (1C7)

L35 74153

1G 2G 1C0 1C1 1C2 1C3 2C0 2C1 2C2 2C3 1Y 2Y

CRESET (1A9) C100

256 (3E10) C200

T3 (2C9)

L38 7414

L55 7409

L37 7432

L51 7402

INCMADD

LD WTM REG (2B11)

WTM-CMP (9)

BFM-CMP (F)

L36 9321

WTM (1B11)

RFM (1A10)

L55 7404

WTM (2B11)

COMPARE

CNTRL-1 (K2)

R8 (3D2)

L53 74LS195 SH/LD CLR

L55 7404

L57 7408

L59 9602

L44 7400

L58 74LS74

LOAD ECC (L1) READ (2) WRITE (3) FETCH (L2) RMW (L1) STROBE (23) BSY (L1) SHIFT ECC (L3)

R1 R2 R3 R6 R10 R9 R7

T4 (2D4)

PRIME (3A9)

CNTR L14 (3F11)

STROBE

R18 2.2K +5VR

C3 .001MF

PU7 2.2K +5VR

(F3) LDT

ADØ-AD9 (2G11) (1G)

AD10 AD11 AD12 AD14 AD15

TO16K

	BY	DATE	APPROVED BY	DATE
DWN			E ENGR	
CHK			M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

MODEL NO. 220-5MD SEE ENGRG SPECIFICATIONS No.

TITLE CONTROL

FINISH

TOL ±.X AS NOTED .XX ± .XXX ± TRAC ± ANG ± FINISH √

SCALE — SHT 4 OF 5

SEE CHART | D | 7420 | 1.1

WANG PART NUMBER | SIZE | DRAWING NUMBER | REV

REVISION | SEE SHT 5

D21

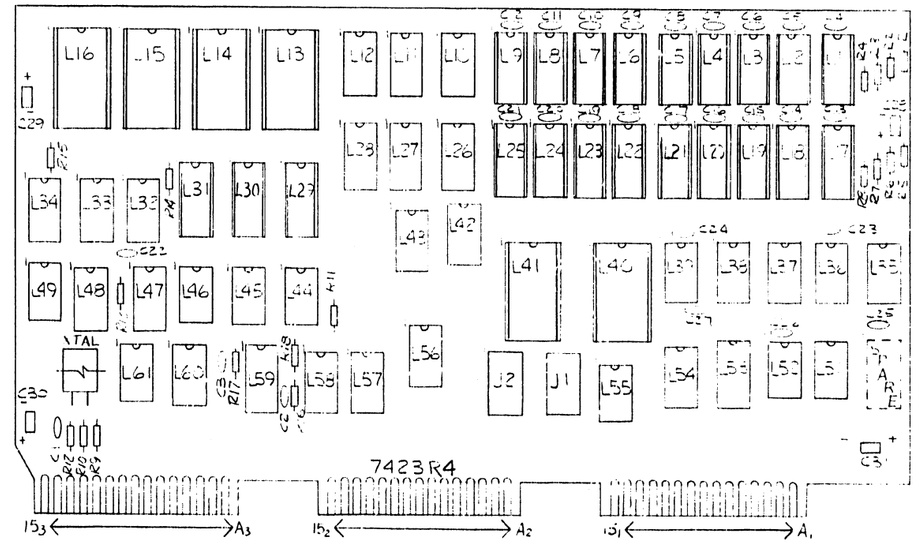
DO NOT SCALE

210	209	210 - 209 (378 OR 379)			
		L13	L14	L15	L16
7423A DIP MICRO CODE	7423	378-4083-R7	378-4084-R7	378-4085-R7	378-4086-R7

COMPONENT	WLI NO.	TYPE
C1	300-1025	100PF 500V CER
C2	300-1220	220PF 500V CER
C3	300-1905	.001MF 500V CER
C4 - C27	300-1900	.05MF 25V CER
C28-C31	300-4022	15MF 20V TA
XTAL	32-0008	10MHz
R1-R8	330-2047	470Ω, ¼W 10%
R9	330-3018	1KΩ, ¼W 10%
R10	330-2033	330Ω ¼W 10%
R11, R13-R16, R18	330-3033	3.3KΩ, ¼W 5%
R12	330-2022	220Ω ¼W 10%
R17	333-0151	16.2K ½W 1%

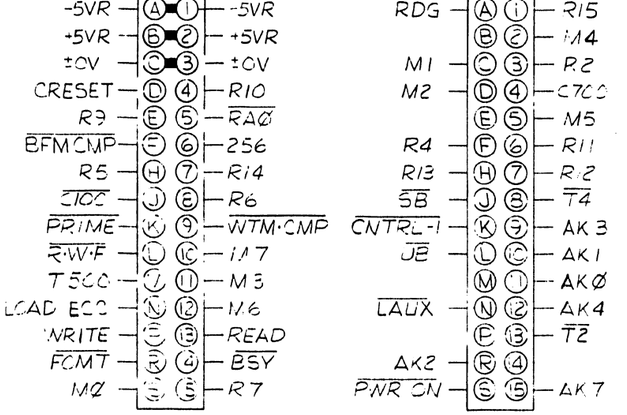
TYPE	LOCATION	SPARES
7432	-L37	-1
7432	-L43	-1
7432	-L60	-1
7402	-L51	-1
7427	-L54	-2
9602	-L59	-1

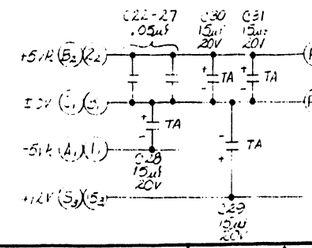
LOCATION	WL PART NO	TYPE
L1-L9, L17-L25	376-0341	2114-L
L10 L11, L26 L27	376-0058	74193
L12 L28	376-0082	74157
L13-L16	SEE CHART	2716
L29, L30 L31	377-0247	2911
L32, L33, L34	376-0098	74174
L35	376-0048	74153
L36	376-0096	9321
L37, L43, L45, L52, L62	376-0093	7432
L38	376-0039	7414
L39	376-0013	7451
L40 L41	377-0263	2905
L42	376-0294	74LS138
L44	376-0002	7400
L46, L57	376-0081	7408
L47	376-0191	74160
L48	376-0009	7442
L49, L58	376-0006	7474
L51	376-0016	7402
L53	376-0097	74195
L54	376-0125	7427
L55, L56, L61	376-0010	7404
L59	376-0104	9602
L50		SPARE
L1-9, 17-25	376-9014	18 PIN SKT
L13-16, 40-41	376-9030	24 PIN SKT
L29-31	376-9020	20 PIN SKT



MNEMONIC	COORDINATE
AD7	4C1
AKØ-AK7	2C11
BFM·CMP	4A11
BSY	4E1
CAPM	3B11
CNTRL-1	4G4
CRESET	1A11
C10C	4B11
C70C	4B11
FCMT	4G1
LAUX	4D11
LOAD ECC	4G1
MØ-M7	2C1
PRIME	3A10
PWR ON	3B11
RAØ	4C11
RDG	3D11
READ	4G1
RETURN	3D11
R·W·F	4F1
ADØ-AD12, 14, 15	1C1
CLKG	2B11
MBØ-MB7	2F1
OSC	2A8

MNEMONIC	COORDINATE
RØ-R15	3E1
SB	3E11
SHIFT ECC	4E1
STROBE	4F1
T500	1B1
T0, T2, T2-5	2D1
T4, T8	3D1
T016K	4A5
T9	2A4
R15	3C11
UB	3E1
WR TE	4G1
WTM·CMP	4A11
256	3E11





E-REV 4

REVISION	NO	BY	DATE	APPROVED BY	DATE
ECO 7/17/79	12	RVD TO PER ECN # 10079 AFF. FSS 7/17/79	7/17/79		
REVISED PER ECN # 11239 APP'D FSS 9/12/79	13		9/12/79		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	14		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	15		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	16		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	17		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	18		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	19		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	20		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	21		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	22		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	23		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	24		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	25		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	26		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	27		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	28		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	29		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	30		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	31		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	32		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	33		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	34		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	35		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	36		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	37		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	38		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	39		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	40		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	41		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	42		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	43		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	44		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	45		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	46		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	47		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	48		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	49		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	50		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	51		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	52		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	53		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	54		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	55		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	56		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	57		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	58		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	59		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	60		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	61		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	62		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	63		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	64		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	65		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	66		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	67		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	68		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	69		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	70		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	71		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	72		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	73		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	74		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	75		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	76		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	77		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	78		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	79		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	80		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	81		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	82		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	83		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	84		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	85		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	86		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	87		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	88		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	89		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	90		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	91		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	92		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	93		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	94		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	95		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	96		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	97		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	98		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	99		10/3/80		
REVISED PER ECO #10338 APP'D WMJ 10/3/80	100		10/3/80		

WANG LABORATORIES, INC. LOWELL MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
MATERIAL	DWN RFB	5-2-79	ENGR M. PEER	7/17/79
MODEL NO. 2200-SMD SEE ENGRG SPECIFICATIONS No.	CHK FSS	7-17-79	M ENGR	
FINISH	TOLERANCES AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH		MFG ENGR	
SCALE — SHT 5 OF 5	TITLE RAM PROM CONTROL			
WANG PART NUMBER	SIZE D	DRAWING NUMBER	REV 1	

D-22

DO NOT SCALE

READ DATA (N2)

R10 (4,)

R6

AK0 (11₂)
AK1 (10₂)
AK2 (14₂)
AK3 (9₂)
AK4 (12₂)
AK5 (3₂)
AK6 (4₂)
AK7 (15₂)
R0 (M3) → R0(2F5)
R1 (9₃) → R1(2G4)
R2 (3₂) → R2(2G4)
R3 (1₃) → R3(2G4)
R4 (F2)
R6 (B1)

L51 74LS374 OC — LDTRACK (1E4) — TRACK ON(1B8)
L49 74LS374 OC
L50 74LS374 OC — LDHEAD (1E4) — HEADON (1B8)
AK0–AK7 → THS0–THS7

L53 74LS374 OC — R0, R1, R2, R3, R4, ±0V → FC2–FC7

L52 74LS244 — THS0–THS7 → THSB0 (1C11), THSB1 (1D11), FC2–FC7

L27 74LS276 CLR — AK6, AK7, TAG 3 REQ (2F3), TK 256 (1B7), TAG 1 REQ (1C11)(2G2), CNTRL28 (3G5), PRIME (2D11)
L17 7451 → FC8
L28 7408 → TK 512 (1C7), FC9
L18 7404 → CMP (3E4)

CNTRL38(2F5), R7(2E6) → L38 7400
L37 9321 — R10(1G4), R9(2E6) → LD TRACK (1F10), LD HEAD (1E9)

FC7, FC6, FC5, FC4, FC3, FC2, FC1, FC0

L20 7404 — ENBC700 (2A4)
+5VR — R1 2.2K
L47 74LS299 — PLO CLOCK (2B11), RDG (3C4), ±0V, RDG·WTG (2F8) → SYNC BIT (2C11), W DATA (2E8), M0–M7
L18 7404 — L38 7400

THSBI (1E7), RDG (2F10), THSBØ (1E7), RD/WT GATE (3F2), WTG (2G7)
L10 7451 → FC1
L1C 7451 → 2 FCØ
L20 7404

TAG 1 REQ (2G2), TAG 2 REQ (2G2) → L4C 9321 → L38, L39 → TRACK ON (1F9), HEAD ON (1D9)
RT1 (3C5), RT2 (2C4), ADDCK (3F5) → L4C 9321 → ENDADD (2D10)
WRITE (P1) → WRITE (3C7)

