System 200/410
Service Manual

BFISD 8035

Basic Four
Information Systems®

BFISD 8035

Printed in the United States of America

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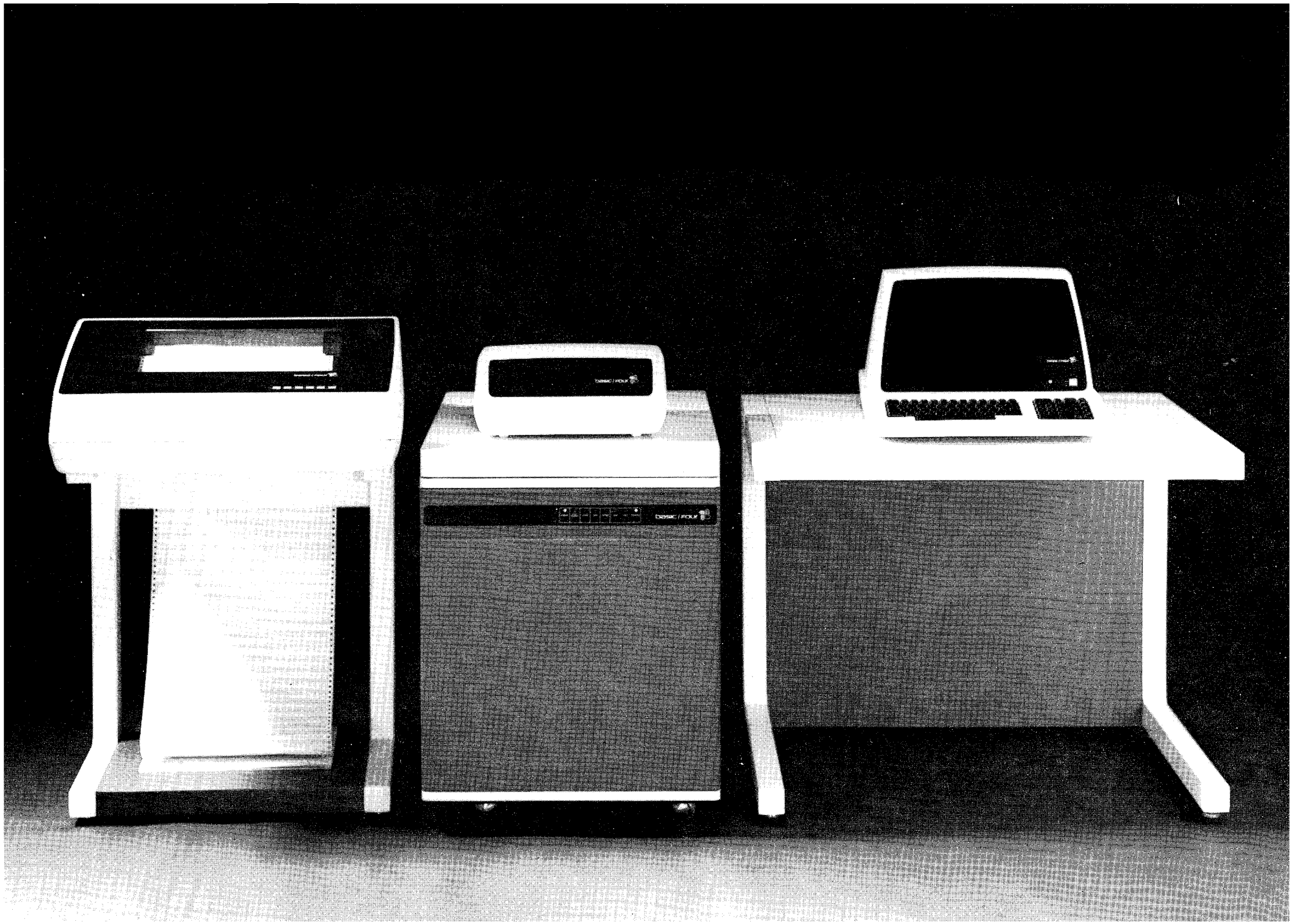


CHAPTER 1

INTRODUCTION

1.0 PURPOSE

This Service Manual is intended to aid the Service Representative in the installation and maintenance of the Basic Four System 200/410 computer systems.

The System 200 and 410 are very similar in structure and operation, therefore, the information contained in this Manual applies to both Systems unless specified otherwise.

Detailed information for the Video Display Terminal, Printer, Disc Drive, and Magnetic Tape Cartridge Drive (MTCD) will not be included in this Manual. For more detailed information refer to the respective Service Manuals:

BFC Document Number	Equipment
8019	Video Display Terminal Service Manual, Model 7250
8012	Matrix Printer Service Manual, Model 3200
8005	Disc Drive Service Manual, Model 2400
8015	Magnetic Tape Cartridge Drive Service Manual, Model 6400

Additional technical information on the CPU may be found in the "Model 1300 Central Processing Unit Technical Manual", BFC Document Number SM 1020.

These Service Manuals will be referenced within this document when applicable.

1.1 PHYSICAL DESCRIPTION (TABLE 1-1)

The System 200/410 consists of a Processor, Fixed Media Disc Drive, Video Display Terminal(s), Printer(s), and Magnetic Tape Cartridge Drive (MTCD). Optional equipment presently available include: 9 track reel-to-reel tape drive, various high speed printers, binary synchronous communications, and additional video display terminals.

Both systems can be expanded by the addition of Printers and Video Display Terminals (VDT) as well as increased Disc Drive and Main Memory capacity. Figure 1-1 illustrates the typical configuration for a System 200/410 computer.

TABLE 1-1. PHYSICAL SPECIFICATIONS

Parameter	Characteristics
PROCESSOR/DISC DRIVE CABINET	
Height	29.0 inches (73.7 CM)
Width	22.5 inches (57.2 CM)
Depth	32.0 inches (81.3 CM)
Weight	275 pounds (125 KG)
VIDEO DISPLAY TERMINAL	
Height	12.5 inches (31.8 CM)
Width	21.5 inches (54.6 CM)
Depth	18.3 inches (46.4 CM)
Weight	25 pounds (11.4 KG)
MAGNETIC TAPE CARTRIDGE DRIVE (6400)	
Height	6.0 inches (15.2 CM)
Width	13.5 inches (34.3 CM)
Depth	12.0 inches (30.5 CM)
Weight	18.8 pounds (8.5 KG)
MATRIX PRINTER (3200)	
Height	37.0 inches (94.0 CM)
Width	26.0 inches (66.0 CM)
Depth	22.0 inches (55.9 CM)
Weight	100 pounds (45.4 KG)

1.1.1 PROCESSOR (MODEL 1340/1345)

The Processor is made up of a card cage and backplane which contains (at minimum) the following PCBs:

1 - Central Processing Unit (CPU)

1 - 2 Channel Serial I/O (Accessory PCB)

1 or 2 Dynamic Semiconductor Memory

1 - Disc Drive Controller

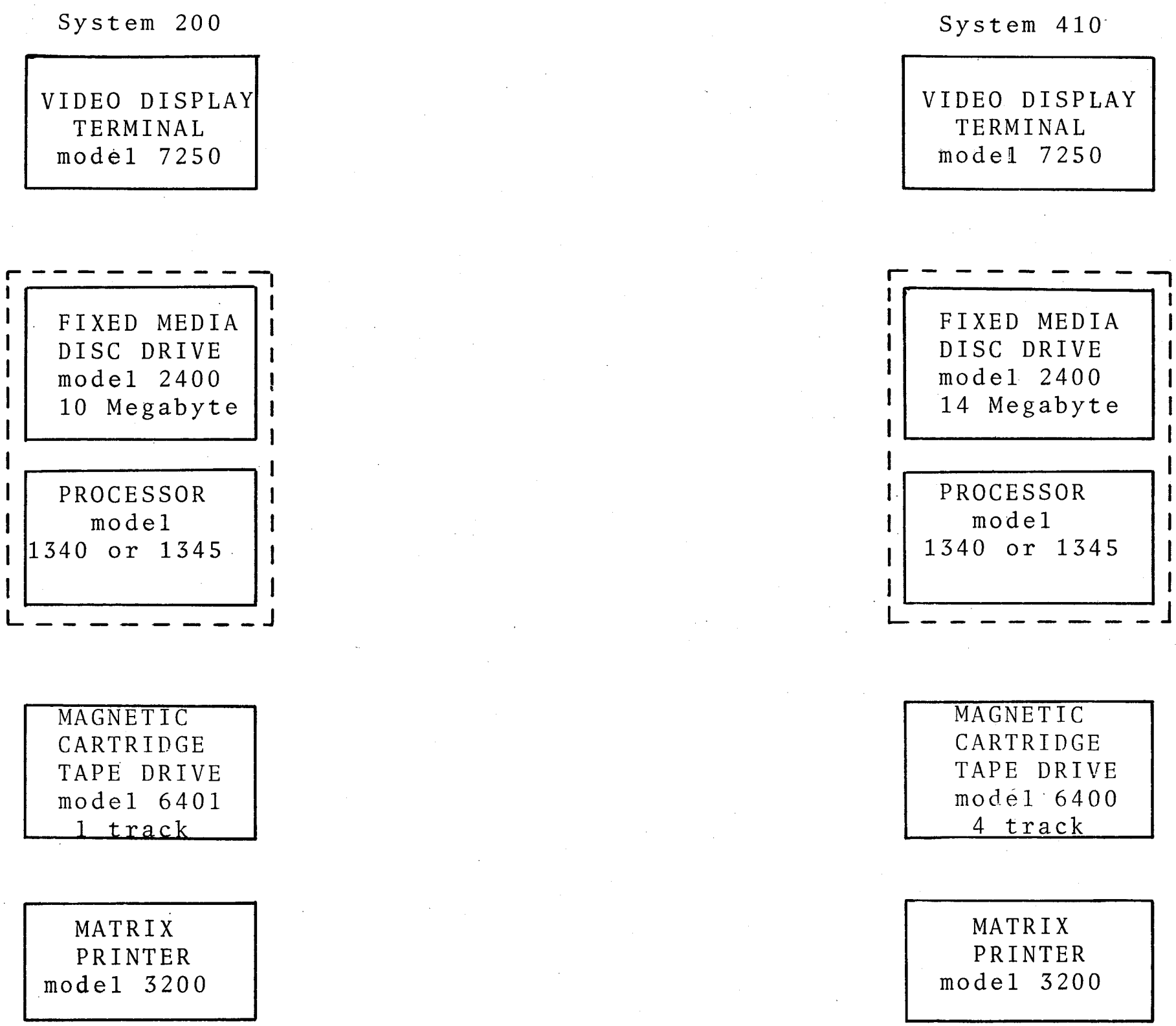


Figure 1-1. System 200/410 Typical Configuration

1 - Magnetic Tape Cartridge Drive (MTCD) Controller

1 - CPU Power Supply

1 - Memory Power Supply

In addition, the Processor consists of a Power Distribution Unit (PDU), front panel PCB, and battery.

The following optional PCBs may be present in the Processor card cage.

1 - 4 or 8 Channel Serial I/O

1 - Binary Synchronous Communications Controller

1 or 2 High Speed Parallel Printer Controller

1 - 9 track Reel-to-Reel Magnetic Tape Drive Controller

The Processor is housed in the lower half of the Processor/Disc Drive Cabinet (see Figure 2-8).

Four, two position switches, located on the CPU PCB allow the selection of a particular memory device (disc or tape) to be loaded into main memory.

Operator controls and indicators are mounted on the Processor/Disc Drive Cabinet front door. The function of these controls and indicators are explained in Chapter 2.

1.1.2 DISC DRIVE (MODEL 2400)

The Disc Drive Unit is located in the upper portion of the Processor/Disc Drive Cabinet (see Figure 2-8). The Disc Drive is a fixed media type, i.e., the discs are not removable. The four (4) discs and head actuator are mounted on a metal platform sealed in a plastic housing. This sealed unit (referred to as the Deck Plate Assembly) may only be opened at the factory when maintenance is necessary. The Deck Plate Assembly, motor and PDU, are attached to a single base casting.

The Disc Drive card cage, which contains nine (9) PCBs, is mounted to the Deck Plate Assembly. Access to these PCBs is gained by lifting off the Processor/Disc Drive cabinet top cover.

The DC power is supplied from a physically separate power supply located behind the Processor in the lower portion of the Processor/Disc Drive Cabinet (see Figure 2-8). The Disc Drive power supply AC input must be connected to the Processor PDU to insure proper power on/off sequencing.

The Disc Drive is connected to a Disc Drive Controller PCB (located in the Processor card cage) via two ribbon cables.

1.1.3 VIDEO DISPLAY TERMINAL (MODEL 7250)

The Video Display Terminal (VDT) is comprised of a standard typewriter keyboard, 10-key numeric keyboard, Cathode Ray Tube (CRT) display, and supplementary electronic circuitry contained in a single enclosure.

Data communication between the VDT and Processor is by full-duplex asynchronous communication lines which are directly connected via a cable or via telephone lines. When directly connected, the VDT can be located up to 1,000 feet away from the Processor.

1.1.4 MAGNETIC TAPE CARTRIDGE DRIVE (MODEL 6400)

The Magnetic Tape Cartridge Drive (MTCD) consists of a drive motor, four track read/write/erase head, four (4) separate printed circuit boards, one (1) interconnect board, and a power supply which are contained in a single enclosure. The MTCD utilizes Basic Four Model 6903 tape cartridges with 1/4 inch wide tape.

The MTCD is connected to a Magnetic Tape Cartridge Drive Controller PCB (located in the Processor card cage) by a single ribbon cable.

1.1.5 MATRIX PRINTER (MODEL 3200)

The Matrix Printer consists of a paper feed mechanism, print head mechanism, internal control electronics, and a power supply which are contained in a single enclosure. The Printer will accept forms up to 15 inches wide.

The Matrix Printer is supplied in two versions: Parallel interface (local operation), and Serial interface (remote operation). Both versions can operate at speeds of 80, 120, or 160 characters per second. The Parallel interface version is connected to a Printer Controller PCB located in the Processor card cage. Interconnection is made via a ribbon cable. The Serial interface version is directly connected to the Accessory PCB (or optional 4- or 8-Way Terminal Controller) via a cable (1,000 feet maximum length) or connected by telephone lines via modems.

Matrix Printer operator controls include: On/Off Line switch, Power switch, Test switch, and Top of Forms switch.

1.2 OPERATIONAL SPECIFICATIONS (TABLE 1-2)

TABLE 1-2. OPERATIONAL SPECIFICATIONS

Parameters	Characteristics
PROCESSOR (1340/1345)	
Type	General Purpose, 8 bit, Microprogrammed
Microinstruction Execution Speed (1 microcycle)	200 Nanoseconds
Macroinstruction Execution Speed	11 to 355 microcycles
Main Memory Type	Dynamic, Semiconductor, Random Access
Word Length	8 data bits plus 1 parity bit
Read Cycle Time	600 nanoseconds
Write Cycle Time	600 nanoseconds
I/O Channels	1
Maximum I/O Devices	32
DMA Devices	Disc and Tape
Environmental	
Temperature	$65^{o}F$ to $80^{o}F$ ($18^{o}C$ to $27^{o}C$)
Relative Humidity	40% to 60% (no condensation)
AC Power	
Voltage	110 VAC, 60 HZ, 1 phase/220 VAC, 50 HZ, 1 phase
Current	
Idle (110 V/220 V)	.4/.2A
Run (110 V/220 V)	6/3A
Start-Up (110 V/220 V)	17/8.5A

TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
DISC DRIVE (2400)	
Type	Fixed Media, Movable Head, Winchester technology
Number of Discs	4
Heads per Surface	2
Bytes per Track, Unformatted	17,920 bytes
Bytes per Track, Formatted	16,384 bytes
Number of Cylinders	349
Capacity per Head, Formatted	5,718,016 bytes
Disc Rotational Speed	2964 RPM ± 2.5%
Bit Transfer Rate	7.08×10^{6} bits per second
Byte Transfer Rate	916.9×10^{3} bytes per second
Data Bytes per Sector	1,024 bytes
Sectors per Track	16 sectors
Maximum Density, Inner Cylinder	5,636 bits per square inch
Soft Error Rate	1 per 10^{10} bits
Hard Error Rate	1 per 10^{13} bits
Single Track Seek	10×10^{-3} seconds
Maximum Seek	75×10^{-3} seconds
Interface	Storage Module Interface using TTL compatible line drivers and receivers on all signals except clock and data.
Environmental	
Temperature	$65^{o}F$ to $80^{o}F$ ($18^{o}C$ to $27^{o}C$)
Relative Humidity	40% to 60% (no condensation)

TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
DISC DRIVE (2400)	
AC Power Requirements	110 VAC, 60 HZ, 1 phase 220 VAC, 50 HZ, 1 phase
DC Power Requirements	
+5.0 VDC	6.5A
-5.2 VDC	4.0A
+15.0 VDC	4.0A
-15.0 VDC	4.0A
MAGNETIC TAPE CARTRIDGE DRIVE (6400)	
Type	Magnetic Tape, Cartridge
Head	1 or 4 track, dual gap (read/write/erase)
Recording Density	6400 bits per inch (4 track version)
Tape Speed	30 inches per second (Read/Write)
	90 inches per second (Fast Forward, Reverse, Search, and Rewind)
Data Transfer Rate	24×10^3 bytes per second (nominal)
Interface	TTL compatible, line drivers and receivers
Tape Cartridge	
Tape Length	300 feet (91.4 M)
Tape Width	0.25 inch (0.64 CM)
Storage Capacity	11.5×10^6 bytes (unformatted) (4 track version)
Environmental	
Temperature	$65^{\circ}F$ to $80^{\circ}F$ ($18^{\circ}C$ to $27^{\circ}C$)
Relative Humidity	40% to 60% (no condensation)

TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
MAGNETIC TAPE CARTRIDGE DRIVE (6400)	
AC Power Requirements	110 VAC, 60 HZ, 1 phase, 1.5A 220 VAC, 50 HZ, 1 phase, 0.75A
DC Power Requirements	
+24 VDC	1.8A (typical), 3.4A (maximum)
-24 VDC	1.9A (typical), 3.5A (maximum)
+5 VDC	1.4A (typical), 2.6A (maximum)
MATRIX PRINTER (3200)	
Type	9 x 7 dot matrix, impact
Printer Speed	80, 120, or 160 characters per second
Form Thickness	0.040 inch (maximum)
Form Width	4 inches to 15 inches (10.2 CM to 38.1 CM)
Line Feed Rate	60×10^{-3} seconds per line feed
Vertical Slew Rate	3.5 inches per second
Interface	Serial, RS-232C, full duplex, asynchronous Parallel, TTL compatible line drivers and receivers
Environmental	
Temperature	$65^{o}F$ to $80^{o}F$ ($18^{o}C$ to $27^{o}C$)
Relative Humidity	40% to 60% (no condensation)
AC Power Requirements	110 VAC, 60 HZ, 1 phase, 5A 220 VAC, 50 HZ, 1 phase, 2.5A

TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
VIDEO DISPLAY TERMINAL (7250)	
Type	Cathode Ray Tube, electro-mechanical keyboard
Usable Screen Area	6.7 x 90 inches (17.02 x 228.6 CM)
Screen Size	12.0 inches (diagonal)
Horizontal Resolution	Center - 900 TV lines at 40 feet Corners - 750 TV lines at 40 feet
Keyboard	Standard typewriter (upper case letters only) Standard 10 key adding machine Special control keys
Character Format	5 x 7 dot matrix
Character Size	0.119 inch high x 0.082 inch wide
Interface	Serial, RS-232C, full duplex, asynchronous
Data Transmission Speed	9600 or 2400 baud (standard)
Environmental	
Temperature	$65^{o}F$ to $80^{o}F$ ($18^{o}C$ to $27^{o}C$)
Relative Humidity	40% to 60% (no condensation)
AC Power Requirements	110 VAC, 60 HZ, 1 phase, 1.1A 220 VAC, 50 HZ, 1 phase, .55A

1.3 OPTIONS

The following paragraphs briefly describe the options presently available for the System 200/410.