TK512 (1F1), THS7 (1B1), TK256 (1G3), THS6 (1B1) → L15 7451 → L35 7404
RIW (3C5) → L16 7411 → L25 7432

L48 74LS2521 — THSØ–THS5, M0–M7, EIN → +0V, EOUT → L9 7474 → ADD ERROR (3D10), ADDCK (3F5)
C700 (2B7)

THS 5, THS 4, THS 3, THS 2, THS 1, THS Ø, THS 7 (1C7), THS 6 (1B7), ERROR

REVISION	BY	DATE	APPROVED BY	DATE
	DWN		E ENGR	
	CHK		M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL —
FINISH —
MODEL NO. 2200 SMD — SEE ENGG. SPECIFICATIONS
TOL ER AS NOTED: XX ± .01, FRAC ± 1/64, ANG ± 1°, FINISH √
TITLE: I/O CONTROLLER
210-7424 — WANG PART NUMBER
SIZE D — DRAWING NUMBER 7424 — REV
SCALE — SHT — OF 4

D23

DO NOT SCALE

WTG

WTG (3B4)

BT4 (2C4)

RDG (3C4)

RDG (1D11) (3G5)

WT12 (3E10)

BIT 4

ENBC200 (2B4)

READ DATA

ECBØ

SORI (3F9)

PRIME (3F9) (1E3) (2E3)

FOMT (3C9)

PLO CLOCK (14)

SYNC BIT (1D5)

SYNC ENB (3F4)

PLO CLOCK (1D7)

BK1 (2B3)

BT256 (2C3)

C700 (2B7)

RDG·WTG (1C1) (3E4)

WTG (1C11) (3G5)

DONE (3D7)

RFM (3D4)

WDATA (1D5)

FOMT (3E10)

SECTOR (3E10)

C700 (2G9) (3G2)

C700 (3G5) (1A4)

ENBC700

R7 (1E6) (3E6)

R9 (1E6)

R8 (3G6)

R10 (1E4)

CNTRL 34

CNTRL 38 (1E6)

T01

TAG 1 REQ (1B)

TAG 2 REQ (1B)

TAG 3 REQ (1B)

PRIME (2D11)

XFERST3 (3D9)

BT1 (1E11)

BT2 (1B11)

BT4 (1C11)

BT8

BT16 (3E10)

BT256 (3G9)

ENBC200 (2F11)

ENBC500 (3G4)

BK1 (2G10)

+5V

+0V

R5 2.2K

R3 2.2K

L1 7414 · L2 7414 · L3 7411 · L4 74S138 · L5 74193 · L6 74193 · L7 74193 · L8 7405 · L11 7404 · L12 7414 · L21 7474 · L22 7432 · L23 7408 · L26 7402 · L28 7408 · L29 74LS276 · L31 7402 · L32 74S10 · L34 7408 · L35 7404 · L36 7411 · L37 9221 · L41 7411 · L42 74S10 · L43 7420 · L44 7474 · L45 7408 · L46 74LS276

SEE SHEET 1

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
	DWN		E ENGR	
	CHK		M ENGR	
MATERIAL —	MODEL NO 2200 SMD SEE ENGRG SPECIFICATIONS No.		MFG ENGR	
FINISH —	TOL ±X AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √ SCALE 2/1 SHT 2 OF 4	TITLE I/O CONTROLLER		
		210-7424 WANG PART NUMBER	D SIZE	7434 DRAWING NUMBER

C1 WTG · C3 C700 · P3 RDG·WTG · 51 WRITE DATA · 71 ECC DATA · R2 DONE · 61 DONE · S3 WXFER ECC

D24

DO NOT SCALE

SOR1 (4₂) DERROR (A₂) EQUALS (13₂) T8 (A₃) CNTRL2 (M₂) READ (13₁) R8 (11₃)

R8(2G5)

CNTRL 2B(1F4)

RDG(2F10) → (L2) RDG

ENBC 500(2B4) → L12 7414 → L32 7450 → L12 7414 → (D1) CRESET

C700(2B7) WTG(2G7) → L17 7451 → INIT

C700(2B7) → L21 7474 → (M) T500

R7(2E6) → L8 7400 → L18 7404 → INIT → (B2) INIT

SOR1 (2E10)

T8(2F6)

L8 7400 · L31 7402

L20 7404 · L19 7474 · L18 7404 · L9 7474 → ADDCK(1B11) → ADDCK(1A4)

SECTOR (EC9) · SECTOR

L25 7432 → SYNC ENB(2B10)

±0V · C1 470 pf · PRIME(2D11) · L34 7408

FOMT(2C8) · BT16(2C4) · WT12(2F9) · L14 7420 · L34 7408 · L16 7411

L33 7474 ← ADD WER · ±0V · RD/WTG GATE (1C7)

RDG-WTG(2F8)

L19 7474 · WTM · WTM → L45 7408 → (9₁) WTM·CMP

CMP(1F2) → L45 7408 → (F1) RFM·CMP

RFM(2E7) → L45 7408

→XFERSTB(2D6)

FOMT

DONE(2F7) · L36 7411 · READ · L34 7408 · ADDWER

ENDADD(1B9) · ADD ERROR(1B3) · L14 7420 · L33 7474

FOMT(2C11) → ADD CK

WRITE(1A9) · 2 7432 · L25 · READ 1 · R1W (1A8)

C2 470PF · C3 470PF · ±0V

L24 7451 → RDG(1C7)(2F11)

SECTOR → (52) SECTOR

FOMT

L24 7451 → WTG(2G11)

WRITE

SEE SHEET 1

WANG LABORATORIES, INC. LOWELL MASS U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN PR		E ENGR	
		CHK		M ENGR	
MATERIAL —	MODEL NO. 3300SMD SEE ENGRG SPECIFICATIONS No.			MFG ENGR	
FINISH —	TOL EX AS NOTED XX ± .01 FRAC ± 1/64 ANG ± 1° FINISH √	TITLE I/O CONTROLLER			
	SCALE 2/1 SHT 3 OF 4	30-722 WANG PART NUMBER	D SIZE	7421 DRAWING NUMBER	REV

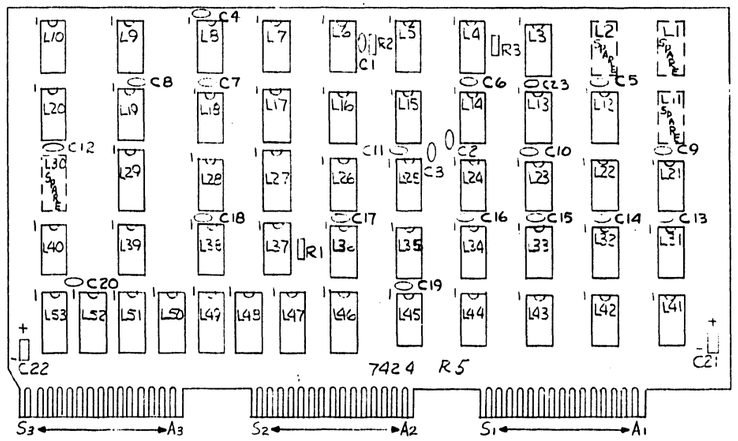
D25

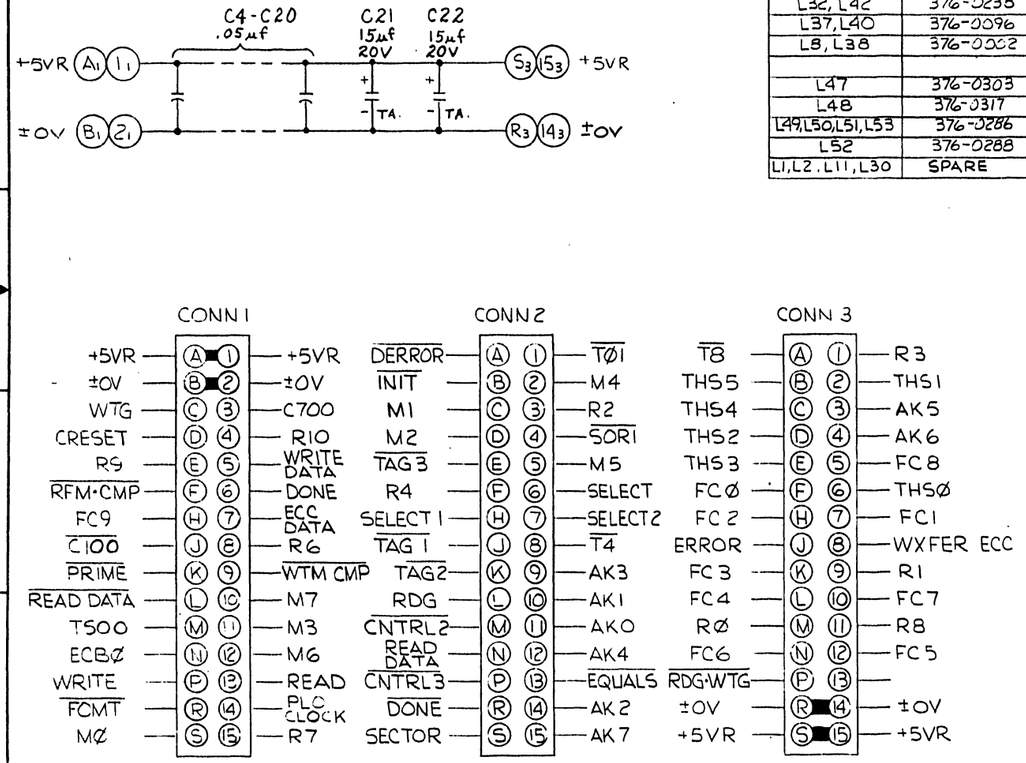
DO NOT SCALE

COMPONENT	WLI NO.	TYPE
C23	300-1220	220pf, 500V
C1, C2, C3	300-1470	470 pf, 500V
C4 - C20	300-1900	.05μf, 12VDC
C21, C22	300-4022	15μf, 20V
R1, R2, R3	330-3022	2.2K, 1/4W 10%

LOCATION	WL PART NO	TYPE
L3, L16, L36, L41	376-0194	7411
L4	376-0298	74S138
L5, L6, L7	376-0053	74193
L10, L17, L15, L24	376-0012	7451
L18, L20, L35	376-0010	7404
L9, L13, L19, L21, L33, L44	376-0006	7474
L14, L43	376-0004	7420
L12	376-0139	7414
L22, L25	376-0093	7432
L23, 28, 34, 39, 45	376-0081	7408
L26, L31	376-0016	7402
L27 L29 L46	376-0318	74276
L32, L42	376-0238	74S10
L37, L40	376-0096	9321
L8, L38	376-0002	7400
L47	376-0303	74LS299
L48	376-0317	25LS2521
L49, L50, L51, L53	376-0286	74LS374
L52	376-0288	74LS244
L1, L2, L11, L30	SPARE	

TYPE	LOCATION	SPARES
7432	L22	1
7414	L12	1
7408	L39	2
7411	L41	1
7474	L44	1





MNEMONIC	COORDINATE
AKØ-AK7	1F11
CNTRLZ	3G7
CNTRL3	265
CRESET	3G1
C100	281
C700	2A7
DERROR	3G8
DONE	2A5
DONE	2A5
ECBØ	2D11
ECC DATA	2A6
EQUALS	3G8
ERROR	1B1
FCØ-FC9	1E1
FOMT	2D11
INIT	3F1
MØ-M7	1D1
PLO CLOCK	2C11
PRIME	2D11
RDG	3G1
RDG·WTG	2A6
READ	3G7
READ DATA	1G8
READ DATA	2E11
RØ-R9, R6	1E11
RFM·CMP	3D1
R7	2G6
R8	3G6
R9	2G5

MNEMONIC	COORDINATE
R10	1G4
SECTOR	3B1
SELECT-SELECT 2	2E1
SOR1	3G9
TAG1-TAG3	2G1
THSØ-THS 5	1C1
T500	3G1
TØ1	2G6
T4	2G5
T8	3G7
WRITE	1B11
WRITE DATA	2A6
WTG	2A9
WTM·CMP	3E1
WXFER ECC	2A4

REVISION NO	REVISION	BY	DATE
	ORIGINATED ECN# 10125 APP'D: 5/17/79	[illegible]	5-17-79
A	REVISED PER ECN# 10125 APP'D: 5/17/79	[illegible]	5-17-79
B	REVISED PER ECN# 11969 APP'D: 6/21/79	[illegible]	6-21-79
C	REV PER ECN# 11922 APP'D: 7/11/79	[illegible]	7-11-79
D	REVISED PER ECN# 12099 APP'D: 7/19/79	[illegible]	7-19-79
E	REVISED PER ECN# 12231 APP'D: 7/31/79	[illegible]	7-31-79
F	REVISED PER ECN# 12490 APP'D: 8/31/79	[illegible]	8-31-79
G	REVISED PER ECN# 12717 APP'D: 9/10/79	[illegible]	9-10-79
H	REVISED PER ECN# 13369 APP'D: 11/30/79	[illegible]	11-30-79
J	REVISED PER ECO# 13715 APP'D: 12/19/79	[illegible]	12-19-79
K	REVISED PER ECO# 14094 APP'D: 1/11/80	[illegible]	1-11-80

E REV. K

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN [illegible]	4/27/79	E ENGR M GREER	6/4/79
		CHK [illegible]	6/4/79	M ENGR	
MATERIAL —	MODEL NO. 2200 SMD SEE ENGRG SPECIFICATIONS No.			MFG ENGR	
		TITLE I/O CONTROLLER			
FINISH —	TOL. EX AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √	210-7424	D	7424	1
	SCALE 2/1 SHT 4 OF 4	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D 7424

D26

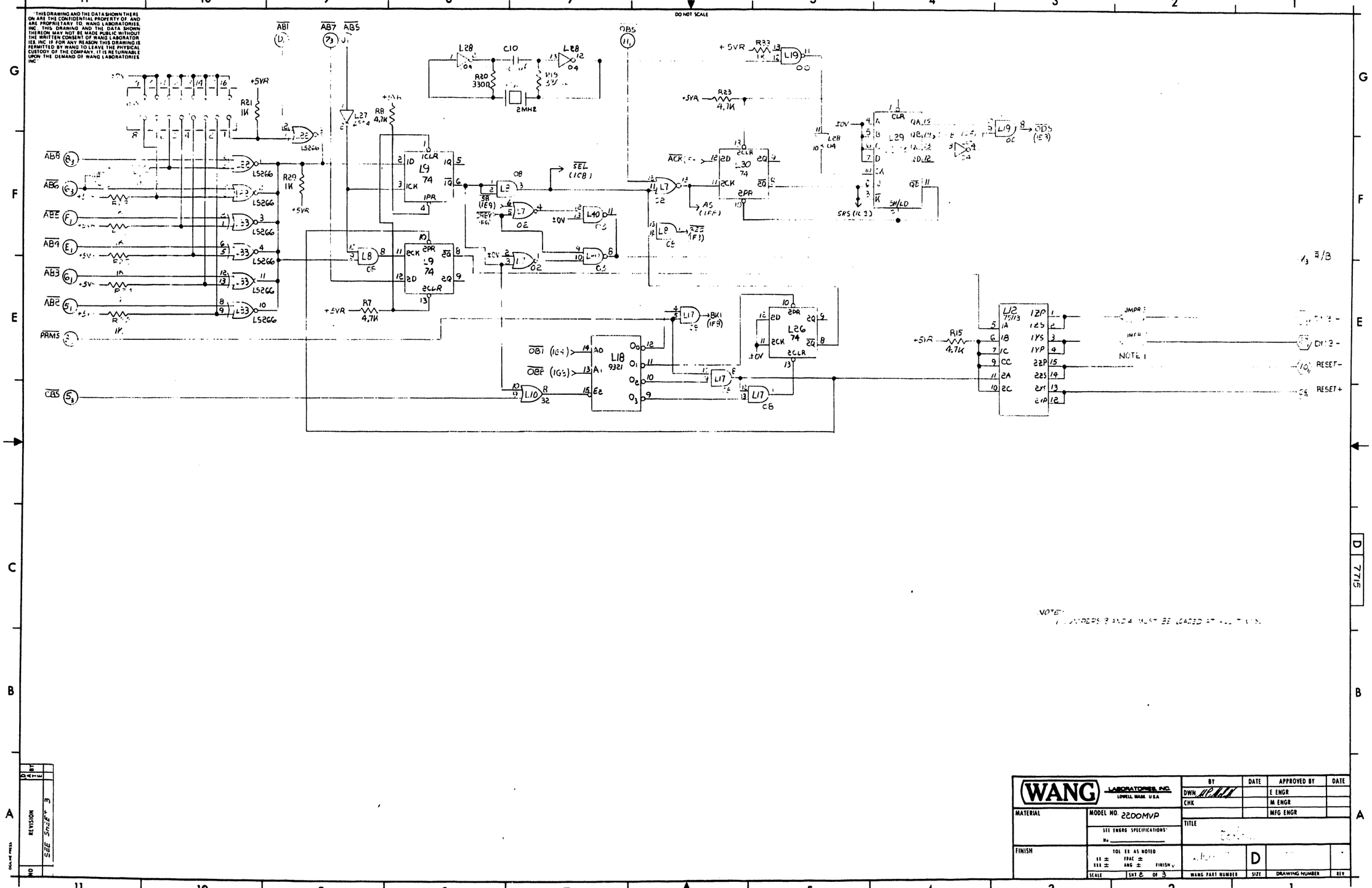
DO NOT SCALE

REVISION	BY	DATE
ECO NO.		

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
MATERIAL	DWN. MP Michaelis	4-8-74	E ENGR	
MODEL NO 2200/MVP	CHK		M ENGR	
SEE ENGRG SPECIFICATIONS No.			MFG ENGR	
FINISH	TITLE 2200 CPU CONTROLLER			
TOL ER AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √	200-7715	D	7715	
SCALE	SHT 1 OF 3	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D27

DO NOT SCALE



NOTE:
[illegible] MUST BE LOADED AT ALL TIMES.

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN		E ENGR	
		CHK		M ENGR	
MATERIAL	MODEL NO. 2200MVP			MFG ENGR	
	SEE ENGRG SPECIFICATIONS No.	TITLE			
FINISH	TOL EX AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √		D		
	SCALE SHT 2 OF 3	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

REVISION

NO	REVISION	BY	DATE
	SEE SHEET 3		

D 7715

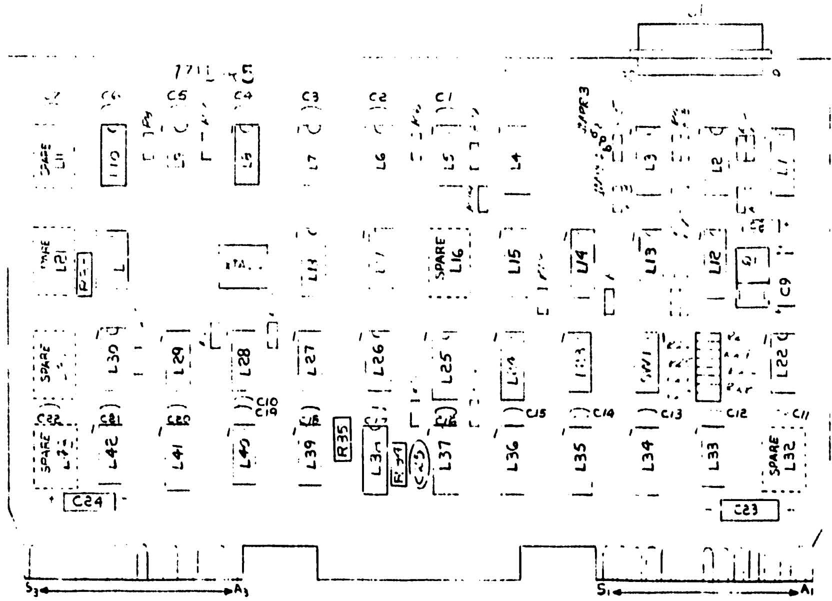
1-28

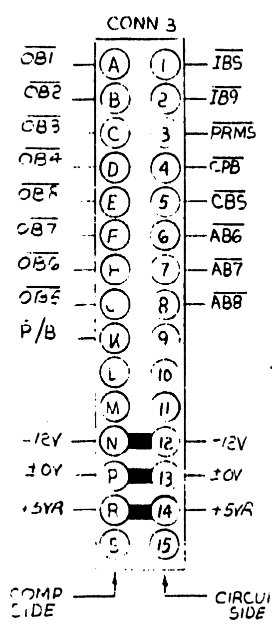
DO NOT SCALE

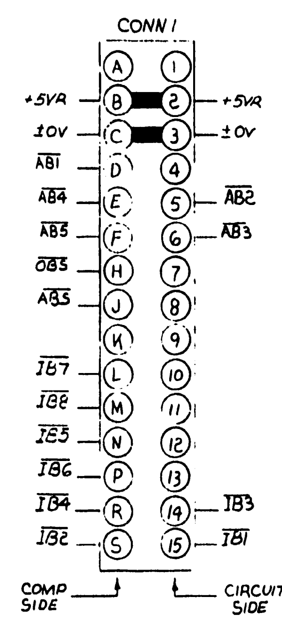
COMPONENT	TYPE	WL PART NO
R1-5 [illegible]	100Ω 1/4W 10%	330-2010
R6-8 [illegible],23	4.7K 1/4W 10%	330-3047
R[illegible]	330Ω 1/4W 10%	330-2033
R9,21,[illegible],31,33,35	1K 1/4W 10%	330-3010
R34	33K 1/4W 10%	330-4033
C[illegible] 1-22	.05 µf 12V	300-1900
C8	5.6µF 35V (T)	300-4[illegible]
C9 23 24	15µf 20V (T)	300-[illegible]2
[illegible]	.01 uf 25V	300-[illegible]
C25	470pf CER	300-1470
Q1	UA7905	374-0002
XTAL 1	2.0 MHZ	321-0010
SW1	[illegible]	325-1503
U1	CONN 36 POS	350-1044

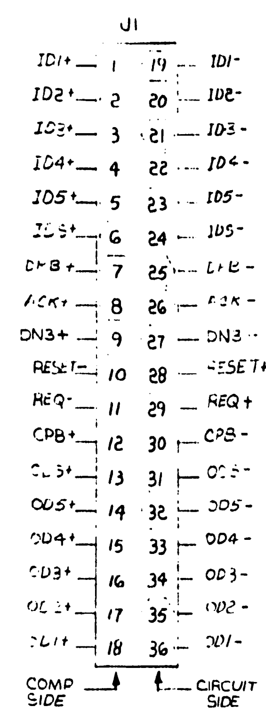
LOCATION	TYPE	WL PART NO
L1,2,3	MC3450	376-0275
L4,12,13,14,15	75[illegible]	376-0856
L5,9,2[illegible],30	7474	376-0006
L6,8,17	7408	376-[illegible]81
L7	7402	376-[illegible]16
L27	74LS04	376-0180
L10	74[illegible]	376-0073
L[illegible]	7400	376-0002
L18	9321	376-0076
[illegible]	74LS[illegible]	376-0148
[illegible],42	74LS280	376-0242
[illegible]24,25,36,37	74174	376-0[illegible]
L28	7404	376-0010
L[illegible]	74LS195	376-0248
L34,[illegible]	74[illegible]	376-0204
L[illegible]	74[illegible]	376-0012
L[illegible]	74[illegible]	376-00[illegible]
L[illegible]	[illegible]	376-0082
L11,16,[illegible] 43	SPARE	
L38	74123	376-0080