1.3.1 9-TRACK, 800 BPI, REEL-TO-REEL MAGNETIC TAPE DRIVE

The Reel-to-Reel Magnetic Tape Drive provides a means of storing large quantities of data. These tape units can be used in applications where the shorter data access time of the disc memory is not needed.

The Reel-to-Reel Magnetic Tape Drive requires a special Tape Drive I/O Controller located in the Processor card cage. The following is a list of specifications for the Reel-to-Reel Tape Drive.

- Recording Mode — 9-track, NRZI
- Data Density — 800 bits per inch
- Tape Velocity — 12.5 inches per second
- Data Transfer Rate — 2,500 to 10,000 characters per second
- Rewind Velocity — 50 inches per second
- Compatibility — 9-track (ASCII) or 7-track industry compatible format
- Tape — Computer grade, 0.5 inch wide, 1.5 mil thick
- Reel Size — 7 inch diameter, IBM hub

1.3.2 4 OR 8 CHANNEL TERMINAL CONTROLLER

The 4 or 8 Channel Terminal Controller option allows up to four (4) or eight (8) serial type VDTs and/or printers to be tied to the System. The 4 or 8 Channel Terminal Controller is located in the Processor card cage. Each channel utilizes the standard RS-232C interface. The following lists the specifications for the 4 or 8 Channel Terminal Controller.

- Data Format — 5, 6, 7, or 8 bits
- Bit Rate — 9600 baud (maximum)
- Sync Codes — Programmable
- VRC/LRC/CRC — Programmable
- Line Modes — Synchronous, full or half duplex, independent transmit, and receive circuits
- Line Control — Auto-answer and line turn-around
- I/O Bus Modes — Programmed or concurrent data transfer
- Interrupts — Data service, line conditions, and synchronization
- Modem Interface — RS-232C
- Power Requirements — +5 V, 1.8A
-16.75 V, 100mA

1.3.3 BINARY SYNCHRONOUS COMMUNICATIONS CONTROLLER

The Binary Synchronous Communications Controller (BSC) is a modem interface that allows BSC over full and half duplex data links. The BSC Controller allows data transmission rates from 200 to 20,000 baud. The BSC Controller is a single plug-in board mounted in the processor card cage (see Figure 2-5). The BSC Controller has a single channel which utilizes an 8 bit character encoded in EBCDIC (transparent or non-transparent) character code assignments. All data is transmitted as a serial bit stream. Automatic answer is a standard feature. The following lists the specifications for the BSC Controller.

- Modem Rates — 20,000 bits/second maximum
- Modem Interface — RS-232C half and full duplex
- Transmission Codes — EBCDIC or Transparent EBCDIC
- Data Link Discipline — IBM Binary Synchronous Communication
- Synchronization — Modem supplied clock

1.3.4 PARALLEL (LOCAL) PRINTER CONTROLLER

This option allows an additional high or medium speed Parallel Interface Printer to be tied to the System 200/410. Parallel Printers cannot be located more than 30 feet from the Processor as cable lengths must be restricted.

The Parallel Printer Controller is located in the Processor card cage (see Figure 2-5). The Controller provides two separate interfaces, although only one may be on-line with the system. One interface (connector P2) is used with Basic Four's High Speed Printers (e.g., Model 3600), the other interface (connector P3) is used with Basic Four's Medium Speed Printers (e.g., Model 3100, 3200, 3510). The following lists the specifications for the Parallel Printer Controller.

- Number of Columns (characters) per Print Line

Medium Speed Printer	Up to 132 characters per line of print
High Speed Printer	Up to 132 characters per line of print

- Maximum Output Data Rate

Medium Speed Printer	132 characters per second (150 or 300 lines per minute)
High Speed Printer	300 or 600 lines per minute

- Input Power Requirements — +5 VDC, 1.5A from CPU (supplied via connector P1 on circuit board)

- Environmental

Temperature	$65^{o}F$ to $80^{o}F$ ($18^{o}C$ to $27^{o}C$)
Relative Humidity	40% to 60% (no condensation)

- Circuit Types — TTL or DTL integrated circuits

CHAPTER 2

INSTALLATION

2.0 INTRODUCTION

A summary/checklist of the major System 200/410 installation tasks are arranged in the proper order of performance as shown in Table 2-1. Reference the section listed in the table for details regarding each task. A summary of installation specifications is contained in Table 2-2.

TABLE 2-1. INSTALLATION SUMMARY/CHECKLIST

Step #	Description of Task	Reference Section
1	Unpack shipping containers, check inventory and damage	2.1
2	Verify customer AC power	2.2.1, 2.2.2
3	Verify customer environment	2.2.3, 2.2.4
4	Release Disc Drive locking devices	2.3.2
5	Verify system switch settings	2.3.3
6	Check inter-power supply resistances	2.3.4
7	Check DC power supply outputs	2.3.5
8	Install/verify cables	2.3.6
9	Perform system power-up check	4.2.3.4
10	Adjust/verify Disc Drive	2.3.8
11	Verify System configuration	2.4
12	Run diagnostics	4.2.3

TABLE 2-2. INSTALLATION SPECIFICATIONS

Parameters	Characteristics
PROCESSOR/DISC DRIVE CABINET	
Dimensions	
Width	22.4 inches (56.9 CM)
Depth	32.0 inches (81.3 CM)
Height	29.0 inches (73.7 CM)
Weight	275 pounds (124.7 KG)
Service Clearances	
Front	36.0 inches (91.4 CM)
Rear	30.0 inches (76.2 CM)
Sides	18.0 inches (45.7 CM)
Electrical	
Voltage	115/230 VAC
Frequency	60/50 HZ
Current	10.5/5.25A*
Environment	
Temperature	65°F to 80°F (18°C to 27°C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	9 feet (2.7 M)
Signal	N/A
VIDEO DISPLAY TERMINAL (VDT)	
Dimensions	
Width	18.3 inches (46.4 CM)
Depth	21.5 inches (54.6 CM)
Height	12.5 inches (31.8 CM)
Weight	25 pounds (11.3 KG)
Service Clearances	
Front	36.0 inches (91.4 CM)
Rear	12.0 inches (30.5 CM)
Sides	6.0 inches (15.2 CM)
Electrical	
Voltage	115/230 VAC
Frequency	60/50 HZ
Current	1.1/0.55A

*20/10A power-up surge for 15 seconds

TABLE 2-2. INSTALLATION SPECIFICATIONS (continued)

Parameters	Characteristics
VIDEO DISPLAY TERMINAL (VDT)	
Environment	
Temperature	65°F to 80°F (18°C to 27°C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	8 feet (2.4 M)
Signal	1000 feet maximum (304.8 M)
MATRIX PRINTER	
Dimensions	
Width	26.0 inches (66.0 CM)
Depth	22.0 inches (55.9 CM)
Height (with stand)	37.0 inches (94.0 CM)
Weight	100 pounds (45.4 KG)
Service Clearances	
Front	36.0 inches (91.4 CM)
Rear	30.0 inches (76.2 CM)
Sides	18.0 inches (45.7 CM)
Electrical	
Voltage	115/230 VAC
Frequency	60/50 HZ
Current	1.75/,88A
Environment	
Temperature	65°F to 80°F (18°C to 27°C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	8 feet (2.4 M)
Signal	1000 feet max. (304.8 M) (serial interface only) 15 feet (4.6 M) (parallel interface only)

TABLE 2-2. INSTALLATION SPECIFICATIONS (continued)

Parameters	Characteristics
MAGNETIC TAPE CARTRIDGE DRIVE	
Dimensions	
Width	13.5 inches (34.3 CM)
Depth	12.0 inches (30.5 CM)
Height	6.0 inches (15.2 CM)
Weight	16 pounds (7.3 KG)
Electrical	
Voltage	115/230 VAC
Frequency	60/50 HZ
Current	1.5/0.75A
Environment	
Temperature	65°F to 80°F (18°C to 27°C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	10 feet (3.1 CM)
Signal	6 feet (1.8 CM)
WORK TABLE/DESK (OPTIONAL)	
Dimensions	
Width	36.0 inches (91.4 CM)
Depth	32.0 inches (81.3 CM)
Height	29.0 inches (73.7 CM)
Weight	103 pounds (46.7 KG)
200/410 SYSTEM	
Electrical	
Voltage	115/230 VAC
Frequency	60/50 HZ
Current	14.85/7.425A
Power	1708 VA
Heat Output	5808 BTU/HR

2.1 UNPACKING PROCEDURE

The following is the recommended procedure to unpack the System 200/410 Processor and peripherals from their shipping containers. All packages should be opened immediately upon arrival and inventoried for completeness.

- Prior to opening the shipping containers, carefully inspect them for signs of damage that may have occurred in shipment. Any damage must be noted on the carrier's shipping form. NOTIFY the Marketing Office of any shortage or damage immediately so that corrective action can be taken.

- Carefully remove the Processor, Printer(s), MTCD, VDT(s), and cables from their respective shipping containers. Save all shipping containers and packing materials in the event that reshipment of the equipment is required at a later date.

- Insure that the System is complete. Compare the items sent with the Shipping List. If it is found that the system is incomplete, make a list of the missing items and report it to your Marketing Office.

- Visually inspect all items for shipping damage. Pay particular attention to inspect the cables and connectors for pinched wires and/or poor electrical connections. Report any damaged parts to your Marketing Office.

- Remove the Processor/Disc Drive Cabinet top cover and remove the layer of foam on the top of the Disc Drive. For reshipment, replace the layer of foam on the top of the Disc Drive.

2.2 PREINSTALLATION CHECKS

2.2.1 AC POWER REQUIREMENTS

It is important that the System 200/410 receive proper ac power. Therefore, prior to selecting a location to install the system, check that:

- The ac power outlet(s) are the proper voltage (110 volts ac, 60 Hertz or 220 volts ac, 50 Hertz as applicable) and near enough to the equipment so that power extension cables are <u>not</u> necessary.

- The ac line is not subject to voltage variations greater than 10% or frequency variations greater than 0.2%.

- The ac line is not shared by devices that cause large transients (examples: air conditioners, heaters, welding equipment, and other equipment with large motors).

- The AC line can meet the following system current requirement:

Component	Voltage	Current
Processor/Disc Drive (single line)	110 VAC	15A continuous 30A power-up surge for 15 seconds
	220 VAC	7.5A continuous 15A power-up for 15 seconds
Video Display Terminal	110 VAC	1.1A
	220 VAC	0.56A
Matrix Printer	110 VAC	5.0A
	220 VAC	2.5A
Magnetic Tape Cartridge Drive	110 VAC	1.5A
	220 VAC	.75A

2.2.2 POWER RECEPTACLES

The 110 volts ac Processor/Disc Drive Cabinet requires a Hubble 4710 power receptacle (or equivalent twist-lock type receptacle) on a dedicated circuit breaker. The Hubble 4710 power receptacle (or equivalent) must be wired as shown in Figure 2-1.

The VDT, Printer, and MTCD require a standard 2 pole, 3 wire ac outlet. The VDT, Printer and MTCD may share a single circuit breaker of the proper current rating.

Verify that the ac outlets are wired as shown in Figure 2-2.

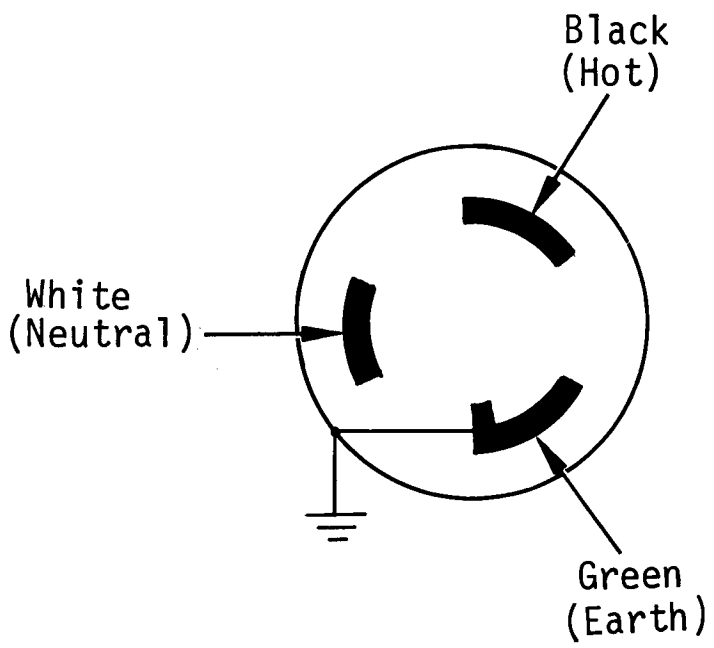


Figure 2-1. Processor/Disc Drive 110 VAC Outlet Wiring

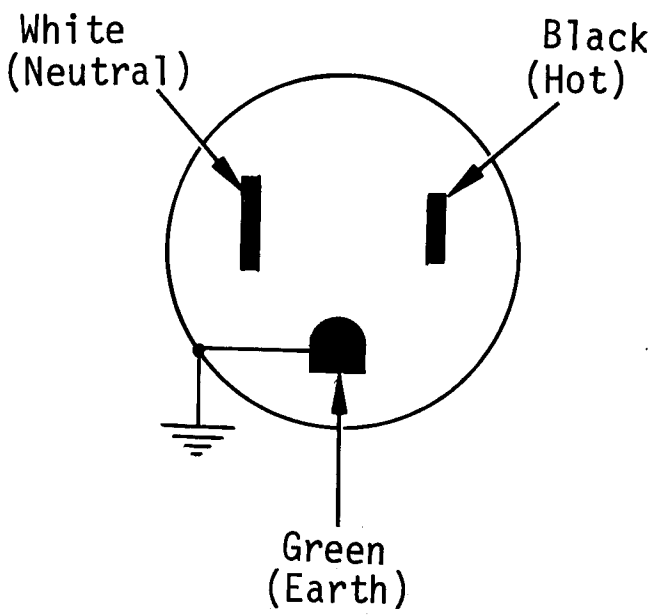


Figure 2-2. Peripheral 110 VAC Outlet Wiring

2.2.3 ENVIRONMENTAL REQUIREMENTS

2.2.3.1 Temperature

It is recommended that the System 200/410 be operated in a room where the ambient temperature is between 65°F to 80°F (18°C to 27°C). The exhaust heat of the System 200/410 is 5,808 BTU/Hour.

2.2.3.2 Humidity

It is recommended that the System 200/410 be operated in a room where the relative humidity is maintained between 40% to 60% (non-condensating). High humidity can cause printer paper handling problems. Low humidity can cause excessive static charge build-up.

2.2.3.3 Static

It is recommended that static-free carpet be installed, or that the existing carpeting be specially treated for this condition, or the system be installed in an area without carpeting.

Static problems can be minimized by the installation of carpet containing Brunslon fiber (avoid wool carpet). In cases of existing carpet, if it is not non-static, it should be treated by spraying with a non-static fluid. The carpets should be cleaned before spraying. The following is a list of some of the brands of non-static fluids that are available:

AS/20 Anti-Static Agent	Bigelow Anti-Shock Spray	Carbona Stop-Shock
Wallerstein Company 6301 Lincoln Morton Grove, Illinois	Bigelow-Sanford Inc. 140 Madison Avenue New York City, New York	Carbona Product Company 30-50 Greenpoint Avenue Long Island City, New York

2.2.4 SPACE REQUIREMENTS

Consult with the customer to select a suitable location for the System 200/410. There are no strict requirements as to where the computer may be installed, with the exception of ac power (refer to Section 2.2.1). However, the following guidelines will aid in selecting the most ideal location from both a maintenance and customer usability point of view.

- Avoid areas where the operator will face into direct sunlight while operating the VDT.
- Select an area that is central to the areas providing input to the computer.
- Select an area that allows the computer components to be spaced far enough apart to allow access for maintenance (refer to Table 2-2).

A typical arrangement of the System 200/410 components is shown in Figure 2-3.

2.3 SYSTEM INSTALLATION

2.3.1 TOOLS

The following tools are required to perform the installation procedures contained in this document.

1 - Digital Multimeter, 3½ digit

1 - 10 Foot Measuring Tape

2 - Common Screwdriver

1 - Oscilloscope, Dual Trace

1 - Adjusting Tool, Slotted

2 - Disc Drive PCB Extender (MM259010)

2.3.2 RELEASING DISC DRIVE LOCKING DEVICES

NOTE

Prior to applying power to the Processor/Disc Drive Cabinet, it is <u>important</u> that these locking devices are released.

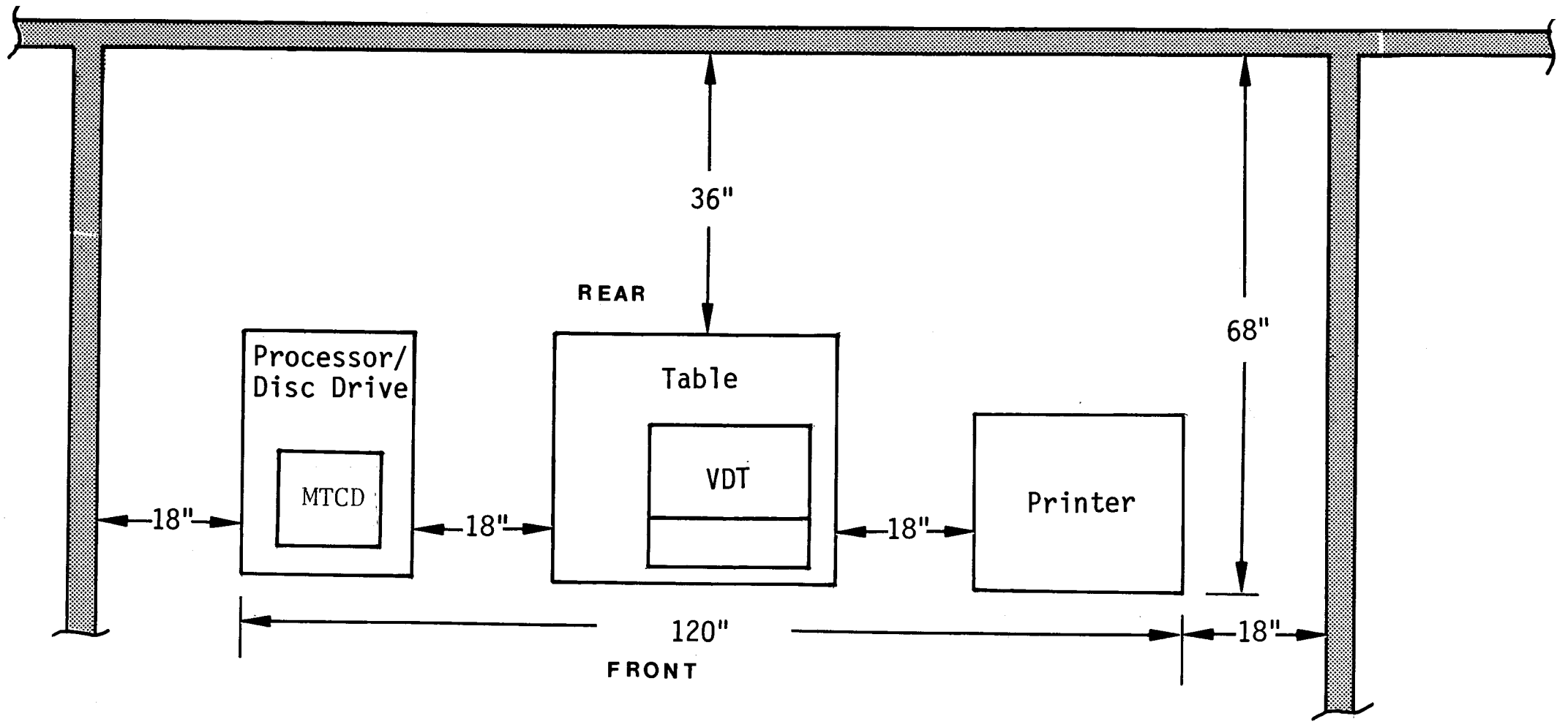


Figure 2-3. Typical System Floor Plan

2.3.2.1 Head Actuator Lock

Release the Disc Drive Head Actuator Lock (see Figure 2-4) by first removing the Processor/Disc Drive Cabinet top cover, then rotating the Head Actuator Lock clockwise until the locking arm rests against the disc housing.

2.3.2.2 Spindle Lock

Release and reposition the Disc Drive Spindle Lock mechanism, located on the underside of the Disc Drive (see Figure 2-4), by loosening the two mounting screws and sliding the locking plate outward until the grounding head rests centered on the spindle. Retighten the two mounting screws.

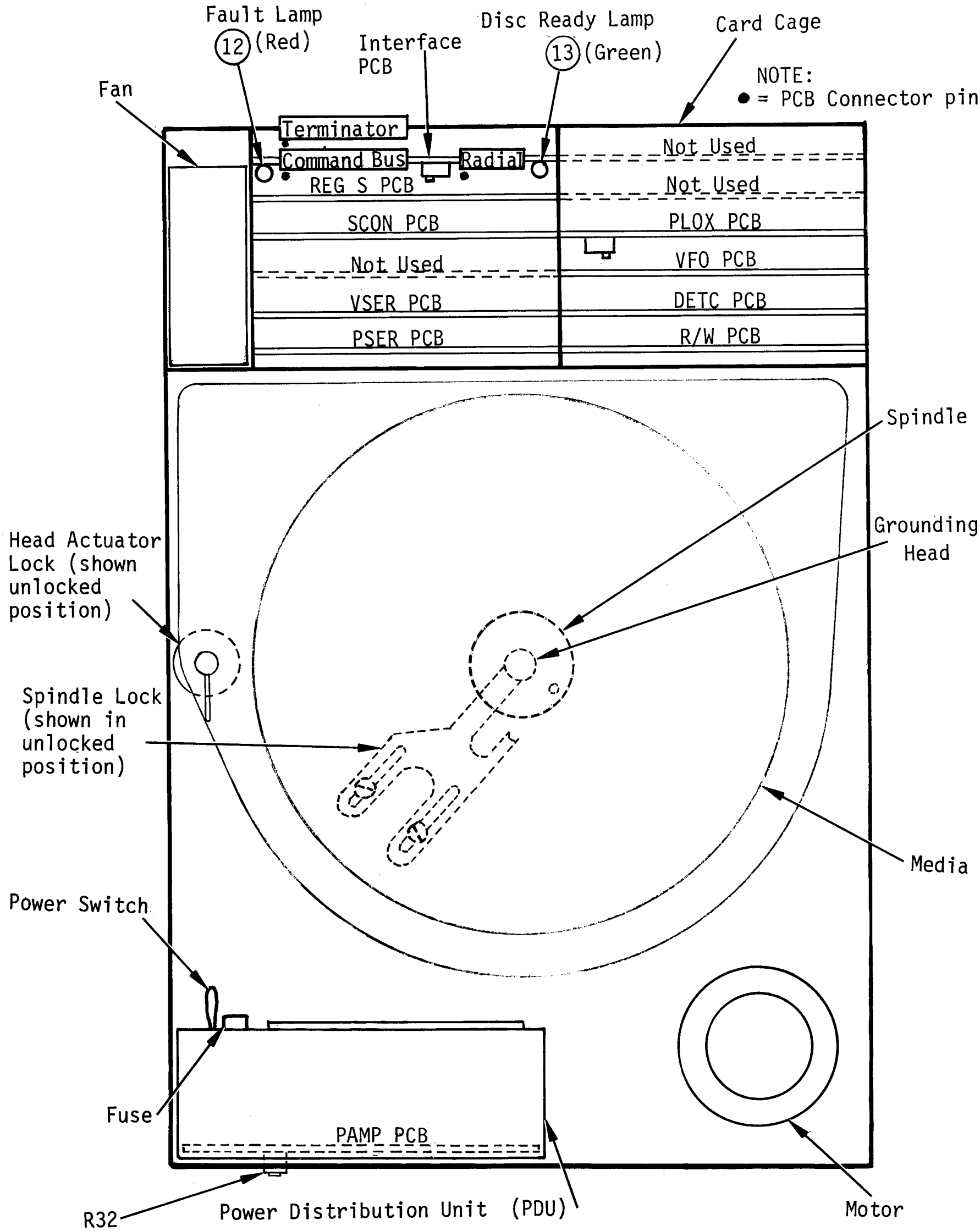
2.3.3 SWITCH SETTINGS

Each serial device (VDT and Remote Printer) is assigned a terminal number as specified by the operating system software. The remote printer(s) is always the last terminal.

Example: A System 410 with 4 VDT's and 1 remote printer is configured as follows: VDT's are terminals 0 thru 3 and the remote printer is terminal 4.

The following lists the PCB-Connector for each terminal.

PCB-Connector	Serial Device Assignment
Accessory PCB - J2	Terminal 0
Accessory PCB - J4	Terminal 1
4- or 8-Way PCB - JØ	Terminal 2
4- or 8-Way PCB - J1	Terminal 3
4- or 8-Way PCB - J2	Terminal 4
4- or 8-Way PCB - J3	Terminal 5
8-Way PCB - J4	Terminal 6
8-Way PCB - J5	Terminal 7
8-Way PCB - J6	Terminal 8
8-Way PCB - J7	Terminal 9



Note: See Table 2-8 for description of numbered callouts (12 and 13)

Figure 2-4. Disc Drive Components, Top View

Prior to system power-up, verify that system switches are set on the following PCBs.

2.3.3.1 Accessory PCB

- Verify that the Processor Accessory PCB (see Figure 2-5) switch SW1 (VDT port baud rate) is set to the 9600 baud position (see Figure 2-6).
- Verify that the Processor Accessory PCB SW2 is set to the correct baud rate for the device assigned (2400 for Serial Printer, 9600 for VDT) (see Figure 2-6).

2.3.3.2 4- or 8-Way Controller PCB

Systems containing multiple VDTs and Serial Printers require a 4- or 8-Way Controller PCB (see Figure 2-5). Set the baud rate switch for each channel to equal the corresponding VDT or Serial Printer's specified baud rate. Switch settings are shown in Figure 2-6.

2.3.3.3 Memory PCB's

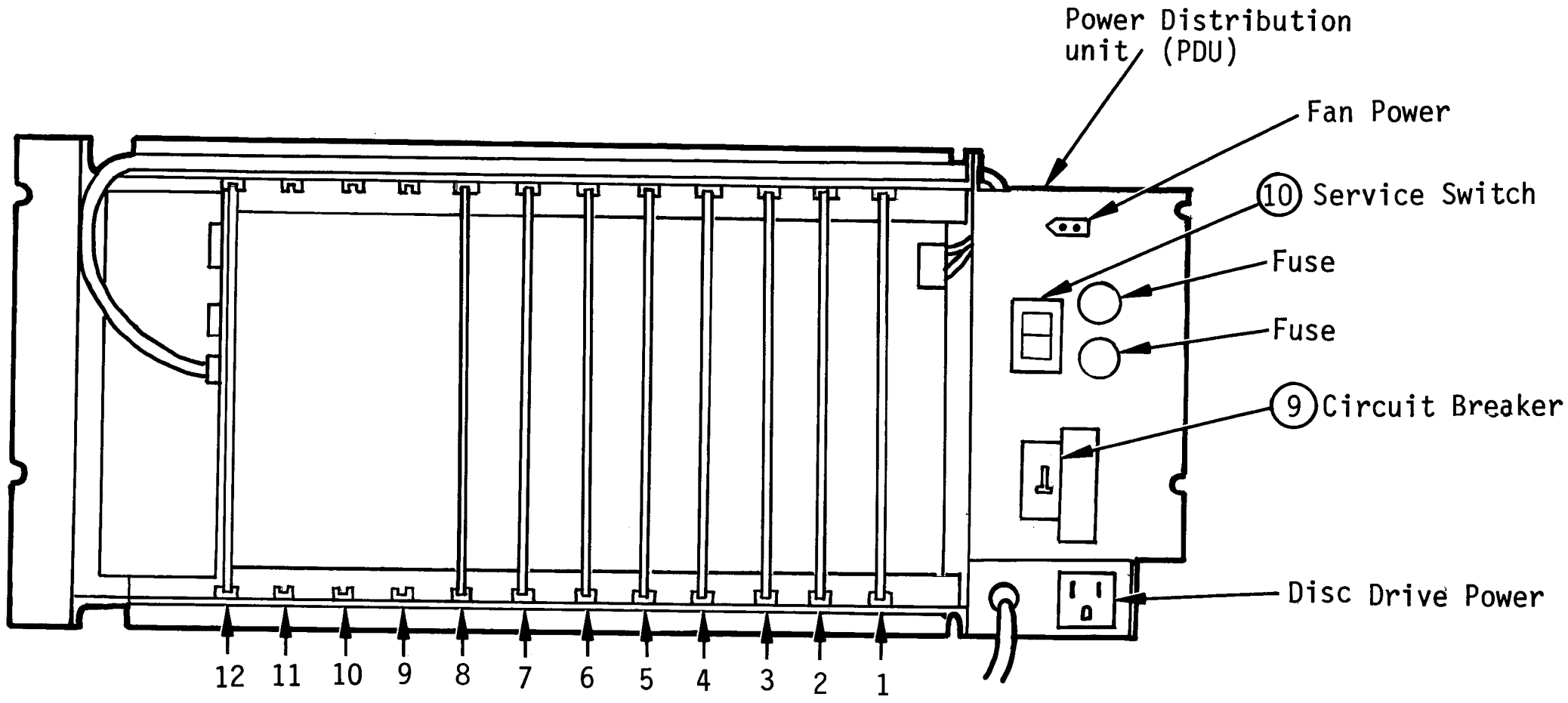
Verify that the memory select switch (S1) on each of the two memory PCB's is set so that a contiguous block of memory is addressed beginning at location 0. A chart is printed on each memory module listing the switch settings.

2.3.3.4 Disc Drive Interface PCB (P/N 24201A)

One, eight position switch controls the device address, read-only mode, and diagnostic. Verify that the switch is set as follows; switch position 1 thru 3 = ON, 4 thru 7 = OFF, 8 = ON. See Figure 2-4 for the location of the Interface PCB within the Disc Drive card cage. Remove the Processor/Disc Drive Cabinet top cover to gain access to the Disc Drive card cage.

2.3.3.5 Disc Drive PLOX PCB (P/N 24142)

Three, eight position switches located on the Disc Drive PLOX PCB control the bytes/sector (1118) and sectors/track (16). Verify that the switches are set as shown in Figure 2-7. Remove the Processor/Disc Drive Cabinet top cover to gain access to the Disc Drive card cage.



1 - Memory Power Supply*

2 - Memory PCB*

3 - Memory PCB* (optional)

4 - CPU PCB*

5 - Accessory PCB*

6 - Disc Controller PCB*

7 - MTCD Controller PCB*

8 - 4- or 8-Way Controller**

9 - Communications Controller PCB**

10 - Printer Controller PCB**

11 - Option**

12 - CPU Power Supply*

* Dedicated Card and Slot
** Option PCB's, may be installed in slots 8 thru 11

Note: See Figure 2-8 for description of numbered call-outs (9 and 10)

Figure 2-5. Processor Card Cage Locations and PDU

To select a particular baud rate, set the corresponding switch position to ON. Set all other switch positions to OFF. (switch shown is set to 9600 baud)

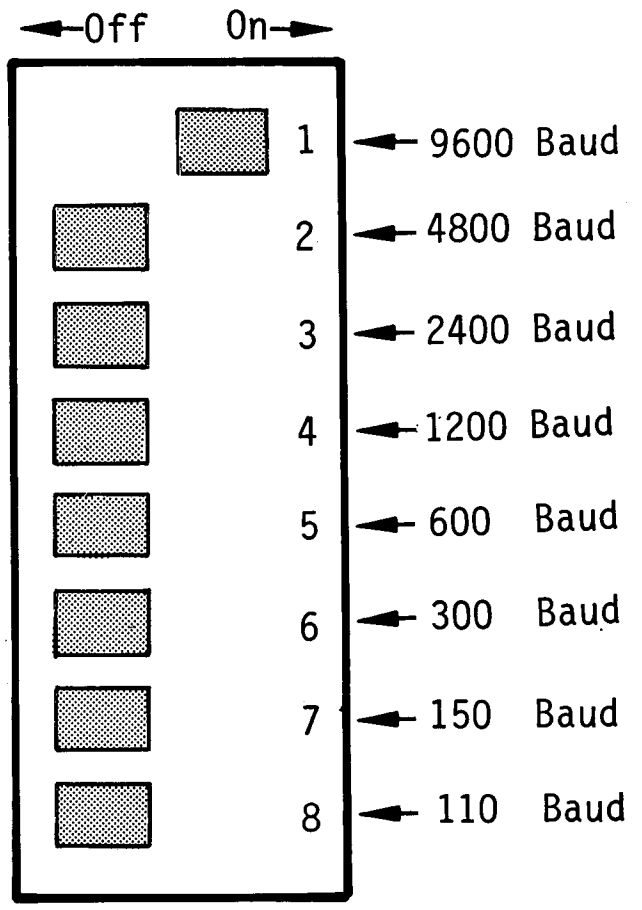


Figure 2-6. Baud Rate Switch Settings

2.3.3.6 Video Display Terminal(s)

- Verify that the baud rate switch, located on the VDT rear panel is set to 9600 baud.
- Verify that the duplex switch, located on the VDT rear panel, is set to F (full-duplex).