TYPE	LOCATION	SPARE
74[illegible]	[illegible]	[illegible]
74[illegible]	[illegible] L17	[illegible]
[illegible]	[illegible]	[illegible]
9321	L18	
74123	L38	
74LS04	L27	2



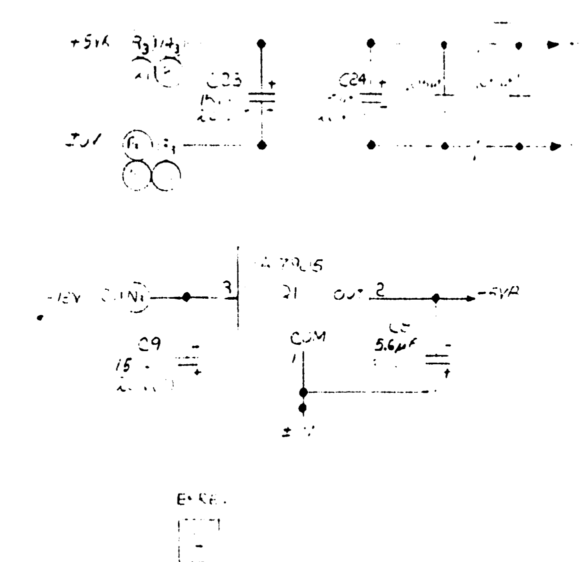






MNEMONIC	COORD
ABS	2G9
AE	3[illegible]
AB[illegible] AE3	2E11
AE	2[illegible]
A[illegible],A[illegible]	[illegible]7
CB5	2E11
[illegible],CP[illegible]	[illegible]
DR[illegible]	[illegible]
[illegible]	1A.
ID1+ ID1-	1E[illegible]
ID2[illegible]	1E[illegible]
ID4+,ID4	[illegible]

MNEMONIC	COORD
ID5+,ID5-	[illegible]
[illegible],ID5-	1G7
OBS	2G[illegible]
OD5+,OD5-	[illegible]
CB1-[illegible]	[illegible]4
CD1[illegible]	[illegible]
OD2+,OD[illegible]-	1B1
OD3+,OD3-	[illegible]
CD4+,CD4-	[illegible]
R/B	3F
RESET+,RESET-	[illegible]
[illegible],REQ-	[illegible]



NO	REVISION	DATE	BY
[illegible]	ORIG[illegible]	5-3[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	8-2[illegible]	[illegible]
[illegible]	[illegible]	8-2[illegible]	[illegible]
4	REVISED PER ECN #16548 APP'D: [illegible]	10-[illegible]-80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	REV[illegible] PER [illegible]	6-23-8[illegible]	[illegible]
7	REVISED PER ECO # 19[illegible] APP'D[illegible]	[illegible]24-8[illegible]	[illegible]

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
DWN	[illegible]		E ENGR	
CHK	[illegible]		M ENGR	
			MFG ENGR	

MATERIAL

MODEL NO. 2200MVP

SEE ENGRG SPECIFICATIONS No.

TITLE 2280 DISK [illegible]

FINISH

TOL EX AS NOTED XX ± FRAC ± XXX ± ANG ± FINISH

SCALE | SHT 3 OF 3

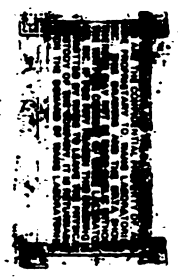
WANG PART NUMBER 210-7715 | SIZE D | DRAWING NUMBER 7715 | REV

D29

NO	REVISION	DATE	BY
	SEE SHT 5		

SIGNAL	INTFC 7422	AUX/MUX 7421	RAM/PROM 7423	VO CONT 7424	SPARE	SPARE	REGULATOR 6439	U1	U2	U3	PRIME CKT 7415	MASTER	SLAVE 1	SLAVE 2	SLAVE 3
ACK2-1												D3	63		
ACK2-2												C3	F3		
ACK2-3												A3	73		
ACK2-4												B3	H3		
ACK3-1												J3		63	
ACK3-2												H3		F3	
ACK3-3												E3		73	
ACK3-4												F3		H3	
ACK4-1												S3			63
ACK4-2												L3			F3
ACK4-3												K3			73
ACK4-4												M3			H3
AK0		112	112	112											
AK1		102	102	102											
AK2		R2	R2	142											
AK3		92	92	92											
AK4		122	122	122											
AK5		33	33	33											
AK6		43	43	43											
AK7		152	152	152											
AD7			F3	F3											
BSY		14,	14,												
BS2												C2	S1		
BS3												B2		S1	
BS4												A2			S1
CAOM		53	52												
CLK												D1	D1	D1	D1
CNTR		K2	K2												
CNTRL-2		M2		M2											
CNTRL-3		P2		P2											
CPB												J1	J1	J1	J1
CSØ												62		P1	P1
CS1												F2		R1	R1
CRESET			D1	D1											
C100			J1	J1											
C700			42	31											
D ERROR	22	E3		A2											
DOD1												61	61	61	61
DOD2												F1	F1	F1	F1
DOD3												E1	E1	E1	E1
DOD4												51	51	51	51
DS												M2	A3	A3	A3
DN3												H1	H1	H1	H1
DONE	R2	142		R2											
ECBO	N1			N1											
ECC SHIFTED	93	K3													
ECC DATA	71			71											
EQUALS	132			132											
ERROR		J3		J3											
FC0	F3			F3											
FC1	73			73											
FC2	H3			H3											
FC3	K3			K3											
FC4	L3			L3											
FC5	123			123											
FC6	N3			N3											
FC7	103			103											
FC8	53			53											
FC9	H1			H1											
FOMT			R1	R1											
INIT	B2			B2											
IOBI												81	81	81	81
IB1												S2	E3	E3	E3
IB2												152	53	53	53
IB3												R2	D3	D3	D3
IB4												142	43	43	43
IB5												P2	C3	C3	C3
IB6												132	33	33	33
IB7												N2	B3	B3	B3
IB8												122	23	23	23
LAUX		N2	N2												
LOAD ECC	P1		N1												
MO		S1	S1	S1											
M1		C2	C2	C2											
M2		D2	D2	D2											
M3		111	111	111											
M4		21	21	21											
M5		52	52	52											
M6		121	121	121											
M7		101	101	101											
NULL	151	B3													
ND												N1	K1	K1	K1
OBS												71	71	71	71
PLO CLOCK	141			141											
PRIME	K1		K1	K1											
PWR ON	S2		S2												
RAØ		51	51												
RB												121	121	121	121
RDG	A2		A2	L2											
READ			131	131											
READ DATA	N2			N2											

D1 / 41



WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL		MODEL NO. 2280	
FINISH	UNLESS OTHERWISE SPECIFIED: DEC ± FRAC ± ANG ±	SEE ERROR SPECIFICATIONS	
NEXT ASSY			
		DWN BY RB 1-23-80	DATE
		CHK	ENGR
			MFG ENGR
MAIN PART NUMBER	210-7716	SIZE D	DRAWING NUMBER 7716 REV 2
TITLE	MUX MOTHERBOARD		

91LL D

4 50

DO NOT SCALE

SIGNAL	PIN No. 2415-1	FAMILY 14c3	PIN No. 2415-3	FAMILY 14c3	SPARE
READ DATA	L1	A2			
READY	J3	E3			
RETURN	D3				
RESET		E1		E1	
PLUG-JMP	E3				
RTS-WTC	D1				
RWF		M1		M3	
RQ		M3		J3	
R1		J3		J2	
R2		J2		K2	
R3		K2		F2	
R4		F2		H1	
R5		H1		B1	
R6		B1		L5	
R7		L5		H3	
R8		H3		E1	
R9		E1		4	
R10		4		6	
R11		6		J2	
R12		J2		H2	
R13		H2		7	
R14		7		L2	
R15		L2			
RQ2-1					
RQ2-2					
RQ2-3					
RQ2-4					
RQ3-1					
RQ3-2					
RQ3-3					
RQ3-4					
RQ4-1					
RQ4-2					
RQ4-3					
RQ4-4					
SB		J2		J2	
SECTOR		S2		S2	
SELECT	6₂				
SELECT 1	H2			H2	
SELECT 2	7₂			7₂	
SHIFT ECC	M3	L3		L3	
SORI	4₂			4₂	
SØ					
S1					
STROBE	12₃			12₃	
TØ		H3		H3	
T2	13₂			13₂	
T2-5	N3			N3	
T4	B2			B2	
T8	A3			A3	
TAG-1	J2			J2	
TAG-2	K2			K2	
TAG-3	E2			E2	
THS Ø	63			63	
THS 1	23			23	
THS 2	D3			D3	
THS 3	E3			E3	
THS 4	C3			C3	
THS 5	B3			B3	
UB		L2			
WP	J3	B2			
WRITE DATA	S1			S1	
WTG	D1			C1	
WTM-CMP.		91		91	
WRITE		P1		P1	
WAFER ECC	B3			B3	
WTR				14₂	
256		61			
7500		M1			
-5VR	A1				
±0V	C1	C1		B1	
	31	31		21	
	R3	P3		R3	
	143	133		143	
+5VR	B1	B1		A1	
	21	21		11	
	S3	R3		S3	
	153	143		153	
+12VR				S1	
				151	
B1-15R				H2	13
B2-15R				J2	86
-21V				K2	14
-18VU				D2	42
B1+12R				C2	32
E1+12R				B2	22
+18VU				A2	12
B2-12R				M3	12
B1-12R				L2	11
E1+8R				P2	14

REVISION	BY	DATE	APPROVED
SEE SHT 5			

WANG LABORATORIES INC. LOWELL MASS. U.S.A.

BY	DATE	APPROVED BY	DATE
DWN RB	4-23-80	ENGR	
CHK		M ENGR	
		MFG ENGR	

MATERIAL

MODEL NO 2280

SEE ENGRG SPECIFICATIONS No.