2.3.4 INTER-POWER SUPPLY RESISTANCE CHECK

CAUTION

To ensure that the Processor power supplies are not short circuited, perform the following procedure prior to applying power to the system.

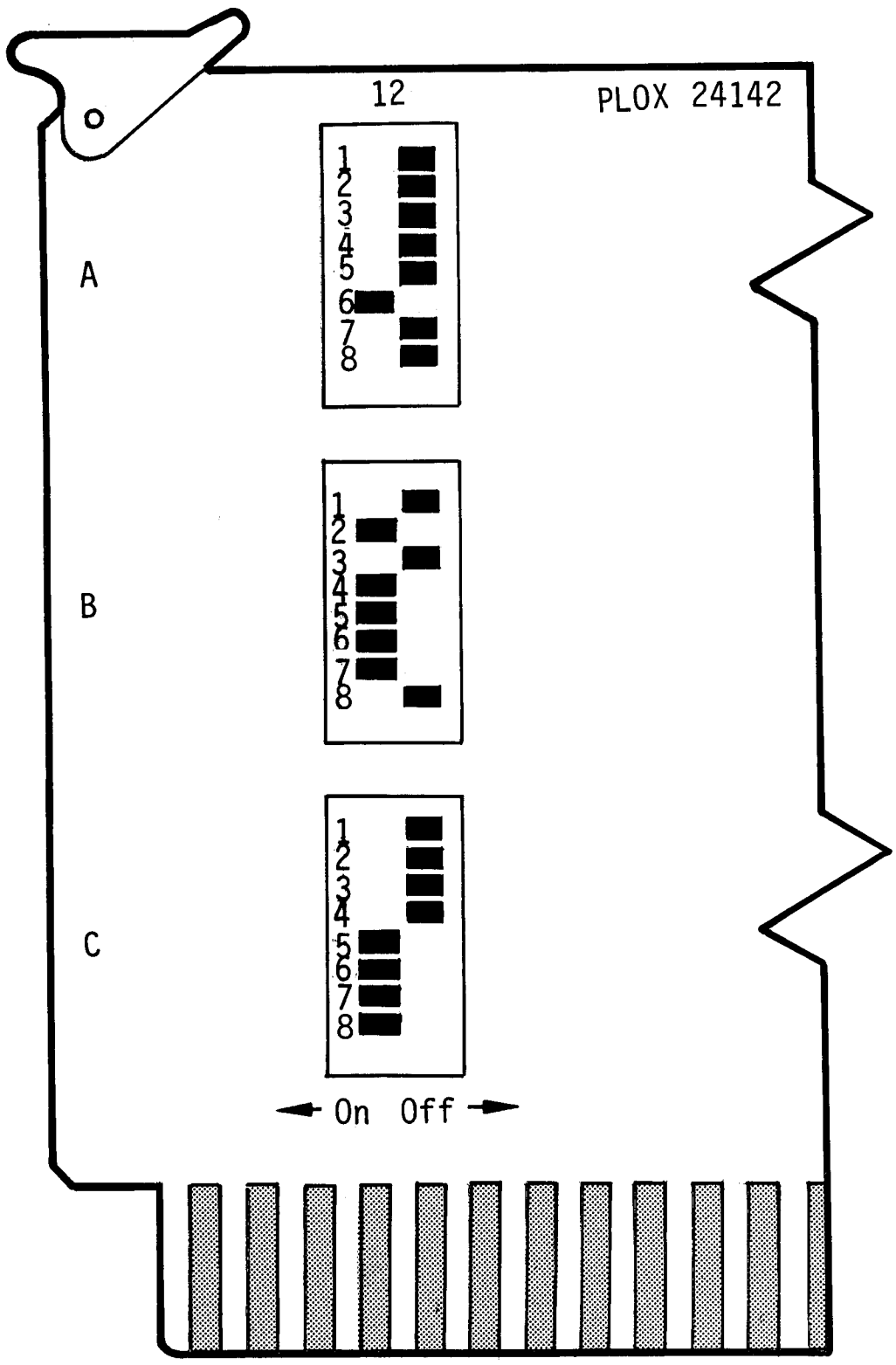


Figure 2-7. Bytes/Sector Disc Drive Sectors/Track Switch Settings, PLOX PCB

1. Remove the Processor/Disc Drive Cabinet rear panel and extract all PCB's, except memory power supply and CPU power supply, from the card cage backplane connectors. See Figure 2-5 to identify the location of each PCB.

2. With a multimeter, set to the R x 1 resistance range, check that short circuits do not exist between any of the power supply outputs as shown in Table 2-3. Test all possible combinations at the test points indicated in Table 2-3.

TABLE 2-3. INTER-POWER SUPPLY RESISTANCE CHECK

Test Point	Signal
CPU P/S - TP3	+5V
CPU P/S - TP1	+12V
CPU P/S - TP2	-15V
CPU P/S - TP4	Ground
Memory P/S - TP5	+5V Bkup
Memory P/S - TP4	+12V Bkup
Memory P/S - TP3	-5V Bkup

2.3.5 POWER SUPPLY OUTPUT CHECK

CAUTION

The Processor Service Switch and Circuit Breaker must be in the OFF position whenever a PCB or cable is inserted or extracted from a connector, otherwise hardware damage and/or program errors may result.

2.3.5.1 CPU/Memory Power Supply

1. Connect both battery wires to the battery; white wire to minus (-), black wire to plus (+). The location of the battery within the Processor/Disc Drive Cabinet is shown in Figure 2-8.

2. Install CPU PCB (P/N 903044) in card cage slot #4 (see Figure 2-5).

3. Connect the two front panel cables (10 conductor ribbon cable P/N 901662) as shown in Figure 2-9.

4. Set Disc Drive Power Switch to the OFF position (see Figure 2-4).

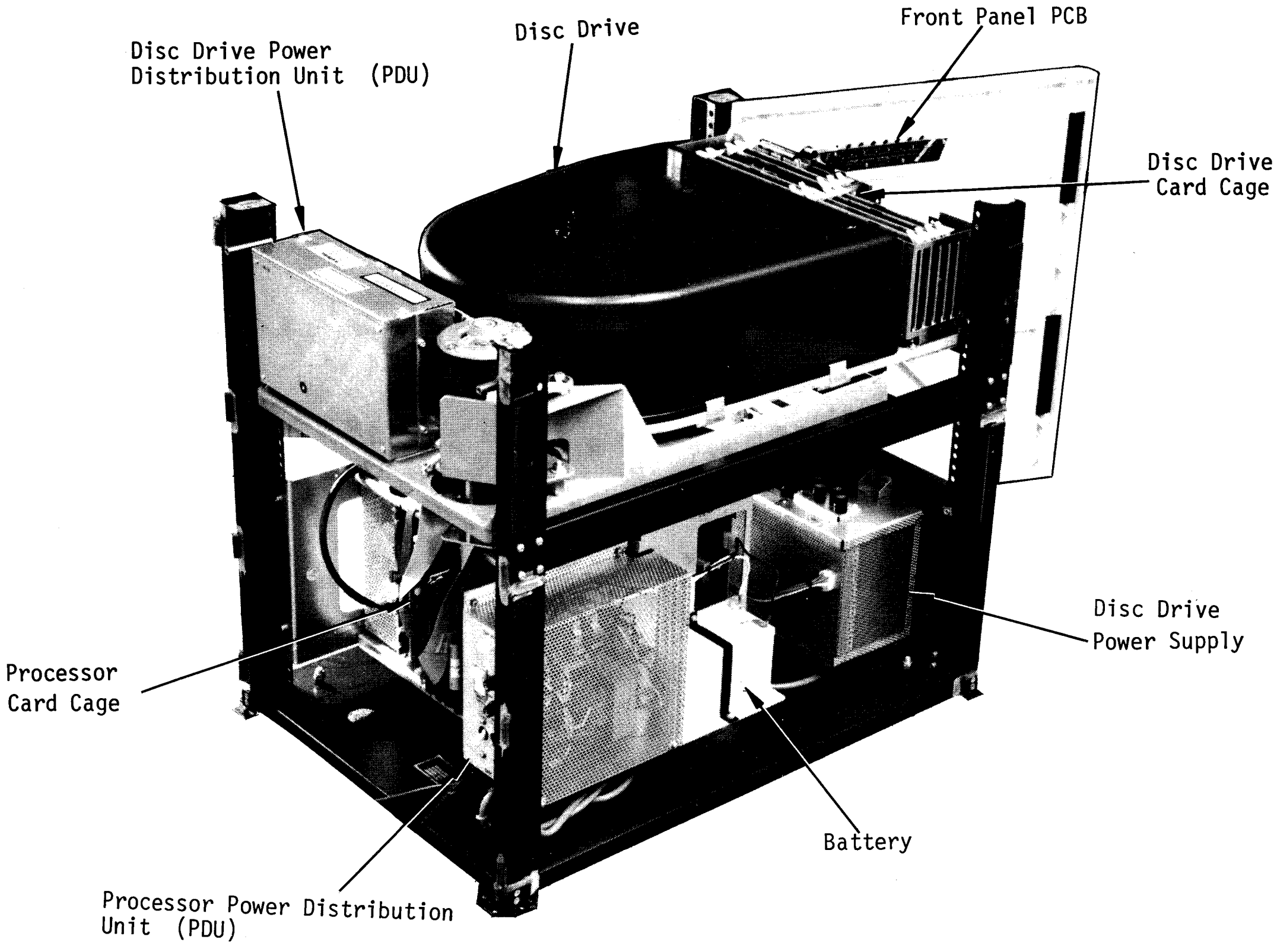


Figure 2-8. Processor/Disc Drive Cabinet, Major Assemblies

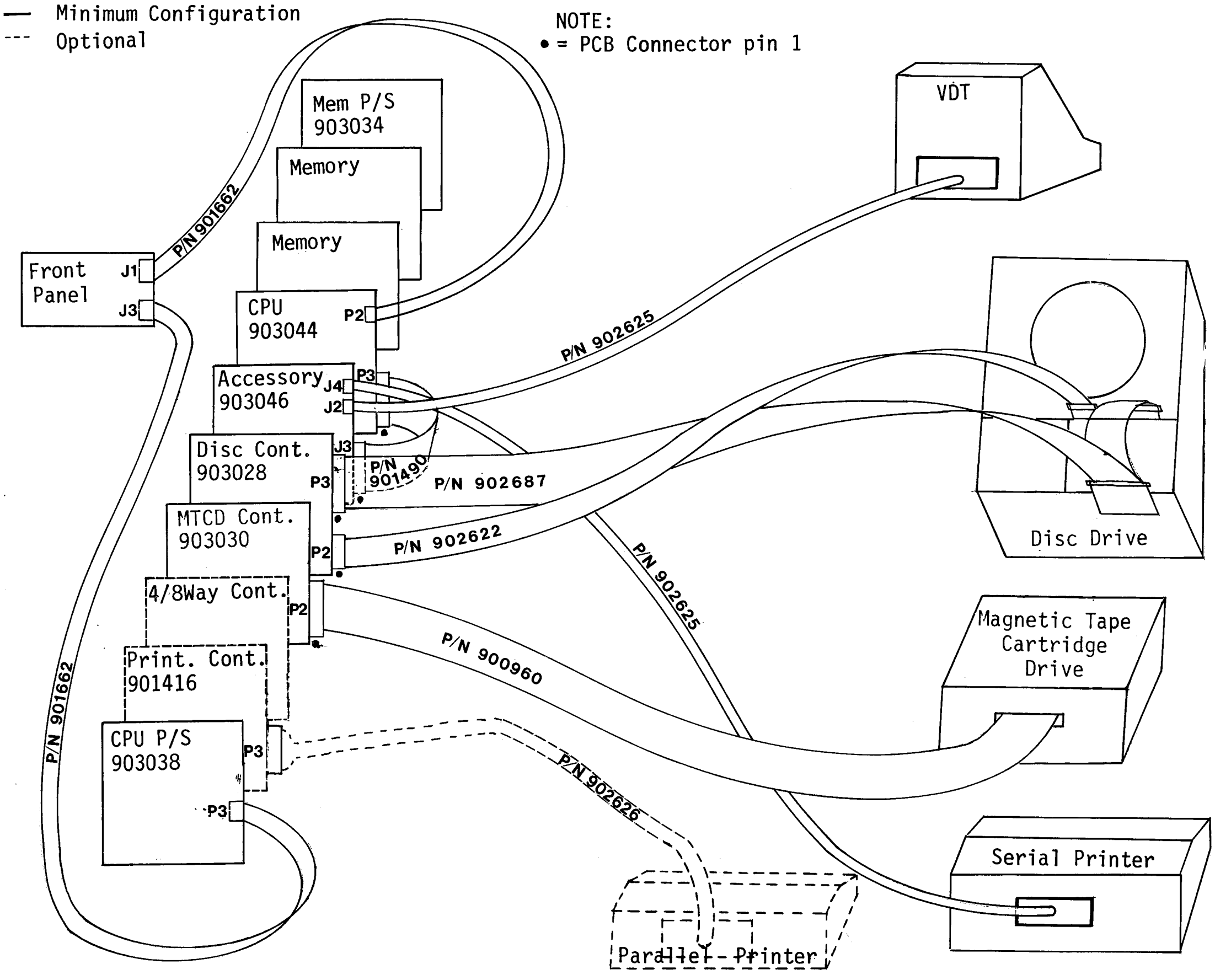


Figure 2-9. System Cables

5. Insert Processor/Disc Drive Cabinet line cord into designated wall outlet (refer to Section 2.2.1).

6. Set Processor Circuit Breaker to the ON position.

7. Set Processor Service Switch to the ON position.

8. Set Processor Front Panel Power Switch to the ON position.

9. Using a multimeter, set to the 20 volts dc range, verify measurements 1 thru 6 as listed in Table 2-4. Measure all voltages between Ground (Memory Power Supply - TP1 or CPU Power Supply - TP4).

TABLE 2-4. NO-LOAD POWER SUPPLY VOLTAGES

Measurement	Test Point Location	Voltage
1	CPU P/S - TP3	+4.75 V to +5.25 V
2	CPU P/S - TP1	+11.4 V to +12.6 V
3	CPU P/S - TP2	-14.25 V to -15.75 V
4	MEMORY P/S - TP5	+4.75 V to +5.75 V (Bkup)
5	MEMORY P/S - TP4	-4.75 V to -5.25 V (Bkup)
6	MEMORY P/S - TP3	+11.4 V to +12.6 V (Bkup)

10. Set Processor Front Panel Power Switch to OFF.

11. Verify presence of Back-up (Bkup) voltages, measurements 4 thru 6 as listed in Table 2-4.

12. Verify absence (i.e., 0 volts dc) of unprotected voltages, measurements 1 thru 3 as listed in Table 2-4.

13. Set Processor Service Switch to the OFF position.

14. Set Processor Circuit Breaker to the OFF position.

15. Install all PCB's in Processor card cage (see Figure 2-5).

16. Set Processor Circuit Breaker to the ON position.

17. Set Processor Service Switch to the ON position.

18. Set Processor Front Panel Power Switch to the ON position.

19. Using a multimeter, set to the 20 volts dc range, verify measurements 1 thru 6 as listed in Table 2-5. Measure all voltages between Ground (Memory Power Supply - TP1 or CPU Power Supply - TP4).

TABLE 2-5. LOADED POWER SUPPLY VOLTAGES

Measurement	Test Point Location	Voltage
1	CPU P/S - TP3	+4.75 V to +5.25 V
2	CPU P/S - TP1	+11.4 V to +12.6 V
3	CPU P/S - TP2	-13.5 V to -16.5 V
4	MEMORY P/S - TP5	+4.75 V to +5.25 V
5	MEMORY P/S - TP4	-4.75 V to -5.25 V
6	MEMORY P/S - TP3	+11.4 V to +12.6 V

2.3.5.2 Disc Drive Power Supply

1. The Disc Drive Power Supply is located directly behind the Processor/Disc Drive Cabinet front door (see Figure 2-8). The Disc Drive Power Supply is mounted on hinges that allow it to swing out.

2. Open the Processor/Disc Drive Cabinet front door, loosen the two fasteners securing the Disc Drive Power Supply, and swing the Power Supply out.

3. Remove connectors P301 and P303 from the Disc Drive Power Supply (see Figure 2-10).

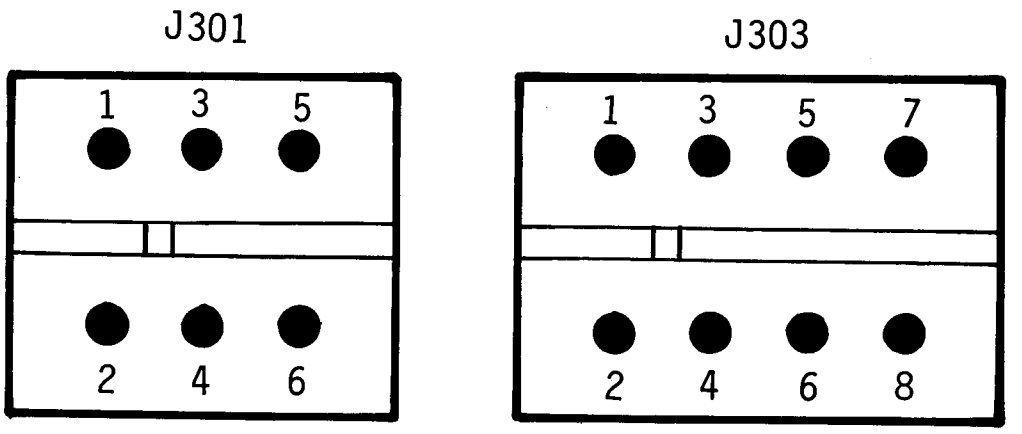


Figure 2-10. Disc Drive Power Supply Connector Pin Designations

4. Set the Disc Drive Power Switch to the ON position.

5. Using a multimeter, verify the dc voltages at the Disc Drive supply connector pins listed in Table 2-6. The pin number designations on J301 and J303 are shown in Figure 2-10.

TABLE 2-6. DISC DRIVE POWER SUPPLY VOLTAGES

Disc Power Supply Connector/Pin		Voltage
Plus	Minus	
J301-1	J301-2	+4.90 V to +5.10 V
J301-5	J301-6	-5.10 V to -5.30 V
J303-2	J303-1	-14.70 V to -15.30 V
J303-4	J303-3	-14.70 V to -15.30 V
J303-6	J303-5	+14.85 V to +15.15 V
J303-8	J303-7	+14.70 V to +15.30 V

6. Set Processor Front Panel Power Switch to the OFF position.

7. Set Processor Service Switch to the OFF position.

8. Set Processor Circuit Breaker to the OFF position.

9. Reconnect Disc Drive dc power connectors P301 and P303 to the Disc Drive Power Supply.

2.3.6 CABLE INTERCONNECTION

Install/Verify system interface cables as described in the following procedure:

1. Position the System 200/410 components in the desired locations (refer to Section 2.3).

2. Install all cables as listed in Table 2-7. The location of connectors within the system are identified in Figure 2-9.

CAUTION

It is important that cables and connectors are properly identified and connected pin-to-pin prior to applying power to the Processor and associated peripherals, otherwise, hardware damage and/or program errors may result.

3. A simple method to ensure that cables are properly connected is to align the arrow marked on the cable connector to the arrow marked on the mating connector. An illustration of a properly connected cable is shown in Figure 2-11.

TABLE 2-7. INTERFACE CABLE INSTALLATION

Cable	From	Cable Description - Part Number	To
1	Front panel - J1	10 Conductor Ribbon - 901662	CPU PCB - P2
2	Front Panel - J3	10 Conductor Ribbon - 901662	CPU P/S - P3
3	CPU PCB - P3	50 Conductor Ribbon - 901490	Accessory PCB - J3
4a	Accessory PCB - J4	4 Conductor Cable - 902625 or 906041*	Printer (serial)
		and/or	
4b	Printer Cont. PCB - P3	26 Conductor (13 tw. pr.) 902626 or 906305**	Printer (parallel)
5	Accessory PCB - J2	4 Conductor Cable - 902625 or 906041***	VDT - Main I/O
6	Disc Drive Interface PCB Terminator	Triple Connector, - 902687 (Command Bus); 50 Conductor Ribbon	Disc Cont. PCB - P3
7	Disc Drive Interface PCB	26 Conductor Ribbon - 902622 (Radial)	Disc Cont. PCB - P2
8	Magnetic Tape Cartridge Drive	50 Conductor Ribbon - 900960	MTCD Cont. PCB - P2

NOTE: Figure 2-9 identifies the location of connectors listed above.

* Use with single Serial (remote) Printer

** Use with Parallel (local) Printer

*** Additional VDT's/Serial Printer use 4- or 8-Way Controller PCB. Connect Serial Printer to last terminal port (refer to Section 2.3.3).

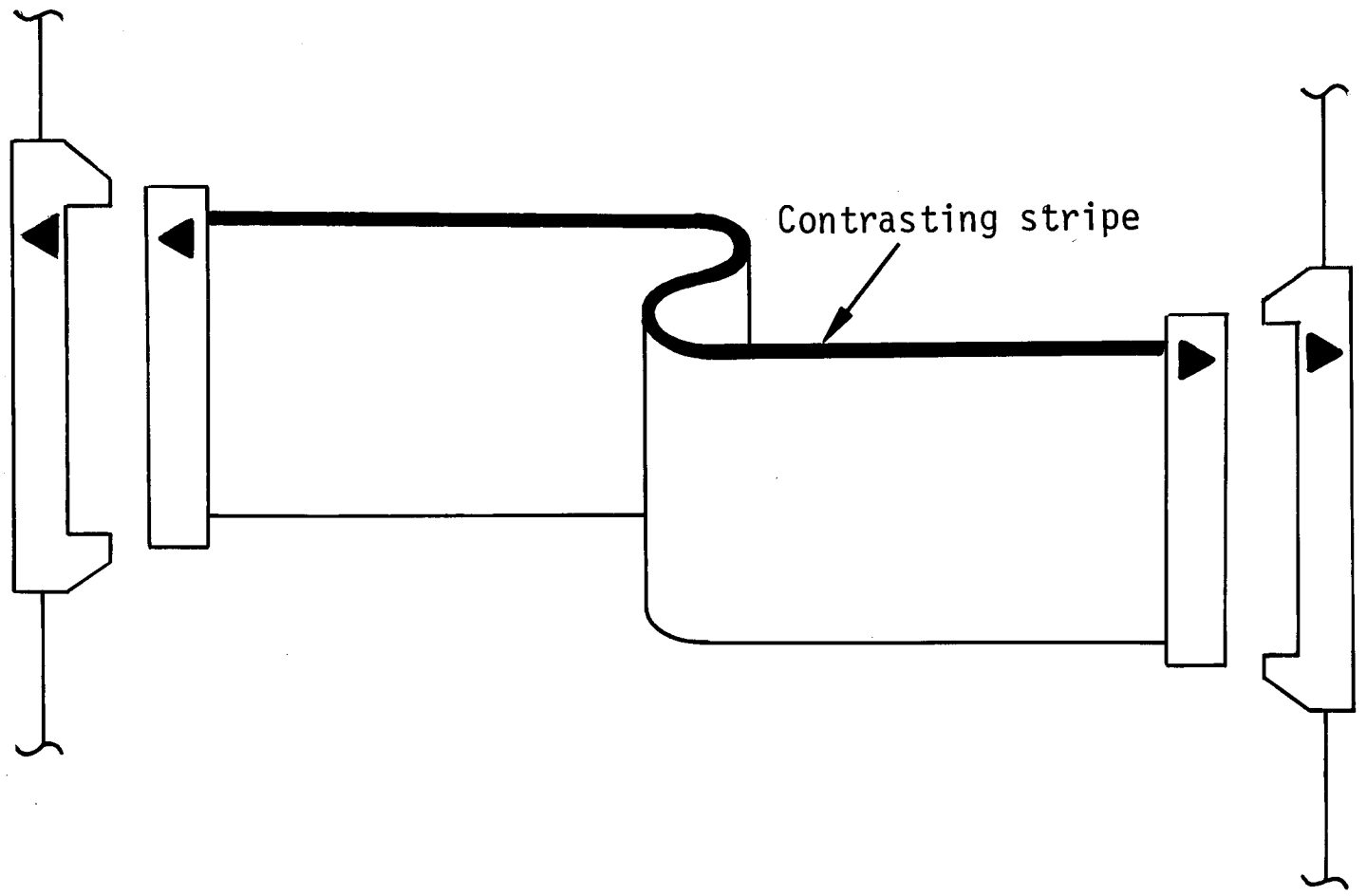


Figure 2-11. Cable to Connector Orientation

2.3.7 SYSTEM POWER-UP CHECK

Perform the System Power-Up Check as described in Chapter 4, Section 4.2.3.4. The System Power-Up Check presents a logical approach to verifying that the system is operating properly and identifying common equipment problems encountered during installation.

2.3.8 ADJUSTMENTS

2.3.8.1 Track Following Adjustment

It is recommended that Disc Drive Track Following circuitry be checked as outlined in this procedure when the system is installed. First, perform Track Following Adjustment, then Tach Gain Adjustment (refer to Section 2.3.8.2).

CAUTION

Adjustment to the Track following circuitry (R32 on PAMP PCB) should not be attempted unless a Zero Recovery Tape is immediately available, otherwise, hardware damage and/or program errors may result.

1. Connect Oscilloscope Channel A to test point 16 on PSER PCB.

2. Install Disc Drive PCB extender (MM#259010) to Disc Drive VSER PCB (see Figure 2-4).

3. Connect Oscilloscope Channel B to VSER PCB, connector pin R2.

4. Set Oscilloscope Trigger Source to Channel A, minus (-) slope.

5. Set Processor Front Panel Power switch to ON.

6. Observe that Disc Ready lamp (see Figure 2-4) is illuminated.

7. Observe Oscilloscope Channel A and verify peaks B and C (see Figure 2-12) are of equal amplitude.

8. If peaks B and C are <u>not</u> of equal amplitude, adjust R32 on PAMP PCB only if a Zero Recovery Tape is readily available.

9. Observe Oscilloscope Channel B and verify that zero volts ±0.5 volts level is present.

10. If R32 on PAMP PCB was adjusted, perform the following operations:

    a. Zero Recovery Procedure

    b. Write Prototype Sectors 1 thru 15 (refer to Section 2.6.4)

    c. Format Disc (refer to Section 2.6.5)

    d. Install System Software (refer to Section 2.6.6)

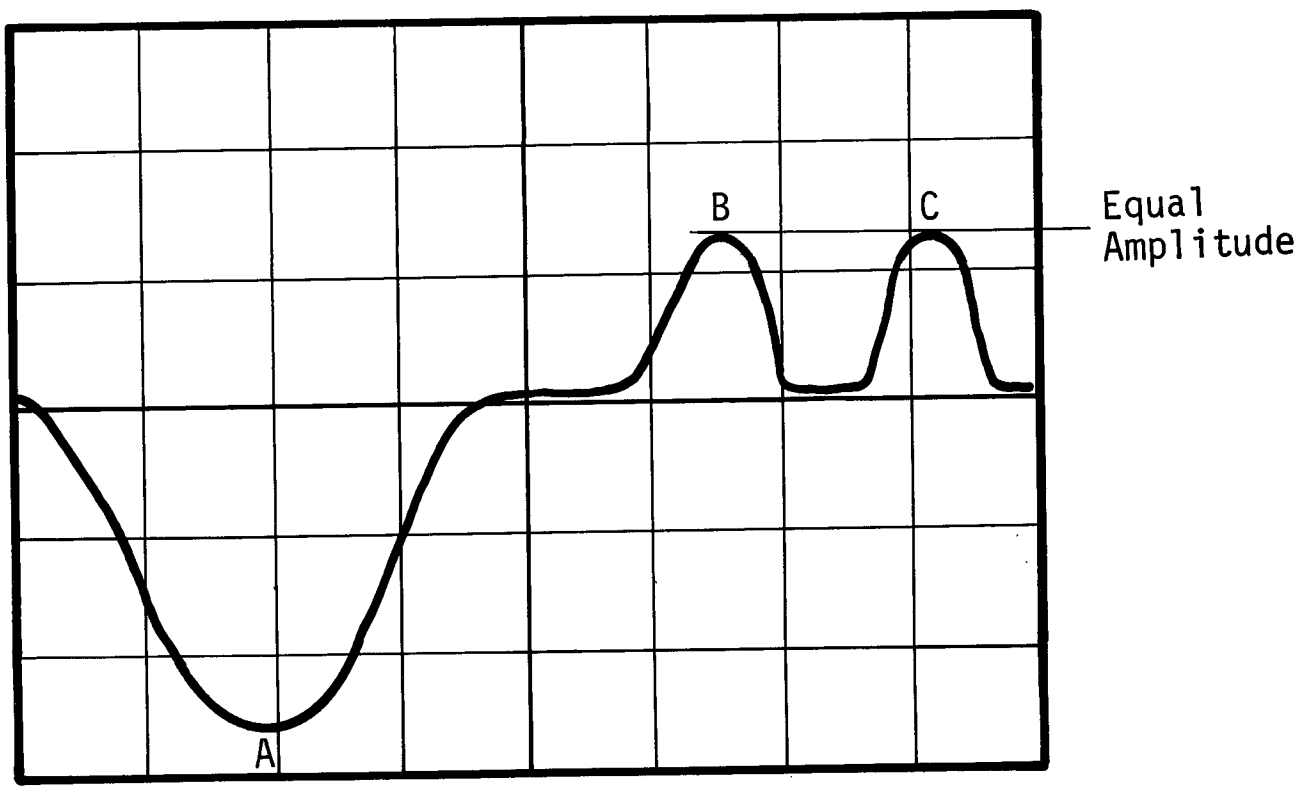


Figure 2-12. Track Following Adjustment Waveform

2.3.8.2 Tach Gain Adjustment

It is recommended that the Disc Drive Tach Gain be adjusted when the system is installed. The Tach Gain is adjusted such, that the average time to complete a seek between cylinders 000 and 105 is between 31.0 and 31.3 milliseconds. Perform the Tach Gain Adjustment after first performing Track Following Adjustment (refer to Section 2.3.8.1). The Tach Gain is adjusted as follows:

1. Set Processor Front Panel Power Switch to OFF.

2. Remove Processor/Disc Drive Cabinet top cover.

3. Install PCB extenders to Disc Drive Servo Control (SCON) and Velocity Servo (VSER) PCB's.

4. Connect Oscilloscope Channel A to VSER PCB connector pin R46 ($\overline{\text{READY}}$).

5. Connect Oscilloscope Channel B to SCON PCB connector pin L26 (positive position error voltage).

6. Set Oscilloscope controls as follows:

   Volts/division = 1
   Time/division = 5 milliseconds
   Trigger source = Channel A
   Slope = Minus (-)
   Trigger mode = AUTO
   Vertical mode = ALTERNATE

7. For System 200 <u>without</u> lister-compiler (32K memory) enter and run the Cylinder 000 to 105 Seek (machine level) program as follows. For systems <u>with</u> lister-compiler skip Step 7 and go to Step 8.

   a. On terminal 0, set VDT mode switch (rear panel) to half (H) duplex.

   b. Set CPU PCB sense switches for VDT Bootstrap Load (see Figure 2-13).

   c. Press VDT CLEAR key.

   d. Press and release Processor Front Panel Load switch.

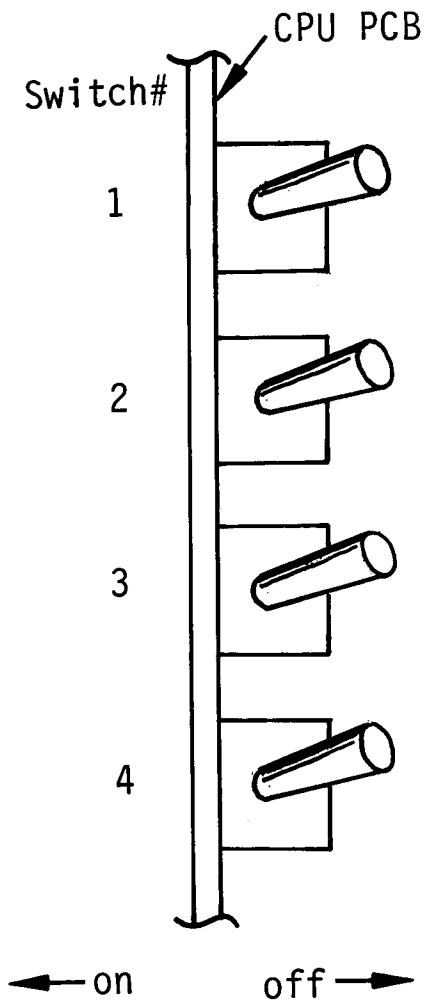
   e. Enter the following hexadecimal numbers:

      020004870040EF0039C73117170261FAEF001205

      97000061039700693A27394761E4, then, Motor Bar IV

   f. Enter: 0200, then motor bar IV. Observe that the disc heads are alternating between Cylinders 000 and 105.

   g. Go to Step 9.



SENSE SWITCH				FUNCTION
1	2	3	4	
OFF	OFF	OFF	OFF	Fixed media disc system load
OFF	OFF	ON	OFF	Fixed media disc alternate load
ON	ON	ON	ON	Tape cartridge alternate load
ON	OFF	OFF	ON	VDT bootstrap load

Figure 2-13. CPU PCB Sense Switch Settings

8. For System 200 with lister-compiler (>40K memory) and System 410 computers, enter and run the Cylinder 000 and 105 Seek (BASIC) program as follows:

   a. Set CPU PCB Sense switch for Fixed Media Disc System Load (see Figure 2-13).

   b. Press and release Processor Front Panel Load switch.

   c. Enter the following:

```
10 LET X = 4 (for 25 MB disc)
            or
10 LET X = 8 (for 50 MB disc)
            or
10 LET X = 12 (for 75 MB disc)
20 DIM A$ (1024)
30 GET 0, 1, A$
40 GET 0, X * 16 * 105, A$
50 GOTO 30
RUN
```

   d. Observe that the disc heads are alternating between Cylinders 000 and 105.