FINISH

TOL ES AS NOTED
.XX ± .XXX ± .XXXX ± ANG ± FINISH

TITLE MUX MOTHER BOARD

SCALE SHT 2 OF 5

719-7716 | D | 7716 | 2

WANG PART NUMBER | SIZE | DRAWING NUMBER | REV

NO	REVISION	DATE	BY
	SEE SHT 5		

SIGNAL	INTFC 7422	AUX/MUX 7421	RAM/PROM 7423	I/O CONT 7424	SPARE	SPARE	REGULATOR 6439	J1	J2	J3	PRIME CRT 7415	MASTER	SLAVE 1	SLAVE 2	SLAVE 3		
B1+5M							P1 / 13	8									
B2+5M							M1 / 11	10									
E2+5M							L1 / 10	12									
B1+5L							K1 / 9	14									
B1+8R							J1 / 8	16									
9.5V									7								
BLU									9								
BLU									11								
E2+5L							H1 / 7		2/5								
+15VR							F1 / 6		4								
B2+5L							E1 / 5		6								
ORN									10								
ORN									12								
+5VRM							A1 / 1										
-12VR							E2 / 5				E1 / 5	N3 / 12	N3 / 12	N3 / 12	N3 / 12		
-15VR							F2 / 6				N1 / 12						
14 VAC							R2										
14 VAC							S2										

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
DWN	AJB	1-23-80	E ENGR	
CHK			M ENGR	
			MFG ENGR	

MATERIAL — MODEL NO. 2280 — SEE IMAGE SPECIFICATIONS

FINISH — TOL ±.XX AS NOTED; FRAC ±; ANG ±; FINISH

TITLE: MUX MOTHER BOARD

SIZE	DRAWING NUMBER	REV
D	7716	2

SCALE	WT	SHT 3 OF 5

USED ON	NEXT ASSY	APPLICATION

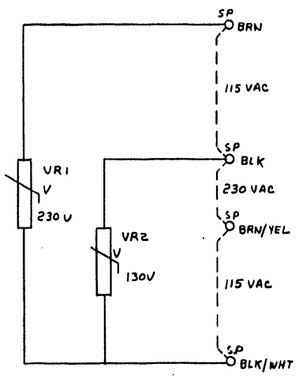
MARK PART NUMBER
210-7716

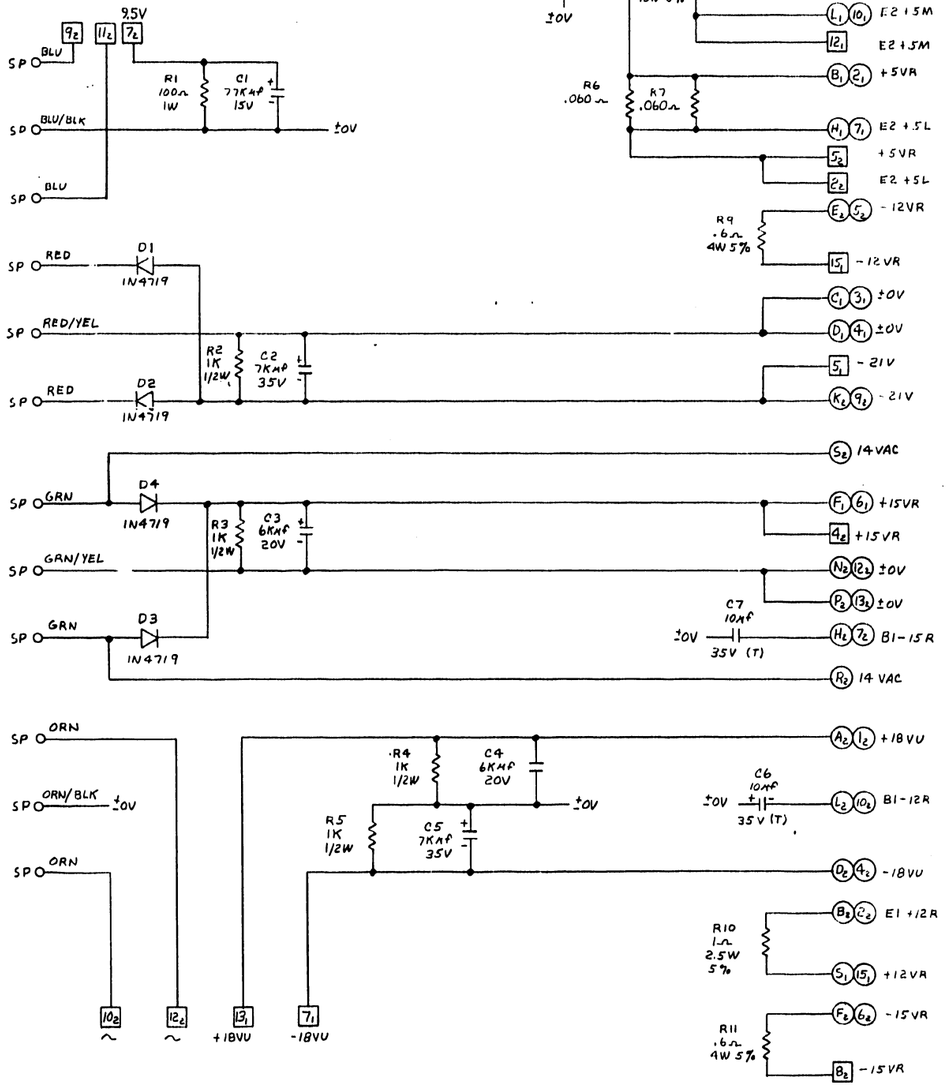
DO NOT SCALE

7716

DO NOT SCALE

NOTE:
LOAD 115/230 VAC
JUMPERS/VARISTER
FOR APPROPRATE
115/230 VAC
OPERATION





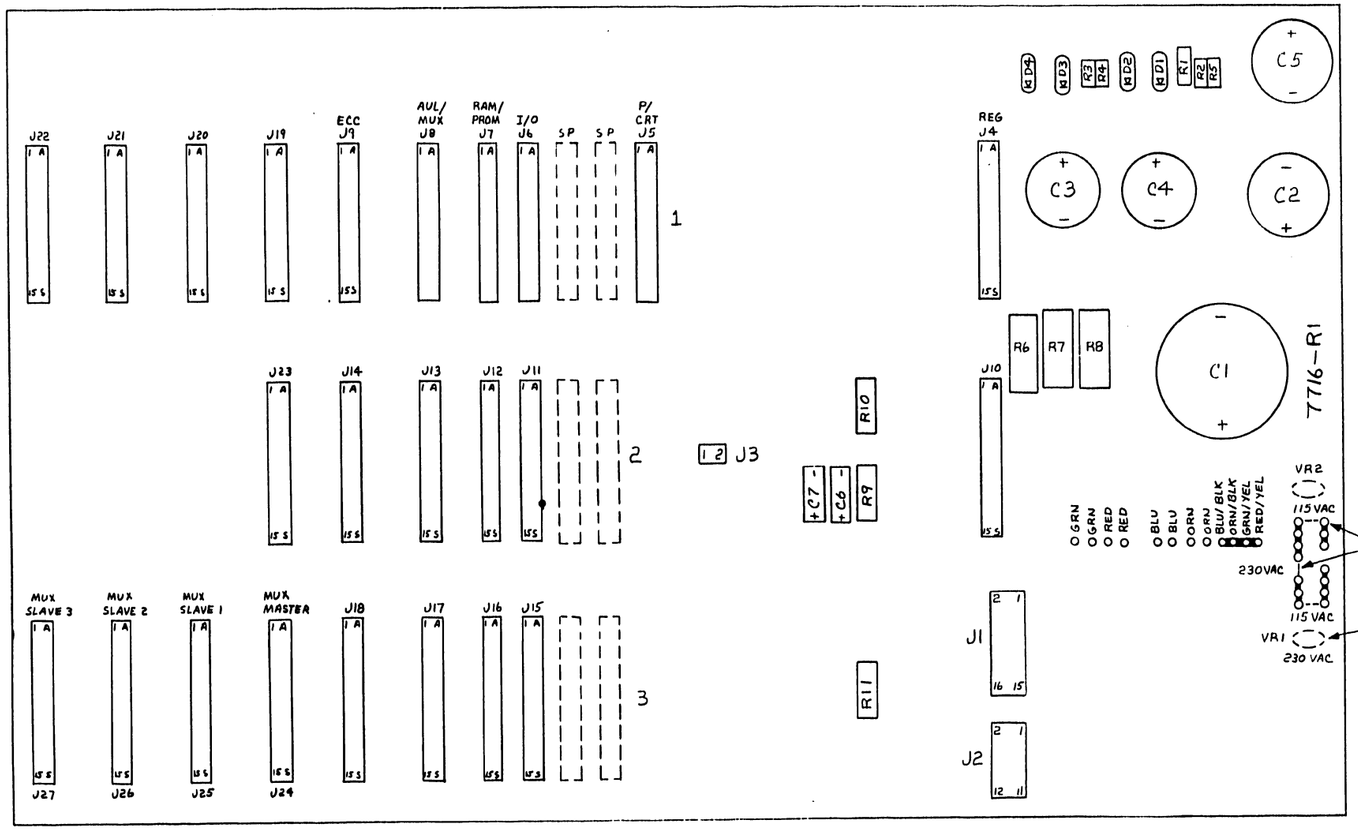
REVISION	DATE	BY
SEE SHT 5		

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
	DWN AB	1-23-80	E ENGR	
	CHK		M ENGR	
			MFG ENGR	

MATERIAL	MODEL NO. 2280	TITLE MUX MOTHERBOARD
	SEE ENGRG SPECIFICATIONS No.	
FINISH	TOL XX AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √	210-7716 / D / 7716 / 2
	SCALE / SHT 4 OF 5	WANG PART NUMBER / SIZE / DRAWING NUMBER / REV

7716

DO NOT SCALE



COMPONENT	TYPE	PART NO.
R6,7	.060Ω	334-0042
R1	100Ω 1W 10%	332-2010
R2-5	1K 1/2W 10%	331-3010
R8	.15Ω 10W 5%	334-0023
R9,11	.6Ω 4W 5%	334-0016
R10	1Ω 2.5W 5%	334-0019
C1	77KMF 15V (E)	300-3049
C2,5	7KMF 35V (E)	300-3024
C3,4	6KMF 20V (E)	300-3019
C6	10MF 35V (T)	300-4032
C7	10MF 35V 5% (T)	300-4041
D1-4	1N4719 RECT.	380-3002
VR1	250V VARISTOR	380-5001
VR2	130V VARISTOR	380-5000
J1	16 PIN HEADER	654-1177
J2	12 PIN HEADER	654-1172
J3	2 PIN HEADER	654-1198
J4-27	30 PIN CONN.	350-0011

E-REV 1

NO.	REVISION	BY	DATE
0	ORIGINATED PER DWR # EBII APP'D:	A.B	1-22-80
1	REVISED PER ENGR'G CHG # 1595 APP'D:	GR	5-14-80
2	REVISED PER ENGR'G CHG # 1755 APP'D:	LN	11-6-80

WANG LABORATORIES INC. LOWELL, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
DWN	B.B	1-23-80	E ENGR	
CHK			M ENGR	
			MFG ENGR	

MATERIAL — MODEL NO. 2280 — SEE ENGRG SPECIFICATIONS — No.

FINISH — TOL ER AS NOTED: XX ± FRAC ± / XXX ± ANG ± / FINISH √ — SCALE — SHT 5 OF 5

TITLE: MUX MOTHERBOARD

210-7716 | D | 7716 | 2

WANG PART NUMBER | SIZE | DRAWING NUMBER | REV.

D 7716

I-34

DO NOT SCALE

L10 MC3450 L11 MC3450 L13 MC3450 L16 MC3540 L22 MC3450 L25 MC3450

L9 / MC3450 L15 / MC3450 L12 / MC3450

L21 L24 L27

L23 74 L5 74 L6 74

L26 153

L33 75113 L28 75113

L7 123 L7 123

L35 L36 L37 L00

L34 L35 L37

L21 L24 L27

L33 L28

L23 L5 L6

L26

L7

L00

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

BY	DATE	APPROVED BY	DATE
DWN BA	1-7-80	E ENGR	
CHK		M ENGR	
		MFG ENGR	

MATERIAL

MODEL NO. 2280

SEE ENGRG SPECIFICATIONS

No.