9. Observe Oscilloscope Channel A (READY), if necessary adjust potentiometer R54 (located on VSER PCB) such that READY is false (high) for 31.0 to 31.3 milliseconds (see Figure 2-14).

10. Observe Oscilloscope Channels A and B and verify that POS POSITION ERROR VOLTAGE (Channel B) is less than 3 volts peak-to-peak when READY is true (low) (see Figure 2-14).

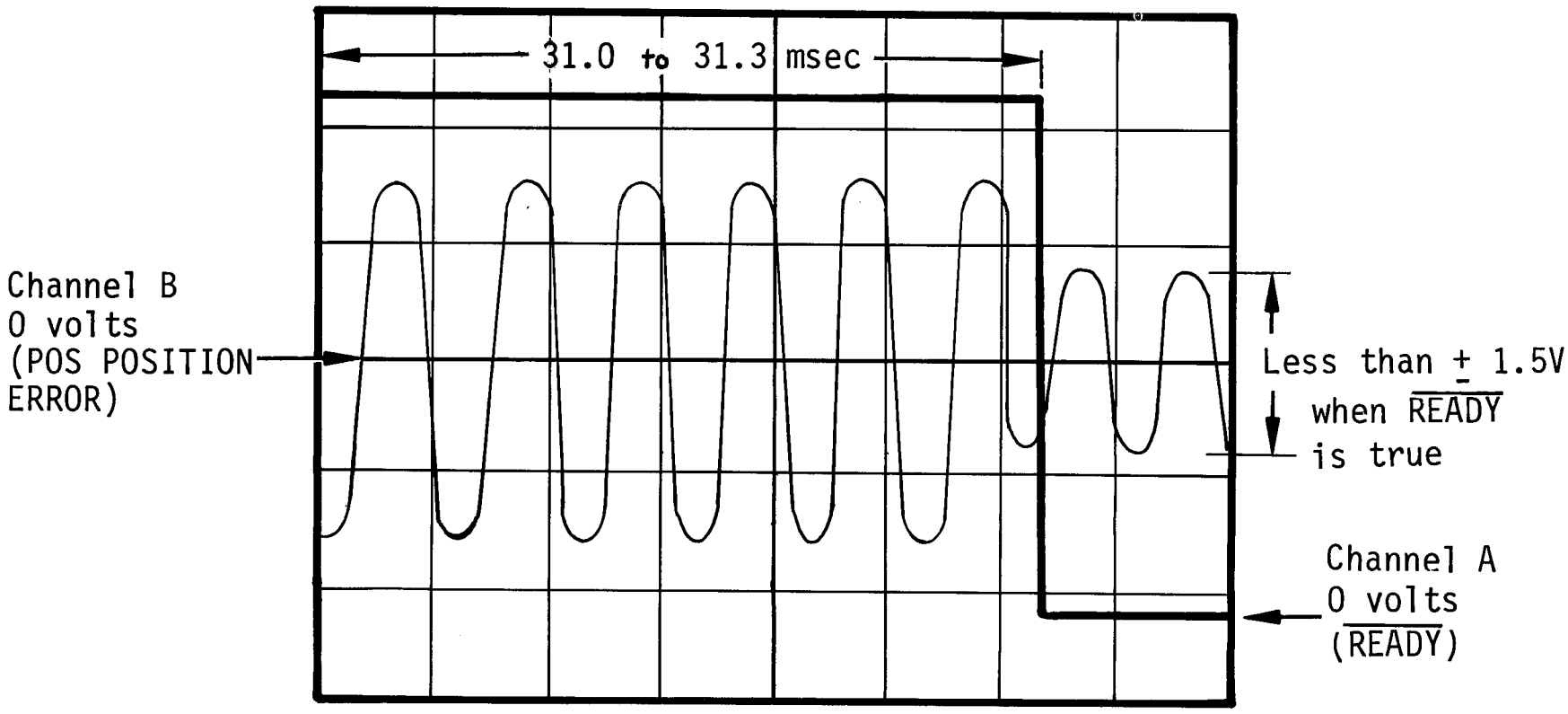


Figure 2-14. Tach Gain Adjustment Waveform

2.4 SYSTEM CHECK-OUT

Before running diagnostics, insure that the system is configured properly. System configuration is verified by running utility Program *Z. This program will list the VDT's, Printers, etc., that the operating system software is programmed to manage. System Check-Out is accomplished by performing the diagnostic programs listed in Chapter 4, Section 4.2.3.

2.5 SYSTEM CONTROLS AND INDICATORS

A functional summary of the Processor/Disc Drive Cabinet controls and indicators is shown in Table 2-8. The VDT, MTCD, and Printer controls and indicators are described in their respective Service Manual.

TABLE 2-8. PROCESSOR/DISC DRIVE CONTROLS AND INDICATORS

Reference	Name	Description
1 (Figure 2-15)	POWER	This momentary latching switch/indicator controls the application of AC power to the Disc Drive, CPU Power Supply, and fans. The lamp, when illuminated, indicates AC power is applied.
2 (Figure 2-15)	DISC READY	This lamp, when illuminated, indicates that both the Disc Drive and Disc Controller PCB are in a ready state.
3 (Figure 2-15)	LOAD	This momentary switch/indicator when pressed and released, transfers the operating system software from either disc or tape (as specified by the sense switches) to main (RAM) memory.
4 (Figure 2-15)	TEST	This momentary switch/indicator is wired in parallel with sense switch 3. Pressing the TEST switch corresponds to sense switch 3 being in the ON state.
5 (Figure 2-15)	CLEAR	This momentary switch/indicator when pressed, will issue a front panel interrupt command to the CPU.
6 (Figure 2-15)	RUN	This lamp, when illuminated, indicates the CPU is in the RUN state.
7 (Figure 2-15)	HALT	This lamp, when illuminated, indicates the CPU is in the HALT state.
8 (Figure 2-15)	RESERVE	This lamp, when illuminated, indicates the Memory Power Supply voltages are present.
9 (Figure 2-5)	CIRCUIT BREAKER	This Circuit Breaker/Switch controls the application of AC power to the Processor PDU.
10 (Figure 2-5)	SERVICE SWITCH	This switch controls the application of AC power to the Memory Power Supply and connects the battery to the charger and inverter.

TABLE 2-8. PROCESSOR/DISC DRIVE CONTROLS AND INDICATORS (continued)

Reference	Name	Description
11 (Figure 2-4)	POWER	This switch controls the application of AC power to the Disc Drive Power Supply, motor, and card cage fan.
12 (Figure 2-4)	FAULT	This red colored LED, when illuminated, indicates the Disc Drive logic detected a fault. The nature of the fault is specified by the status bits (refer to Model 2400 Disc Drive Service Manual).
13 (Figure 2-4)	READY	This green colored LED, when illuminated, indicates the Disc Drive is in a ready state, i.e., heads at cylinder 0 (after initial power up) or at specified cylinder (during normal operation), no fault detected, and motor at speed.

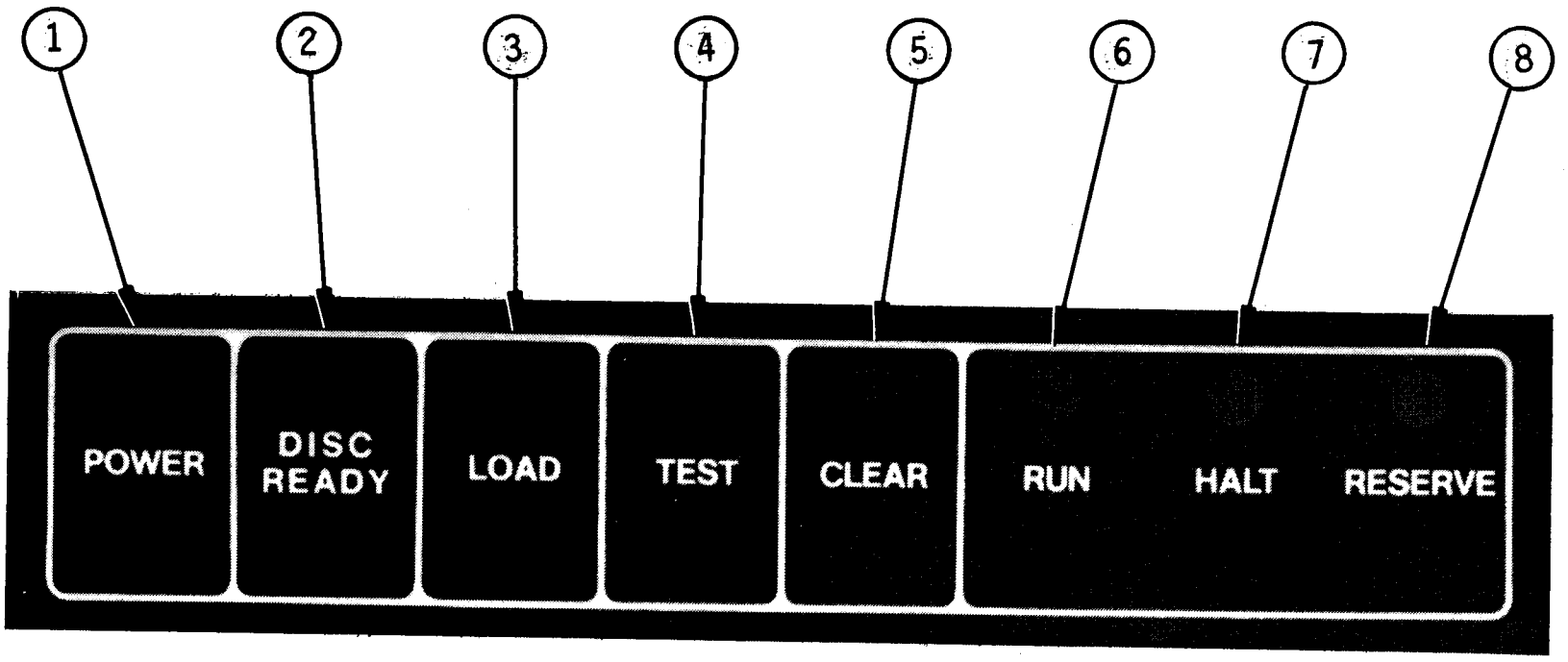


Figure 2-15. Processor Front Panel Switches/Indicators

2.6 OPERATING PROCEDURES

2.6.1 DISC SYSTEM LOAD

1. Set CPU sense switches for Disc System Load (see Figure 2-13).
2. Press and release Processor Front Panel Load switch.
3. Enter "N" in response to: "DO YOU WANT SPOOLING?"

2.6.2 ALTERNATE DISC LOAD

1. Set CPU sense switches for Normal Disc Load (see Figure 2-13).*
2. Press and hold Processor Front Panel Test switch.
3. Press and release Processor Front Panel Load switch.
4. Release Test switch after: "ALT/LOAD INITIALIZATION" is displayed on the VDT.
5. Press "CR" (carriage return) key in response to: "MAKE ENTRY TO OVERRIDE DEFAULT".

*Optionally set CPU sense switches for Alternate Disc Load (see Figure 2-13) and skip Steps 2 and 4.

2.6.3 ALTERNATE TAPE LOAD (FROM SYSTEM TAPE)

1. Insert System Tape Cartridge into Tape Drive; allow tape to rewind.
2. Set CPU sense switches for Alternate Tape Load (see Figure 2-13).
3. Press and release Processor Front Panel Load switch.
4. Enter "CR" (carriage return) key in response to: "MAKE ENTRY TO OVERRIDE DEFAULT".

2.6.4 WRITING PROTOTYPE SECTORS 1 THRU 15

1. Ensure that the bootstrap is present on the disc (track 0) and sectors 1 thru 15 have been formatted.
2. Perform Alternate Tape Load (refer to Section 2.6.3).
3. Enter "*SRCFL" followed by "CR" (carriage return) in response to: "ENTER PROGRAM NAME".

2.6.5 FORMATTING DISC

1. Make sure that the bootstrap is present on disc sectors 0 thru 15.
2. If necessary, create a backup tape, as the reformatting process will destroy all data except track 0.
3. Insert system tape in tape drive.
4. Perform Alternate Tape Load (refer to Section 2.6.3).
5. Enter "BBIITC" followed by "CR" (carriage return) in response to "ENTER PROGRAM NAME".

6. Enter "FORMT2" in response to "ENTER PGM NAME (*MTC or BASS)".

7. Perform disc formatting.

2.6.6 INSTALLING OPERATING SYSTEM FROM TAPE

The Operating System software can be loaded from the System Tape Cartridge to the disc, provided *MTC, *MTCR1, OSMNTC, the bootstrap, and the serial number are intact.

Install the system software as follows:

1. Insert System Tape into Tape Drive.

2. Set CPU PCB sense switches for Tape Cartridge Alternate Load (see Figure 2-13).

3. After the tape has been rewound and moved to the beginning of tape, press Processor Load switch.

4. Enter "BBIITC" followed by "CR" (carriage return) in response to "ENTER PROGRAM NAME".

5. Enter "*MTC" in response to "ENTER PGM NAME (*MTC or BASS)".

6. Perform a system installation by selecting Option 6 on *MTC menu.

2.6.7 UPDATING SYSTEM SOFTWARE

1. Insert System Tape containing updated software into Tape Drive.

2. Perform Alternate Tape Load (refer to Section 2.6.3).

3. Enter "BBIITC" followed by "CR" (Carriage return) key in response to "ENTER PROGRAM NAME".

4. Enter "*MTC" in response to "ENTER PGM NAME (*MTC or BASS)".

5. Perform a system update by selecting Option 7 in *MTC.

2.6.8 CREATING BACKUP TAPE

1. Perform Alternate Disc Load (refer to Section 2.6.2).

2. Enter "BBIITC" followed by "CR" (carriage return) key in response to "ENTER PROGRAM NAME".

3. Enter "*MTC" in response to "ENTER PGM NAME (*MTC or BASS)".

4. Insert a Certified Tape Cartridge into Tape Drive. Do not use a System Tape or Zero Recovery Tape.

5. Perform a full backup by selecting Option 1 or a selective backup using Option 2.

CHAPTER 3

THEORY OF OPERATION

3.0 INTRODUCTION

This chapter provides a brief functional description of the System 200/410 computer system. It is intended as an introduction to fundamental concepts and system relationships. More detailed information about particular parts of the system (e.g., CPU, Printer, Disc Drive) can be found in their respective Service Manual or Technical Manual.

3.1 FUNCTIONAL DESCRIPTION

A functional block diagram of the System 200/410 is shown in Figure 3-1. A more detailed functional description of the processor can be found at the beginning of Section 3.2.

The following paragraphs describe the basic function(s) of each block and its relationship to the rest of the system.

3.1.1 PROCESSOR (MODEL 1340/1345)

The Processor consists of a Central Processing Unit (CPU), Main Memory, and Input/Output (I/O) Controllers. The CPU functions as the central control point to initiate all actions within the system as specified by the program. The Main Memory stores the program until commanded by the CPU to transfer a small portion of the program (called an "instruction") to the CPU to be processed. The instructions are processed in sequence, one-by-one. The results of the process are written into Main Memory to be stored or sent to an I/O Controller which transfers the results to its associated peripheral device.

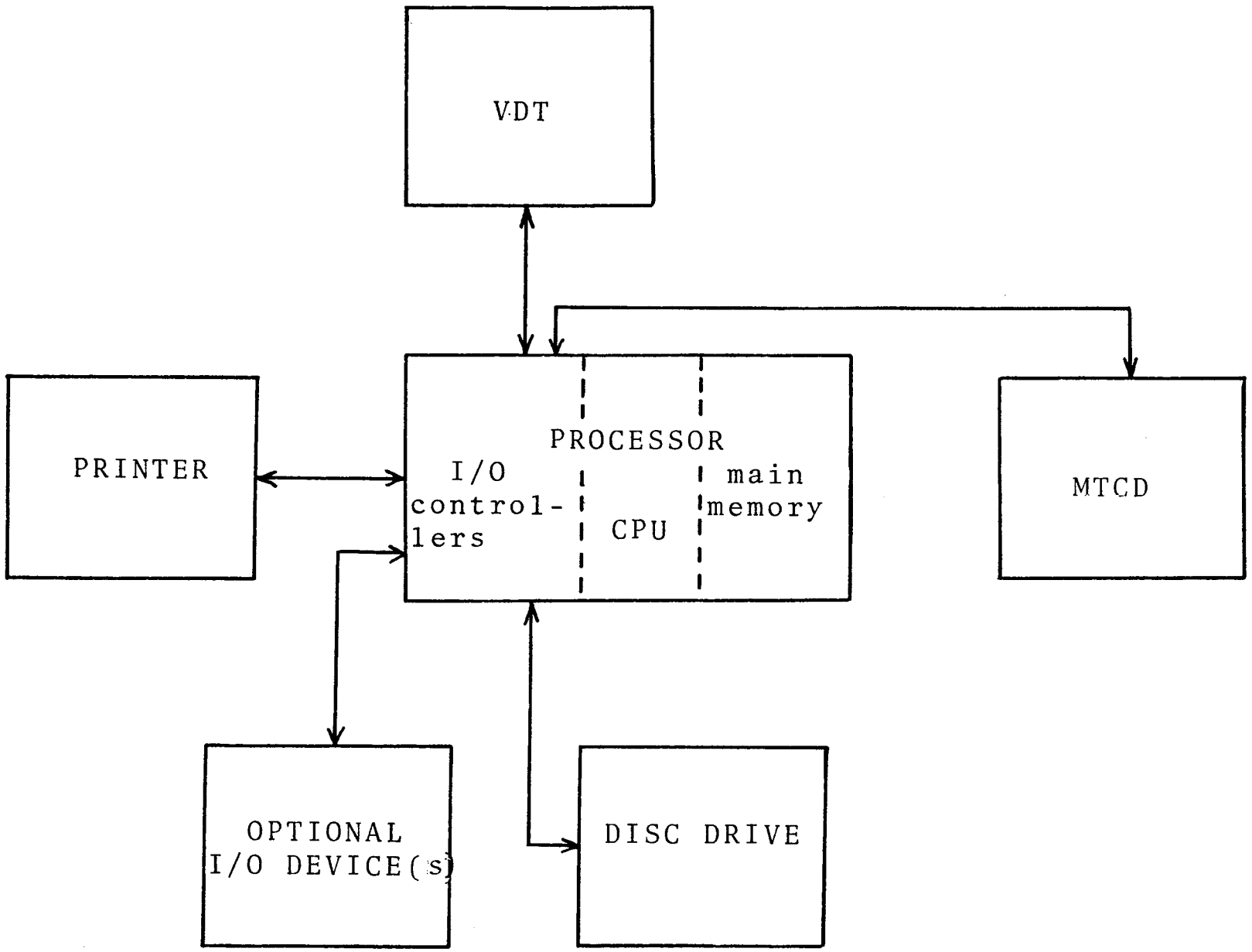


Figure 3-1. System 200/410 Functional Block Diagram

3.1.2 VIDEO DISPLAY TERMINAL (MODEL 7250)

The Video Display Terminal (VDT) provides a two-way interface between the CPU and the operator (see Figure 3-1). The operator enters commands, programs, and data at the VDT keyboard. The CPU returns characters for display, and, under program control, the results of processed data and requests for operator action. Between the CPU and the VDT is a serial I/O Controller channel that functions to translate, format, and insure that the information travelling between the CPU and the VDT is sent and received at the proper time. The serial I/O Controller channel utilizes standard RS-232C interface protocol when communicating with the VDT.

3.1.3 DISC DRIVE (MODEL 2400)

The Disc Drive provides the CPU with a large storage area for programs and data (see Figure 3-1). Both the Disc Drive and the Main Memory provide information storage. However, because the Disc Drive accesses the information stored at a much slower rate than Main Memory, the Disc Drive will generally store information that is less urgently required by the CPU. Programs, when ready to be run, are transferred from the Disc Drive to the Main Memory where they are read and executed by the CPU.

Between the CPU and the Disc Drive is the Disc Drive I/O Controller. The Disc Drive I/O Controller performs error checking, formatting, translation, and timing of information transferred between the CPU and the Disc Drive. The Controller also performs interrupt processing, stores status information, and controls Direct Memory Access (DMA) operations.

3.1.4 MAGNETIC TAPE CARTRIDGE DRIVE (MODEL 6400)

The Magnetic Tape Cartridge Drive (MTCD) provides a large off-line storage area for programs and data (see Figure 3-1). The main function of the MTCD is to provide backup storage in the event the programs and/or data on the Disc Drive are lost.

Between the CPU and the MTCD is the MTCD I/O Controller which decodes CPU commands, monitors MTCD operational status, generates Tape Drive control and timing signals, formats information written on tape, initiates interrupts, performs error checking, and controls DMA operations.

3.1.5 MATRIX PRINTER (MODEL 3200)

The Printer provides a hard copy record of the program and/or data processed by the program (see Figure 3-1).

Between the Printer and CPU is a serial I/O Controller channel or a parallel I/O Controller (remote or local printer operation respectively). In either case, the I/O Controller issues timing and control signals to the Printer and CPU, interprets and sends Printer status information and interrupt commands to the CPU.

The serial I/O Controller channel utilizes standard RS-232C interface protocol when communicating with the Printer.

3.2 PROCESSOR FUNCTIONAL DESCRIPTION

Within the dotted lines of Figure 3-2 is an illustrated functional block diagram of the Processor. The Processor consists of the following devices:

- Central Processing Unit (CPU)
- Main Memory
- Disc Drive Controller
- Magnetic Tape Cartridge Drive (MTCD) Controller
- 2 Channel Serial Interface (Accessory PCB)
- Optional Controllers

Communication between the CPU and the rest of the Processor devices is accomplished by various busses as shown in Figure 3-2. Each bus handles information of a particular type.

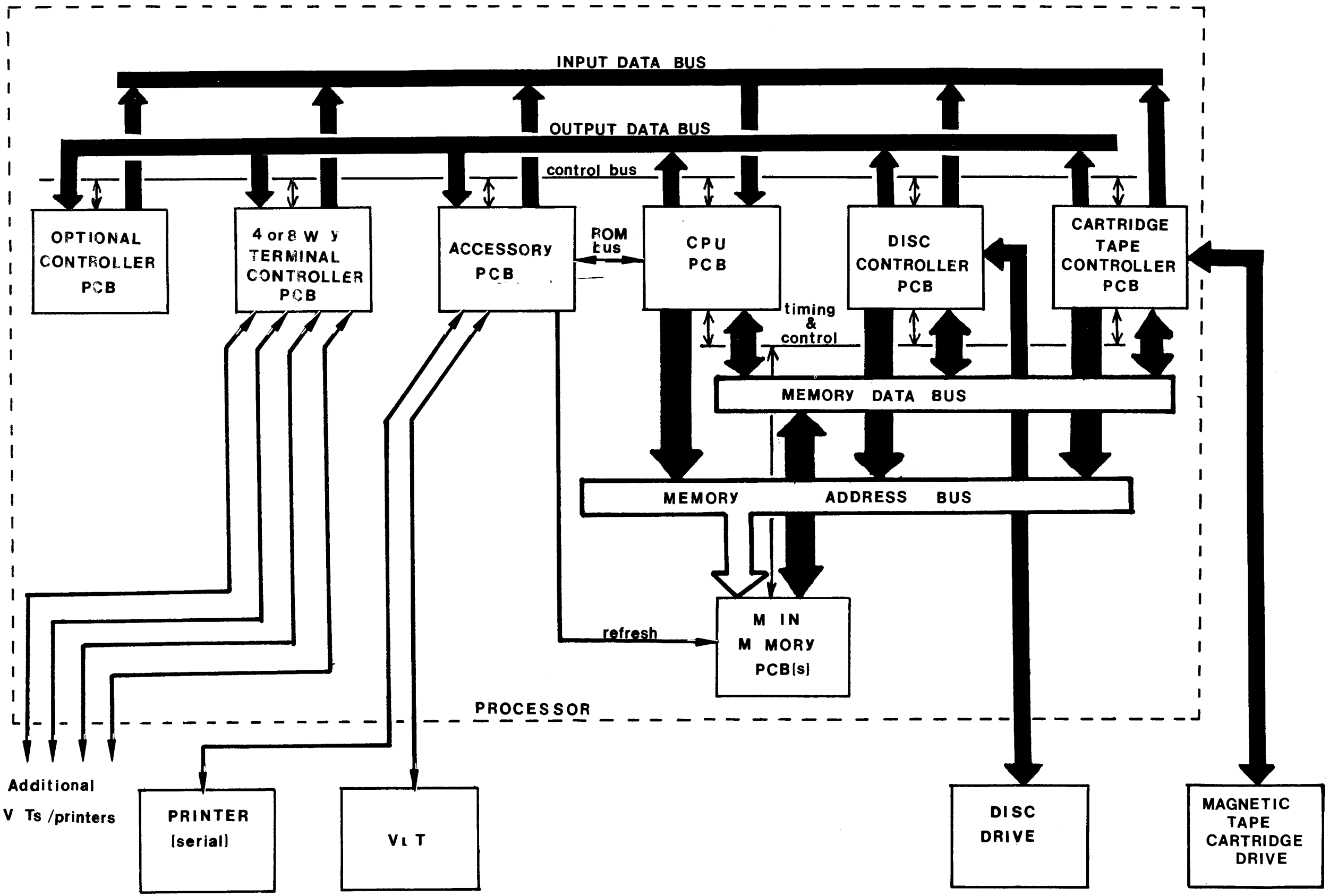


Figure 3-2. Processor Functional Block Diagram

For reference purposes, Figure 3-2 also shows how each peripheral device is tied to its associated Controller. The respective Service Manual describes its relationship (Printer, VDT, Disc Drive, and Magnetice Tape Cartridge Drive) to the controller.

3.2.1 CENTRAL PROCESSING UNIT (MODEL 1340/1345)

The Central Processing Unit (CPU), as shown in Figure 3-2, initiates, controls, and terminates all actions within the computer system, as well as performing arithmetic calculations and logical functions. The CPU controls the movement and modification of data throughout the system as specified by the program present in Main Memory.

The CPU hardware is designed with certain arithmetic, logical, data movement, and memory capabilities. Each of these capabilities and sub-variations are defined by a set of instructions that specify the exact action the CPU hardware will take. The program is a group of these instructions that are fed to the CPU in a unique order to perform a unique task.

The CPU used in the System 200/410 is "micro-programmed". The main difference between the micro-programmed CPU and the more standard "fixed-instruction" CPU is in the control unit. The control unit is the part of the CPU that enables the various control signals to sequence the CPU hardware to perform a given program instruction. In the mirco-programmed CPU, the actions of the control unit are determined by a firmware program contained in a read-only memory. This program (called the micro-program) is made up of many micro-instructions arranged in subroutines. The micro-instructions produce the most fundamental actions of the CPU, e.g., "move the contents of a register to a bus." The subroutines are groups of micro-instructions that perform commonly required data manipulations. A group of these micro-program subroutines is the equivalent of a machine level (macro) instruction, i.e., when the CPU receives a particular machine level (macro) instruction, a corresponding sequence of micro-program subroutines is executed to produce the action specified by the machine level (macro) instruction.

The advantage of the micro-programmed CPU is flexibility and efficiency. By altering the micro-program, the CPU can be made to act in an entirely different manner.

A more detailed description of the CPU hardware and its operation can be found in the "1300 CPU Technical Manual", Document No. SM 1020 and "M1300 Series CPU Organization and Description Reference Manual".

3.2.2 MAIN MEMORY

Main Memory functions as the storage medium for programs and data currently being executed upon by the CPU (see Figure 3-2). Main Memory may be organized up to 96k words or nine (9) bits in length. Eight (8) bits of each word represents data and the remaining bit is the parity bit for the word (an LED on the memory PCB illuminates when a parity error has occurred). Because the Main Memory is a dynamic semiconductor type, each cell (1 bit/cell) must be refreshed every two milliseconds, otherwise, the charge held in the cell will leak off. Figure 3-3 shows the required timing relationships to perform a memory refresh cycle. Refresh timing and control is supplied to Main Memory by circuitry located on the Accessory PCB.

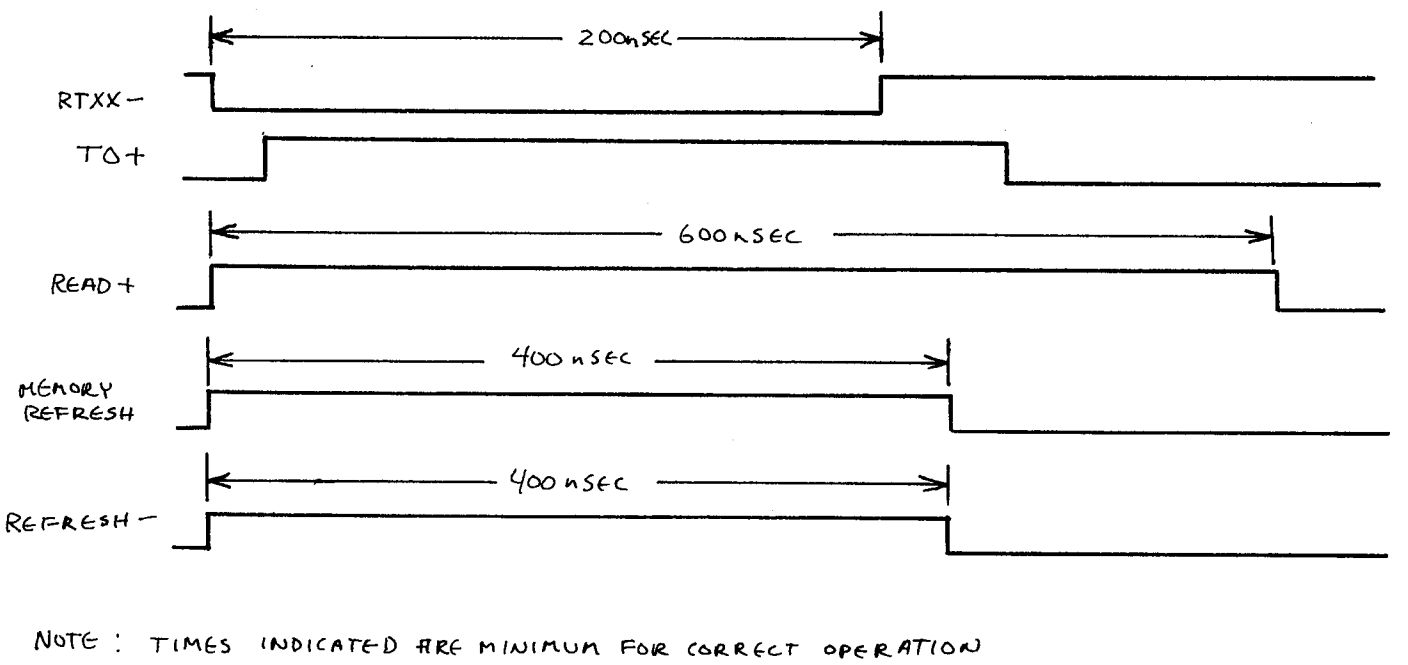


Figure 3-3. Memory Refresh Cycle Timing Diagram

Main Memory is connected to the CPU, Disc Controller, and MTCD Controller by a memory data bus, two (2) memory address busses, and timing and control signals (see Figure 3-2). It is on these busses that the information is transferred to/from Main Memory to the rest of the system in a DMA.

The first 24k words of Main Memory are dedicated to the storage of the BASIC Operating System Software (BOSS). Another 8k of Main Memory is dedicated to the storage of the Compiler/Lister *. The remaining memory is assigned to user task storage.

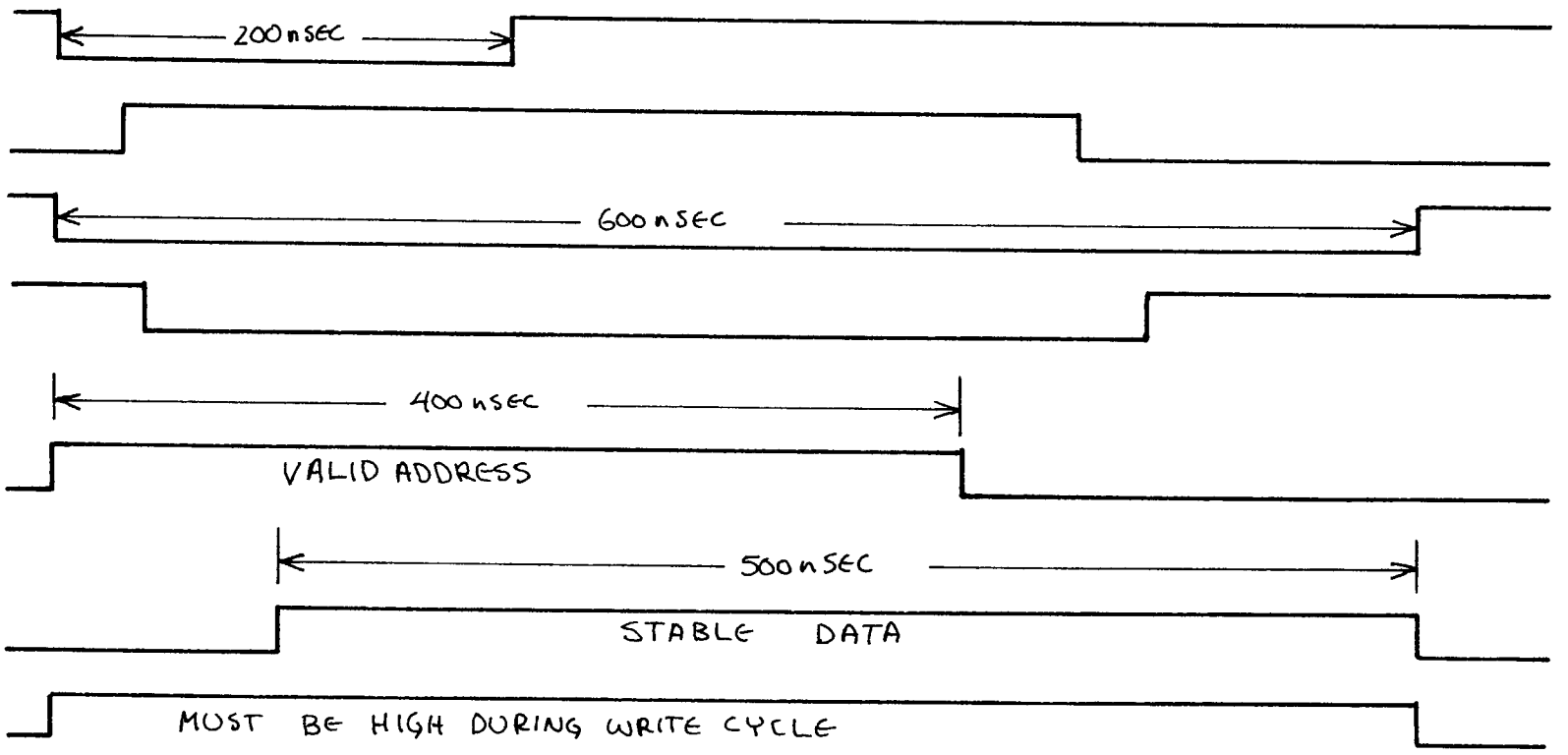
The Main Memory consists of two (2) PCBs. Each PCB stores either 8k, 16k, 32k, or 64k words (or bytes). The minimum memory requirement for the System 200 is 32k; System 410 is 40k. Maximum Main Memory size is therefore, 96k. The function of the address bits for a 64k main memory (2 - 32k modules) is shown in Table 3-1.