FINISH

TOL EX AS NOTED

XX ± FRAC ± ANG ± FINISH √

TITLE DISK MUX MASTER BOARD

SCALE SHT 1 OF 4

WANG PART NUMBER 700-7717 SIZE D DRAWING NUMBER 7717 REV

REVISION BY DATE

SEE SHT 4

D35

DO NOT SCALE

WTR (11₂)

L19/132 (1A9) L19/132 L20/14

+5VR R68 1K

CLR L30 195 SH/LD

RQ1-1 (1E6) RQ1-2 (1E6) RQ1-3 (1E6)

ACK1-1 (1B7) ACK1-2 (1B7) ACK1-3 (1B5)

R62 1K

L41 148 L40 148

BK1 (2A11) BK2 (2E6)

L39 L20/14

BS1 (1C7)

L38 LS139

P1 (1G6)(1G11) P2 (1G2)(1E11) P3 (1G4)(1C11)

L37 P3 (1C2) P2 (1D2) P1 (1E2)

S0 (1B7) S1 (1B7)

RQ2-1 RQ2-2 RQ2-3 RQ2-4

ACK2-1 ACK2-2 ACK2-3 ACK2-4

L31 164 L32 164

RQ3-1 RQ3-2 RQ3-3 RQ3-4

ACK 3-1 ACK 3-2 ACK 3-3 ACK 3-4

RQ4-1 RQ4-2 RQ4-3 RQ4-4

ACK4-1 ACK4-2 ACK4-3 ACK4-4

RQ2-1 (4₂) RQ2-2 (3₂) RQ2-3 (1₂) RQ2-4 (2₂)

RQ3-1 (8₂) RQ3-2 (7₂) RQ3-3 (5₂) RQ3-4 (6₂)

RQ4-1 (5₂) RQ4-2 (10₂) RQ4-3 (9₂) RQ4-4 (11₂)

R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 390Ω 10V

R64 1K +5VR C20 .01μF R65 330Ω R63 330Ω XTAL 1 2MHZ R66 1K +5VR R67 1K +5VR

L29 L34 L37

BK1 (2G6) BK2 (2E6) ND (1C6) ND (N₁)

CLK (1E7) CLK (D₁)

ACK2-1 ACK2-2 ACK2-3 ACK2-4 ACK3-1 ACK3-2 ACK3-3 ACK3-4 ACK4-1 ACK4-2 ACK4-3 ACK4-4

CS0 CS1 BS3 BS4 S1 S0

BS2 (C₂)

IB4 IB6 IB3 IB7 IB2 IB6 IB1 IB5

L4 157 STB SEL

L17 195 L18 74 L19/132 L20/14

R55 330Ω R56 1K

C22 5.6μF 35V(T) C21 5.6μF 35V(T) MA7905 -5VR R70 10Ω 2W -12V

CPB (1F1)

STR (1E2) STR (K₂) DS (M₂) GKBD (J2₂)

L1 L3 L8 L14 L11 L2

R26 R44 R35 1K +5VR

-ID1₁ +ID1₁ -ID2₁ +ID2₁ -ID3₁ +ID3₁ -ID4₁ +ID4₁

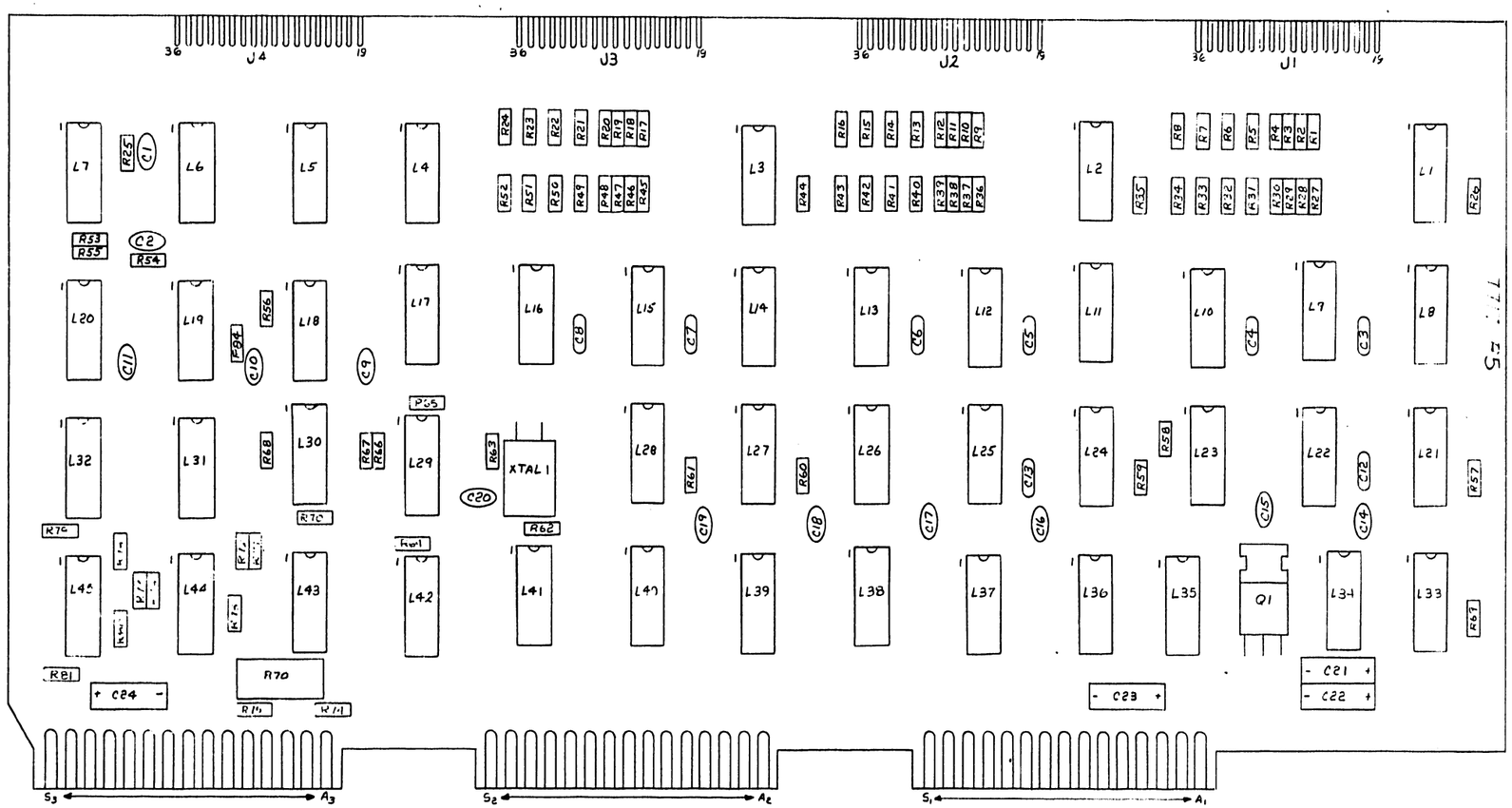
-ID1₂ +ID1₂ -ID2₂ +ID2₂ -ID3₂ +ID3₂ -ID4₂ +ID4₂

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
MATERIAL	MODEL NO. 2280 SEE ENGRG. SPECIFICATIONS	DWN AD	1-9-80	E ENGR	
		CHK		M ENGR	
FINISH	TOL ER AS NOTED			MFG ENGR	
	SCALE — SHT 2 OF 4	TITLE: DISK MUX MASTER BOARD			
		210-7717 WANG PART NUMBER	D SIZE	7717 DRAWING NUMBER	REV

REVISION NO. SEE SHT 4

D36

DO NOT SCALE



WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN FG	3-19-80	E ENGR	
		CHK		M ENGR	
MATERIAL	MODEL NO 2280			MFG ENGR	
	SEE ENGR SPECIFICATIONS No.	TITLE DISK MUX MASTER PCA			
FINISH	TOL ER AS NOTED XX ± .01 XXX ± .005 ANG ± 1° FINISH √	810-7717	D	7717	
	SCALE	SHT 3 OF 4	WANG PART NUMBER	SIZE	DRAWING NUMBER REV

NO	REVISION	DATE	BY
	SEE SHEET 4		

D 57

DO NOT SCALE

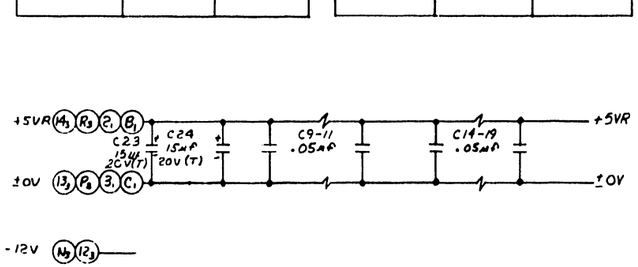
I.C LOCATION	W.L PART NO	TYPE
L1,2 3,8,11,19, 21,24,27,28,33	376-0256	75113
L4	376-0082	74157
L5,6,23	376-0098	74174
L7	376-0080	74123
L9,10,12,13,15, 16,22,25	376-0275	MC3450
L17,30	376-0097	74195
L18	376-0006	7474
L20,42-45	376-0002	7400
L37	376-0010	7404
L26	376-0048	74153
L31,32	376-0102	74164
L34,39	376-0093	7432
L35	376-0056	7407
L36	376-0092	7425
L38	376-0226	74LS139
L40,41	376-0171	74148
L19	376-0266	74132
L20	376-0139	7419

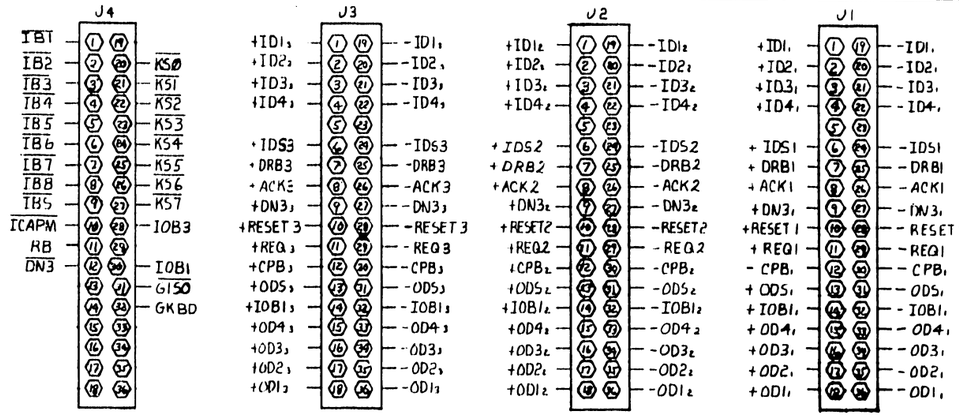
I.C TYPE	LOCATION	SPARES
1400	L29	1
7407	L35	3
7425	L36	1
7432	L34	3
74LS139	L38	1

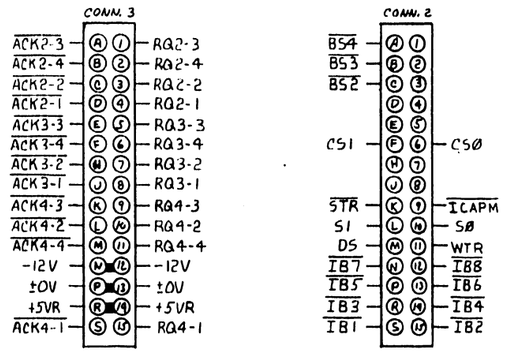
COMPONENT	TYPE	W.L PART NO
R1,3,9,11,17, 19,28,30,37, 39,46,48, 71-81,83,84	390Ω 1/4W,10%	330-2039
R2,4,10,12,18, 20,27,29,36, 38,45,47	150Ω 1/4W,10%	330-2015
R5-8,13-16, 21-24,31-34, 40-43,49-52	100Ω 1/4W,10%	330-2010
R25	8.2K 1/4W,10%	330-3082
R26,35,44,54, 56-62,64, 66-69,82	1K 1/4W,10%	330-3010
R53	33K 1/4W,10%	330-4033
R55,63,65	330Ω 1/4W,10%	330-2033
R70	10Ω 2W,10%	337-1010
C1,2	.47ΦF 50V	300-1470
C3-8,12,13,	.1ΦF 50V	300-1930
C9-11,14-19	.05ΦF 12V	300-1900
C20	.01ΦF 25V	300-1903
C21,22	5.6ΦF 35V(T)5%	300-4025
C23,24	15ΦF 20V(T)	300-4022
XTAL1	2 MHz	321-0010
Q1	UA7905	374-0002
J1-4	36 PIN CONN.	350-1044

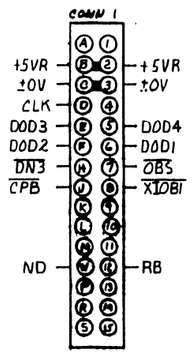
MNEMONIC	COORD.
ACK2-1, ACK 4-1	2A8
ACK2+, ACK2-	1A7
ACK1+, ACK1-	1A6
ACK3+, ACK3-	1A5
$\overline{BS2}$	2A5
$\overline{BS3}$	2A6
BS4	2A6
CLK	2A8
CS0	2A6
CS1	2A6
$\overline{CPB}$	1F1
$+CPB_1$, $-CPB_1$	1G7
$+CPB_2$, $-CPB_2$	1G3
$+CPB_3$, $-CPB_3$	1G5
$\overline{DN3}$	1F1
$+DN3_1$, $-DN3_1$	1G6
$+DN3_2$, $-DN3_2$	1G3
$+DN3_3$, $-DN3_3$	1G5
DOD1 - DOD4	1A9
DRB1+, DRB1-	1D1
DRB2+, DRB2-	1C1
DRB3+, DRB3-	1B1
DS	2A2
GISO	1D1
GKBD	2A4
$\overline{IB5}$	2G4
$\overline{IB1}$ - $\overline{IB8}$	2G3
ICAPM	1A9
$-IDI_1$ - $-ID4_1$	2G1
$+IDI_1$ - $+ID4_1$	2G1
$-IDI_2$ - $-ID4_2$	2B1
$+IDI_2$ - $+ID4_2$	2B1
$-IDI_3$ - $-ID4_3$	2E1
$+IDI_3$ - $+ID4_3$	2E1
$+IOBI_1$, $-IOBI_1$	1G6
$+IOBI_2$, $-IOBI_2$	1G8
$+IOBI_3$, $-IOBI_3$	1G4
IOB1	1F1
IOB3	1F1

MNEMONIC	COORD.
IDS1-, IDS1+	1B1
IDS2-, IDS2+	1D1
IDS3-, IDS3+	1C1
$\overline{RS0}$ - $\overline{RS7}$	1B2
ND	2A10
$\overline{OBS}$	1F1
$-OD4_1$ - $-OD4_1$	1F11
$+OD1_1$ - $+OD4_1$	1F11
$-OD1_2$ - $-OD4_2$	1E11
$+OD1_2$ - $+OD4_2$	1E11
$-OD1_3$ - $-OD4_3$	1C11
$+OD1_3$ - $+OD4_3$	1C11
$+ODS_1$, $-ODS_1$	1G7
$+ODS_2$, $-ODS_2$	1G4
$+ODS_3$, $-ODS_3$	1G5
RB	1G2
-REQ1 - -REQ3	1G8
+REQ1 - +REQ3	1G8
RQ2-1 - RQ4-4	2E11
SØ	2A5
S1	2A5
$\overline{STR}$	1B3
WTR	2G11
$\overline{XIOBI}$	1F1









E-REV
1

NO	REVISION	BY	DATE
1	ADDED PER ECO#19334 ADDED: U16,U17	AG	10-16-81
0	ORIGINAL RELEASE	AG	10-3-80

MATERIAL	MODEL NO. 2280	BY	DATE	APPROVED BY	DATE
	SEE ENGRG SPECIFICATIONS No.	DRWN AG	1-9-80	E ENGR	7-7-80
FINISH	TOL EX AS NOTED .XX ± .FRAC ± .XXX ± .ANG ± FINISH √	CHK RAY	7-10-80	M ENGR	
	SCALE SHT 4 OF 4			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

TITLE: DISK MUX MASTER BOARD

WANG PART NUMBER 210-7717 | SIZE D | DRAWING NUMBER 7717 | REV 7

D 38

DO NOT SCALE

L6 MC3450 — $\overline{P_1}$ (2C9): +OD1, -OD1, +OD2, -OD2, +OD3, -OD3, +OD4, -OD4

L11 MC3450 — $\overline{P_2}$ (2C9): +OD1$_2$, -OD1$_2$, +OD2$_2$, -OD2$_2$, +OD3$_2$, -OD3$_2$, +OD4$_2$, -OD4$_2$

L14 MC3450 — $\overline{P_3}$ (2C9): +OD1$_3$, -OD1$_3$, +OD2$_3$, -OD2$_3$, +OD3$_3$, -OD3$_3$, +OD4$_3$, -OD4$_3$

L17 MC3450 — $\overline{P_4}$ (2C9): +IOB1, -IOB1, +DN3, -DN3, +CPB, -CPB, +OBS, -OBS

L7 MC3450 — $\overline{P_1}$ (2B9): +IOB1$_1$, -IOB1$_1$, +DN3$_1$, -DN3$_1$, +CPB$_1$, -CPB$_1$, +OBS$_1$, -OBS$_1$

L10 MC3450 — $\overline{P_2}$ (2B9): +IOB1$_2$, -IOB1$_2$, +DN3$_2$, -DN3$_2$, +CPB$_2$, -CPB$_2$, +OBS$_2$, -OBS$_2$

L13 MC3450 — $\overline{P_3}$ (2C9): +IOB1$_3$, -IOB1$_3$, +DN3$_3$, -DN3$_3$, +CPB$_3$, -CPB$_3$, +OBS$_3$, -OBS$_3$

L16 MC3450 — $\overline{P_4}$ (2C9): +IOB1$_4$, -IOB1$_4$, +DN3$_4$, -DN3$_4$, +CPB$_4$, -CPB$_4$, +OBS$_4$, -OBS$_4$

Q1 2N4410 — +5VR, R76 10Ω 2W, .22 5.6mF (T), -5VR

L26 75113 — ACK1 −, ACK1 +, ACK2 −, ACK2 +

L27 75113 — ACK3 −, ACK3 +, ACK4 −, ACK4 +

$\overline{ACK_4}$ $\overline{ACK_3}$ $\overline{ACK_2}$ $\overline{ACK_1}$ -12V

$\overline{IOB1}$ $\overline{DN3}$ $\overline{CPB}$ $\overline{OBS}$

DOD$_1$ DOD$_2$ DOD$_3$ DOD$_4$

REVISION	BY	DATE

WANG LABORATORIES, INC. LOWELL MASS U.S.A.

MATERIAL	MODEL NO.	DWN		APPROVED BY	DATE
	SEE ENGRG SPECIFICATIONS No.	CHK		E ENGR	
FINISH	TOL EX. AS NOTED .XX ± FRAC ± .XXX ± ANG ± FINISH √			M ENGR	
				MFG ENGR	

TITLE: DISK MULTIPLEXER PC

SCALE — SHT / OF

DWG PART NUMBER	SIZE	DRAWING NUMBER	REV
7-7713	D	7718	?

DO NOT SCALE

+RESET1 (10₁) · -RESET1 (28₁) · +RESET2 (10₂) · -RESET2 (28₂) · +RESET3 (10₃) · -RESET3 (28₃) · +RESET4 (10₄) · -RESET4 (28₄) · ND (K₁) · +REQ1 (11₁) · -REQ1 (23₁) · +REQ2 (11₂) · -REQ2 (23₂) · +REQ3 (11₃) · -REQ3 (23₃) · +REQ4 (11₄) · -REQ4 (23₄) · CLK (D₁) · S1 (R₁) · S0 (P₁) · BS (S₁) · RB (12₁) · STR (N₁)

MC3450 L23 · MC3450 L20 · 74153 L24 · 74174 L21 · 74LS139 L34 · L33 7404 · L33 7409 · L33 7407 · L32 7432 · L27 7809 · L19 75113 · L22 75113 · L25 75113 · L29 75113

IBS1− · IBS1+ · DRB1− · DRB1+ · IBS2− · IBS2+ · DRB2− · DRB2+ · IBS3− · IBS3+ · DRB3− · DRB3+ · IBS4− · IBS4+ · DRB4− · DRB4+

RQ4 RQ3 RQ2 RQ1 ICAPM

IB4 IB8 IB3 IB7 IB2 IB6 IB1 IB5 DS

74157 L27 · L1 75113 · L6 75113 · L2 75113 · L7 75113 · L3 75113 · L12 75113 · L15 75113 · L4 75113 · L5 75113

-IB1 · +IB1 · -IB2 · +IB2 · -IB3 · +IB3 · -IB4 · +IB4

BY	DATE	APPROVED BY	DATE
DWN		E ENGR	
CHK		M ENGR	
		MFG ENGR	

WANG LABORATORIES, INC. LOWELL MASS. U.S.A.

MATERIAL · MODEL NO. 2220 · SEE ENGRG SPECIFICATIONS · No. ____

FINISH · TOL ES AS NOTED: XX ± FRAC ±, XXX ± ANG ±, FINISH √

TITLE: DUAL MUX SLAVE -1

SCALE: — · SHT 2 OF 4 · 220-7718 · D · 7718 · B

WANG PART NUMBER · SIZE · DRAWING NUMBER · REV

D40

DO NOT SCALE

J4 J3 J2 J1

C21 C22 C23 R76 C24

7718 P2

NO	REVISION	DATE	BY
1			

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
	DWN		E ENGR	
	CHK		M ENGR	
			MFG ENGR	

MATERIAL

MODEL NO. 2250

SEE ENGRG SPECIFICATIONS No.

FINISH

TOL EX AS NOTED
XX ± FRAC ±
XXX ± ANG ± FINISH

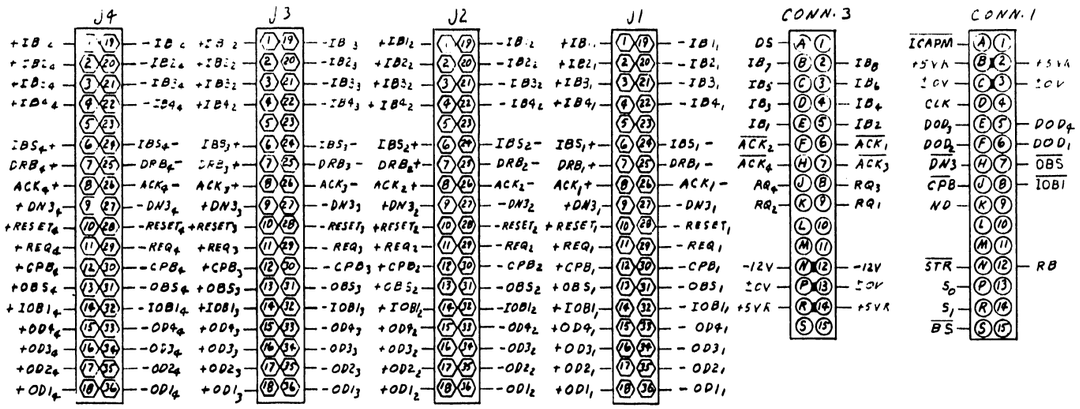
TITLE DIAGNOSTIC

SCALE — SHT 3 OF 5

WANG PART NUMBER 160-7718 | SIZE D | DRAWING NUMBER 7718 | REV 3

D4-1

DO NOT SCALE



I.C. TYPE	LOCATION	SPARES
7409	L31	3
7425	L32	1
74LS139	L34	1

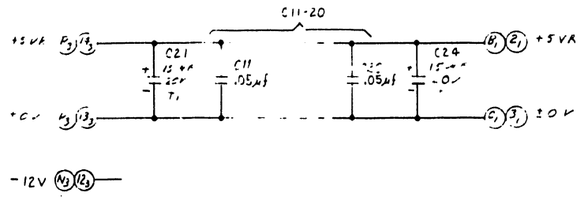
LOCATION	WL. PART No	TYPE
L1-4, 6, 9, 12, 15, 18, 22, 25-28	376-0256	75113
L5, 10, 30		SPARE
L7, 8, 10, 11, 13, 19, 1b, 17, 20, 23	376-0275	MC3450
L21	376-0098	74174
L24	376-0098	74153
L29	376-0082	74157
L31	376-0085	7409
L32	376-0092	7425
L33	376-0010	7404
L34	376-0226	74LS139

COMPONENT	WL PART No	TYPE
R1, 3, 5, 9, 11, 17, 19, 25, 27, 33, 37, 44, 46, 53, 55, 62, 64	330-2039	330Ω ¼W 10%
R2, 4, 10, 12, 18, 20, 26, 28, 34, 36, 43, 45, 52, 54, 61, 63	330-2015	150Ω ¼W 10%
R5-8, 13-16, 21-24, 29-32, 38-41, 47-50, 56-59, 65-68	330-2010	100Ω ¼W 10%
R35, 42, 51, 60, 69-75	330-3010	1K ¼W 10%
R76	337-1010	10Ω 2W 10%
C1-10	300-1930	.1μF 50V CER
C11-20	300-1900	.05 μF 12V CER
C21, 24	300-4022	15μF 20V ET
C22, 23	300-4025	5.6μF 35V ET
Q1	374-0002	7905

MNEMONIC	COORDINATE
RB	2 B 11
+RESET1 THRU +RESET4	2 G 11
-RESET1 THRU -RESET4	2 G 11
+REQ1 THRU +REQ4	2 D 11
-REQ1 THRU -REQ4	2 D 11
RQ1 - RQ4	2 A 5
SD, SI	2 C 11
STR	2 B 11

MNEMONIC	COORDINATE
+IB31 + IB41	2 F 1
-IB31 - IB41	2 F 1
+IB32 + IB42	2 D 1
-IB32 - IB42	2 D 1
+IB33 + IB43	2 B 1
-IB33 - IB43	2 B 1
+IB34 + IB44	2 B 4
-IB34 - IB44	2 B 4
IBS1+	2 A 9
IBS1-	2 A 9
IBS2+	2 A 8
IBS2-	2 A 9
IBS3+	2 A 7
IBS3-	2 A 8
IBS4+	2 A 6
IBS4-	2 A 7
ICAPM	2 A 5
IOB1	1 B 4
+IOB11	1 G 6
-IOB11	1 G 6
+IOB12	1 G 4
-IOB12	1 G 9
+IOB13	1 G 7
-IOB13	1 G 7
+IOB14	1 G 8
-IOB14	1 G 8
ND	2 E 11
OBS	1 B 3
+OBS1	1 G 5
-OBS1	1 G 5
+OBS2	1 G 3
-OBS2	1 G 3
+OBS3	1 G 6
-OBS3	1 G 6
+OBS4	1 G 7
-OBS4	1 G 7
+OD11 THRU +OD41	1 F 11
-OD11 THRU -OD41	1 F 11
+OD12 THRU +OD42	1 D 11
-OD12 THRU -OD42	1 D 11
+OD13 THRU +OD43	1 B 11
-OD13 THRU -OD43	1 B 11
+OD14 THRU +OD44	1 G 10
-OD14 THRU -OD44	1 G 10

MNEMONIC	COORDINATE
ACK1 - ACK4	1 G 2
ACK1- ACK2-	1 E 1
ACK1+ ACK2+	1 E 1
ACK3- ACK4-	1 D 1
ACK3+ ACK4+	1 D 1
BS	2 B 11
CLK	2 C 11
CPB	1 B 3
+CPB1	1 G 5
-CPB1	1 G 5
+CPB2	1 G 3
-CPB2	1 G 3
+CPB3	1 G 7
-CPB3	1 G 7
+CPB4	1 G 8
-CPB4	1 G 8
DN3	1 B 7
+DN31	1 G 6
-DN31	1 G 5
+DN32	1 G 4
-DN32	1 G 3
+DN33	1 G 7
-DN33	1 G 7
+DN34	1 G 8
-DN34	1 G 8
DOD1 - DOD4	1 A 10
DRB1+	2 A 7
DRB1-	2 A 9
DRB2+	2 A 8
DRB2-	2 A 8
DRB3+	2 A 7
DRB3-	2 A 7
DRB4+	2 A 6
DRB4-	2 A 6
DS	2 G 3
IB1 - IB8	2 G 4
+IB11 + IB21	2 G 1
-IB11 - IB21	2 G 1
+IB12 + IB22	2 E 1
-IB12 - IB22	2 E 1
+IB13 + IB23	2 C 1
-IB13 - IB23	2 C 1
+IB14 + IB24	2 B 3
-IB14 - IB24	2 B 3



REVISION	BY	DATE
NO		
1	DISTRIBUTED FOR FINAL RELEASE	4/12/73
2	ADDED C11-20	4/12/73
3	REVISED PER FINAL RELEASE 30044	9/24 APPD

	BY	DATE	APPROVED BY	DATE
DWN			E ENGR	
CHK			M ENGR	
			MFG ENGR	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.

MATERIAL

MODEL NO. 30

SEE ENGRG SPECIFICATIONS No.

FINISH

TOL EE AS NOTED
XX ± FRAC ±
XXX ± ANG ± FINISH

TITLE

SCALE SHT OF

WANG PART NUMBER | SIZE D | DRAWING NUMBER 7718 | REV

D42

DO NOT SCALE

EXTERNAL

P.C. BOARD G355

410-0090 50 Hz
410-0088 60 Hz

RED — 8 mF FOR 50 Hz, 6 mF FOR 60 Hz — RED

250V 3 A-SB
115/230 VAC 60 Hz
125V 5 A-SB
115/230 VAC 50 Hz

POWER

BLK
GRN
WHT

FAN

115 VAC
230 VAC

BLK/RED
BLK/YEL
BLK/GRN

LOCATION	TYPE	W.L. PART NO.	TERM. NO. ±0V	TERM. NO. V_{CC} +5VR	QTY
L1,2,4,5	723C	376-0066	—	—	4
L3, 6	LM307	376-0134	—	—	2

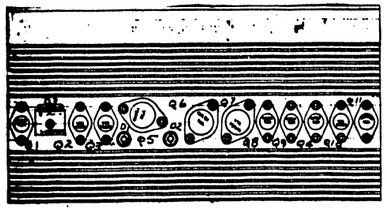
COMPONENT LAYOUT

L567-R2

-12VR -15VR +18VR +8VR +5VRM +5VRL
R37 R40 R39 R43 R47 R2

Q4 Q3 L3 Q2 L2 Q1 L1 Q5 L5 L6 Q6

SRPNMLKJHFEDCBA SRPNMLKJHFEDCBA



OUTPUT CONNECTOR

PIN NO.	SIGNAL
1,2,3,4	+5VRL
5,6	+5VRM
7	+8.5VU
8	-17VU
9	+17.5VU
10,11,12	±0V (REA)
13	115VAC (HOT)
14	CH. GND
15	115VAC (NEUT)
16	PNC
17	PND
18	WTR
21	+12VR
22	+8VR
23	-12VR
24	-18VR

14VAC
IN4719
100Ω 5W
6000 mF 20V
+14V
±0V
IN1200A
IN1230A
.6A-SB
OUTPUT CONNECTOR
+8.5V
5Ω 25W
12000 mF 15V
MDA970-1
-17V
.4A-SB
IN4719
BLU
BLU/YEL
-20V

EXTERNAL 14VAC

+17.5V

2N4037 Q5 B1+5L
2N6315 X7 X8 +8V
2N5303 X6 .15Ω 5W
E2+5L
B2+5L
+5VRL
C1 1mF 35V
C2 1mF 35V
C3 1mF 35V
C4 1mF 35V
C6 18mF 15V
C27
C8 1mF 35V
L4 C.S. M.I. C.L. F.COMP. V-
R1 R2 R3 R4 R5 R6 R7 R8 R9
L5 R10 R11 R12 R13 R14 R15
C9 82 pF
C10 1mF 35V
C11 1mF 35V
1N746A D1
+8VR
EXTERNAL
2N6315 X9
B1+8R
E1+8R
EXTERNAL
C25 1mF 35V
C12 .1mF 35V
L1 R16 R17 R18 R19 R20 R21
2N4037 Q1
C5 1mF 35V
B1+5M
E2+5M
B2+5M
EXTERNAL
2N6315 X4
2N5303 X5
+8V
.15Ω 5W
+5VRM
C7 47mF 15V
R22 220Ω
R23 1.5K
R24 680Ω
D2 IN5823
R25 150Ω

+17.5V

2N4037 Q2 B1+12R
L2 R26 R27 R28 R29 R30 R31 R32 R33
C13 1mF 35V
C14 1mF 35V
C15 10mF 35V
2N6315 X1
E1+12R
1Ω 2.5W
+12VR
C16 1000 pF
C17 10mF 35V
R34 R35

-17V

2N4037 Q7
2N5956 X3
2N6315 X2
+6Ω 3.75W
B1-12R
B2-12R
R36 R37 R38 R39 220Ω
C18 .001mF
C19 .47mF 35V
-12VR
L3 GND ADJ REF BOOSTER REG. COMP SVR VIN

-20V

2N4037 Q6
2N5956 X11
40250 X10
B1-15R
B2-15R
R40 R41 R42 R43 R44 R45 220Ω
C20 10mF 35V
C21 .001mF
C22 .47mF 35V
-15VR
L6 AN GND REF BOOSTER REG. COMP SVR VIN

14VAC 14VAC

D3 D4 D5 D6 D7 SIL
R46 R47 R48 R49 R50 3.3K
C23 1.2mF 35V
C26 1.2mF 35V
2N3014 Q8
WTR
F51 3½ AMP

NOTE:
THIS DRAWING IS A INTERCONNECTING DIAGRAM AND ANY CHANGES TO THE "L567 PORTION MUST ALSO BE RECORDED ON DWG. D6439. (L567).

1st HALF

A	1	+5VRM
B	2	+5VRL
C	3	±0V
D	4	±0V
E	5	B2+5L
F	6	+18V
H	7	E2+5L
J	8	B1+8R
K	9	B1+5L
L	10	E2+5M
M	11	B2+5M
N	12	+8VR
P	13	B1+5M
R	14	E1+8R
S	15	+12VR

2nd HALF

A	1	+17.5V
B	2	E1+12R
C	3	B1+12R
D	4	-17V
E	5	-12VR
F	6	-15VR
H	7	B1 15R
J	8	B2-15R
K	9	-20V
L	10	B1-12R
M	11	B2-12R
N	12	±0V
P	13	±0V
R	14	WTR
S	15	14VAC

SIGNAL - TERMINAL DESIGNATIONS, VIEW FROM BOTTOM (WIRING) SIDE OF CONNECTOR

COMP SIDE — WIRING SIDE

REV	REVISION	DATE	APP'D
0	REVISED PER ECN 9054	8-28-73	
1	ADDED MC 6034 OUTLINE	9-9-73	
2	REVISED PER ECN-3248	10-18-73	
3	REVISED PER ECN-3468	10-4-73	
4	PER ECN-3880 R27 WAS 5KW	11-9-73	
5	REVISED PER ECN 3903	11-26-73	
6	REVISED PER ECN 9012	1-23-74	
7	TABLE OF CONTENTS ADDED	10-23-74	
8	REVISED PER ECN-4367 & ECN-4368	2-5-75	
9	REVISED PER ECN 9837	6-5-75	
10	REV PER ECN-4859	6-11-75	
11	REVISED PER ECN 5004	9/8/1	
12	REVISED PER ECN = 14148	2/2/80	

WANG LABORATORIES INC.
TEWKSBURY, MASS.

MODEL NO.	DRAWN	APP.
2200	3-15-73	
	CHECKED 6-5-75	APP.

TITLE: INTERCONNECTION DIAG 2200 POWER SUPPLY

SHT 1 OF 1 — DWG NO. D L567-9001 — REV 12

J-43 44

END