The required signals and their time relationships to perform memory write cycles and memory read cycles respectively, are shown in Figures 3-4 and 3-5.

TABLE 3-1. 64K MAIN MEMORY (2 - 32K MEMORY PCB'S) ADDRESS BIT FUNCTIONS

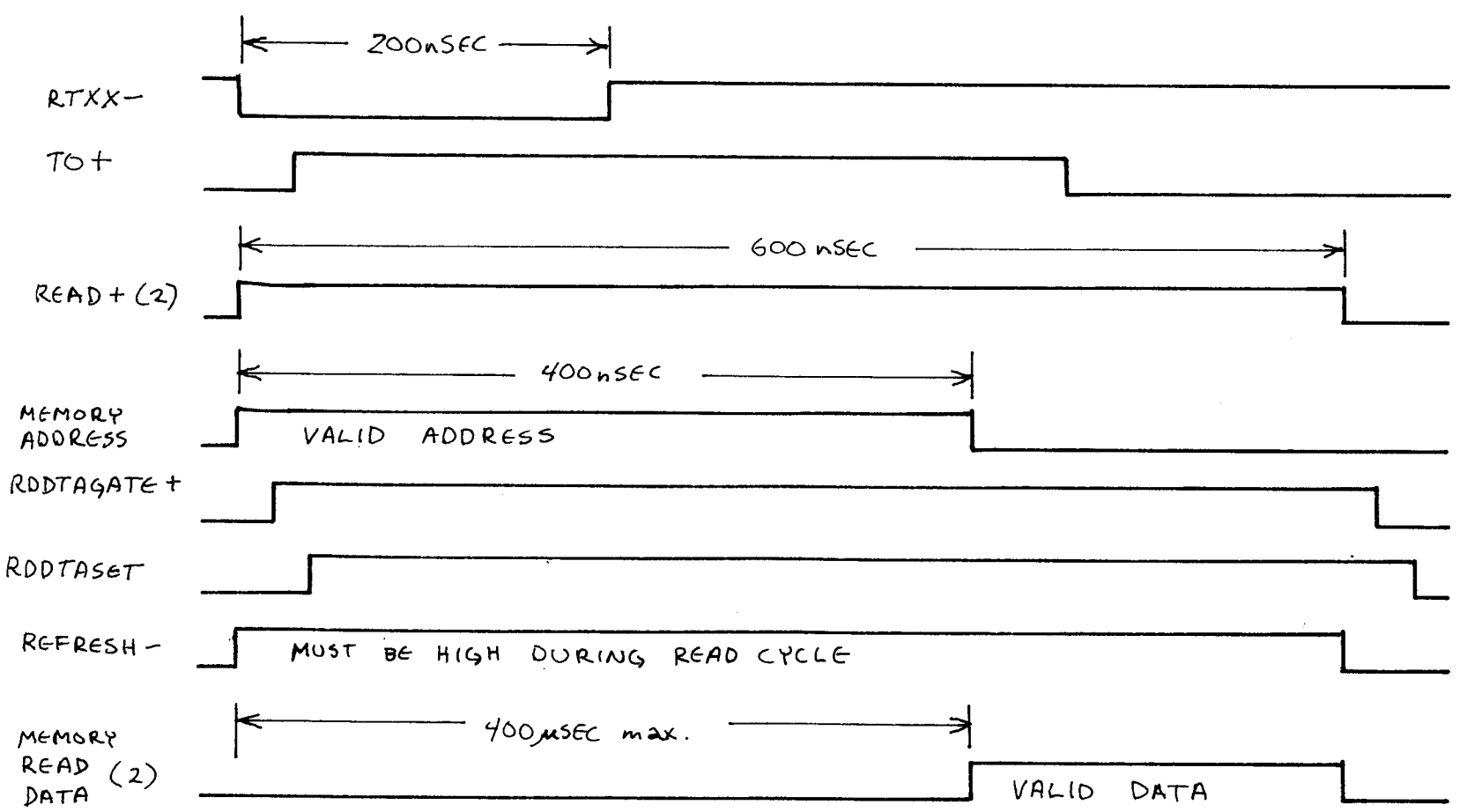
<table>
<tr><th>Address Bit</th><th colspan="2">Function</th></tr>
<tr><td>MAØ</td><td rowspan="6">Chip Row Select</td><td rowspan="12">Select Memory Location Within Chip (4096 Locations)</td></tr>
<tr><td>MA1</td></tr>
<tr><td>MA2</td></tr>
<tr><td>MA3</td></tr>
<tr><td>MA4</td></tr>
<tr><td>MA5</td></tr>
<tr><td>MA6</td><td rowspan="6">Chip Column Select</td></tr>
<tr><td>MA7</td></tr>
<tr><td>MA8</td></tr>
<tr><td>MA9</td></tr>
<tr><td>MA10</td></tr>
<tr><td>MA11</td></tr>
<tr><td>MA12</td><td colspan="2" rowspan="3">Select Bank of 9 Chips (8 Banks)</td></tr>
<tr><td>MA13</td></tr>
<tr><td>MA14</td></tr>
<tr><td>MA15</td><td colspan="2">Select Memory Module (2 Modules)</td></tr>
<tr><td>MA16</td><td colspan="2" rowspan="2">Not Used</td></tr>
<tr><td>MA17</td></tr>
</table>

*Some System 200s do not contain the Compiler/Lister program.



NOTE: TIMES INDICATED ARE MINIMUM FOR CORRECT OPERATION.

Figure 3-4. Memory Write Cycle Timing Diagram



NOTES: (1) UNLESS SPECIFIED, TIMES INDICATED ARE MINIMUM FOR CORRECT OPERATION.

(2) IF READ + IS LONGER, DATA WILL BE VALID LONGER.

Figure 3-5. Memory Read Cycle Timing Diagram

3.2.3 DISC DRIVE CONTROLLER

The Disc Drive Controller (see Figure 3-2) provides the interface required to pass information between the CPU and the Disc Drive. The Disc Drive Controller provides the following functions.

- Translate I/O commands issued by the CPU into commands that the Disc Drive can recognize.
- Perform error checking of information passed between the Disc Drive and the CPU.
- Detect particular conditions and issue interrupt commands to the CPU.
- Provide Controller and Disc Drive status information to the CPU.
- Implement DMA transfer between the Disc Drive and the Main Memory.
- Synchronize timing of information transfer.

The Disc Drive Controller consists of a microprocessor system (2901) that, via a resident firmware program, and additional logic circuits, performs the above functions. The microprocessor initiates, tests, and controls the entire operation of the Controller as specified by its firmware and CPU commands.

The Disc Drive Controller can recognize and perform the following I/O commands, as sent by the CPU:

1. DMA Transfer
2. Special Transfer
3. Set Lower Cylinder
4. Set Alternate Lower Cylinder
5. Set Upper Cylinder
6. Set Alternate Upper Cylinder
7. Set Head
8. Set Offsets
9. Set Interrupt Mask Bit
10. Reset Interrupt Mask

11. Reset Controller

12. Input Status (to CPU)

13. Input Alternate Lower Cylinder (to CPU)

14. Input Alternate Upper Cylinder (to CPU)

15. No operation

The operation of the Disc Drive Controller is best described by a flowchart of the Disc Drive Controller's firmware program (see Figure 3-6). The program is structured such that particular conditions are tested and, depending on the results of the test(s), a specified sequence of instructions (or routine) is executed to perform the specified function.

3.2.4 MAGNETIC TAPE CARTRIDGE CONTROLLER

The Magnetic Tape Cartridge Controller provides the interface required to pass information between the CPU and the Magnetic Tape Cartridge Drive (MTCD) (see Figure 3-2). The MTCD provides the following functions.

- Decode commands sent by the CPU.
- Tape start/stop timing.
- Tape record formatting.
- Tape positioning.
- Status reporting and interrupt control.
- DMA transfer.

The Magnetic Tape Cartridge Controller consists of a microprocessor system (Z80) that, via a resident firmware program, and additional logic circuits, performs the above functions. The microprocessor initiates, tests, and controls the entire operation of the Controller as specified by its firmware and CPU commands. CPU commands are sent to the Magnetic Tape Cartridge Controller via the I/O channel. Once received by the Magnetic Tape Cartridge Controller, the CPU command is decoded and, depending on the command, a specific firmware routine is executed.

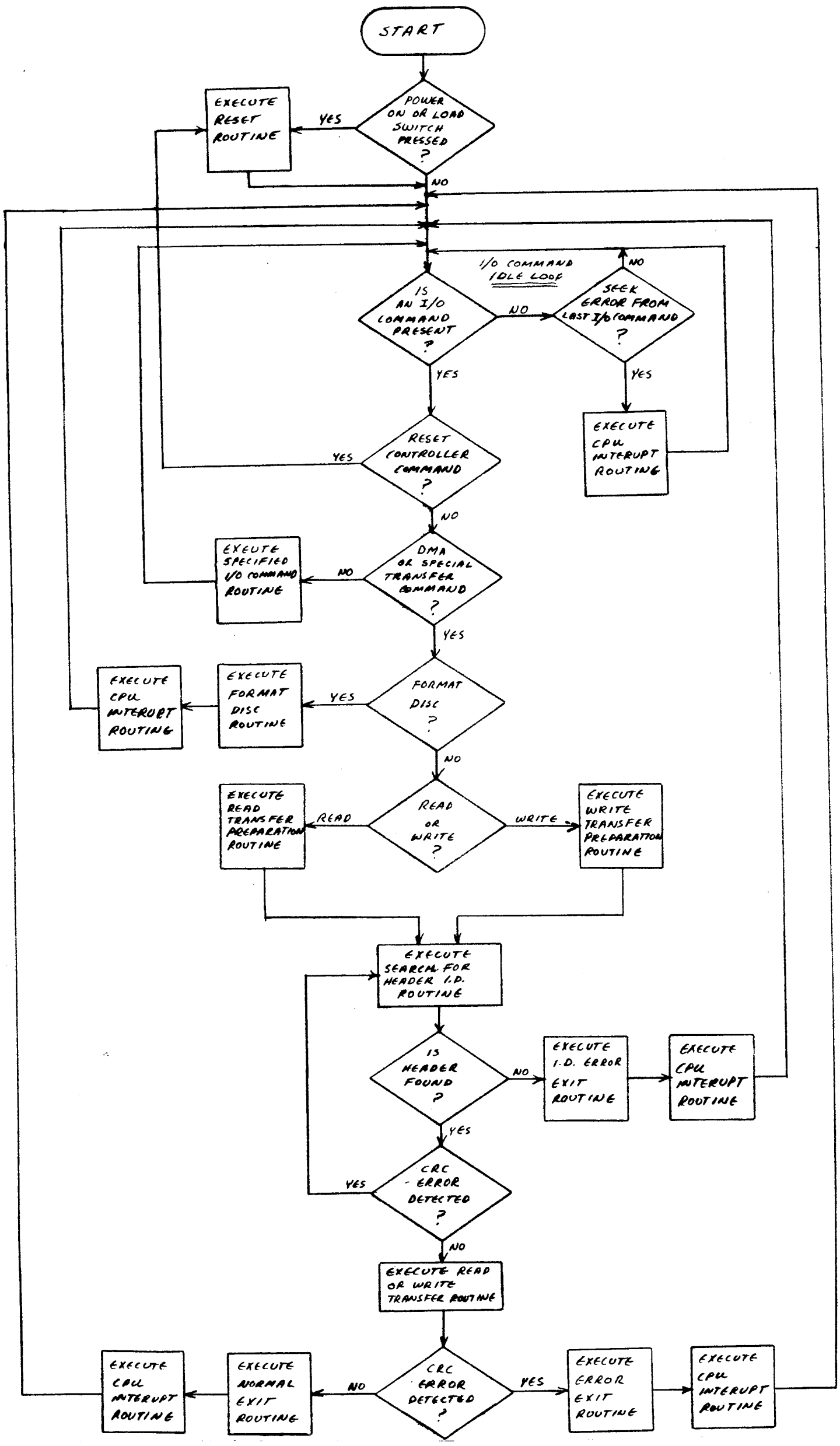


Figure 3-6. Simplified Firmware Flowchart, Disc Drive Controller

The MTCD Controller can recognize the following I/O commands as sent by the CPU.

Input
- Inputs Command Byte
- Inputs Interrupt Mask
- Sets CRC Enable FF
- Inputs DMA Data Byte
- Inputs MTU Data Byte
- Inputs MTU Status Byte
- DMA Data w/o Request
- Outputs Test Strobe

Output
- Loads Status Bus
- Loads LSH DMA Address
- Loads MSM DMA Address
- Sends Data Byte to CPU
- Send Data Byte to MTU
- Sends Interrupt Request to CPU
- DMA Bank Select
- Sends Data to MTU w/o Wait

Output
- DMA Write/Read
- CRC Enable
- Last Latch
- Init Latch
- Select Unit LSB
- Select Unit MSB
- Track Select LSB
- Track Select MSB
- Select Gate
- Rewind
- Reverse
- Forward
- High Speed
- Write Heads Enable
- Write Data Enable
- Test Latch
- Reset Z80 Interrupt

The MTCD Controller may access memory directly (both read and write), bypassing the CPU. DMA is accomplished via the DMA channel.

3.2.5 ACCESSORY PCB

The Accessory PCB, located adjacent to the CPU PCB in the Processor card cage, contains the following circuits.

- Two serial I/O ports
- Timing and control for memory refresh
- Real Time Clock
- Power Fail Logic
- Control (micro-code) ROM for CPU

The Accessory PCB is connected to the I/O Channel to allow data communication between the CPU and the VDT(s) and/or serial Printer (see Figure 3-2). The Accessory PCB and CPU are connected together by a short 50 wire ribbon cable. It is through this cable that the CPU gains access to the micro-instruction control ROM located on the Accessory PCB.

3.2.6. BUS STRUCTURE

A bus, for the purposes of this discussion, is a set of wires used as a path over which information is transmitted from any of several sources to any of several destinations. Each bus is shared by several devices, with the CPU as one end point (see Figure 3-2). The following paragraphs describe the function and basic operation of the CPU busses.

3.2.6.1 Input/Output Channel Busses

The Input/Output (I/O) Channel consists of three (3) physically independent busses that work in conjunction with one another to provide data communications between the CPU and the peripheral Controllers (see Figure 3-2). The Output Data Bus (OD00-OD07) is an 8-bit uni-directional, and, as its name implies, carries information sent from the CPU to the peripheral Controllers. The Input Data Bus (ID00-ID07) is also 8-bit uni-directional, and, carries information sent from the peripheral Controllers to the CPU. The control bus (IO1X-, IO2X-, IO3X-) is a 3-bit uni-directional bus that carries information sent from the CPU (I/O control register) to all peripheral Controllers. The bit pattern that appears on the control bus specifies, to the selected peripheral Controller, what action is to be taken on the Input and Output Data busses (refer to Table 3-2).

Initiation of data transfer in either direction requires two-steps. First, a control byte is placed on the output bus. This control byte specifies the device address of the Controller to be communicated with (bits 0-4) and the nature of the byte to be transferred (bits 5-7). Each controller interprets bits 5 thru 7 differently. Second, a command is placed on the control bus to define the data transfer. Table 3-2 shows how the number present on the three (3) control bus lines is decoded by the Controllers.

TABLE 3-2. CONTROL BUS COMMANDS

Number	I/O Activity	Decoded Signal on Controller
0	Reset Control States	-----
1	Control Output	COXX-
2	Data Output	DOXX-
3	Not Used	-----
4	Block Acknowledge	BACK-
5	Interrupt Acknowledge	IACK-
6	Data Input	DIXX-
7	Not Used	-----

Three (3) types of information is sent by the CPU to the Controllers on the Output Data bus:

- CPU to Controller commands
- Program-controlled transfers (character-at-a-time data)
- Block-of-character transfers (some controllers are not capable of block-of-character transfers)

Two (2) types of information is sent to the CPU by the Controller on the Input Data bus:

- Controller status
- Answer bytes (in response to a CPU command)
- Block-of-character transfers (some controllers are not capable of block-of-character transfers)

The required signals and their time relationship to perform character I/O transfer and block-of-character I/O transfer, respectively, are shown in Figures 3-7 and 3-8.

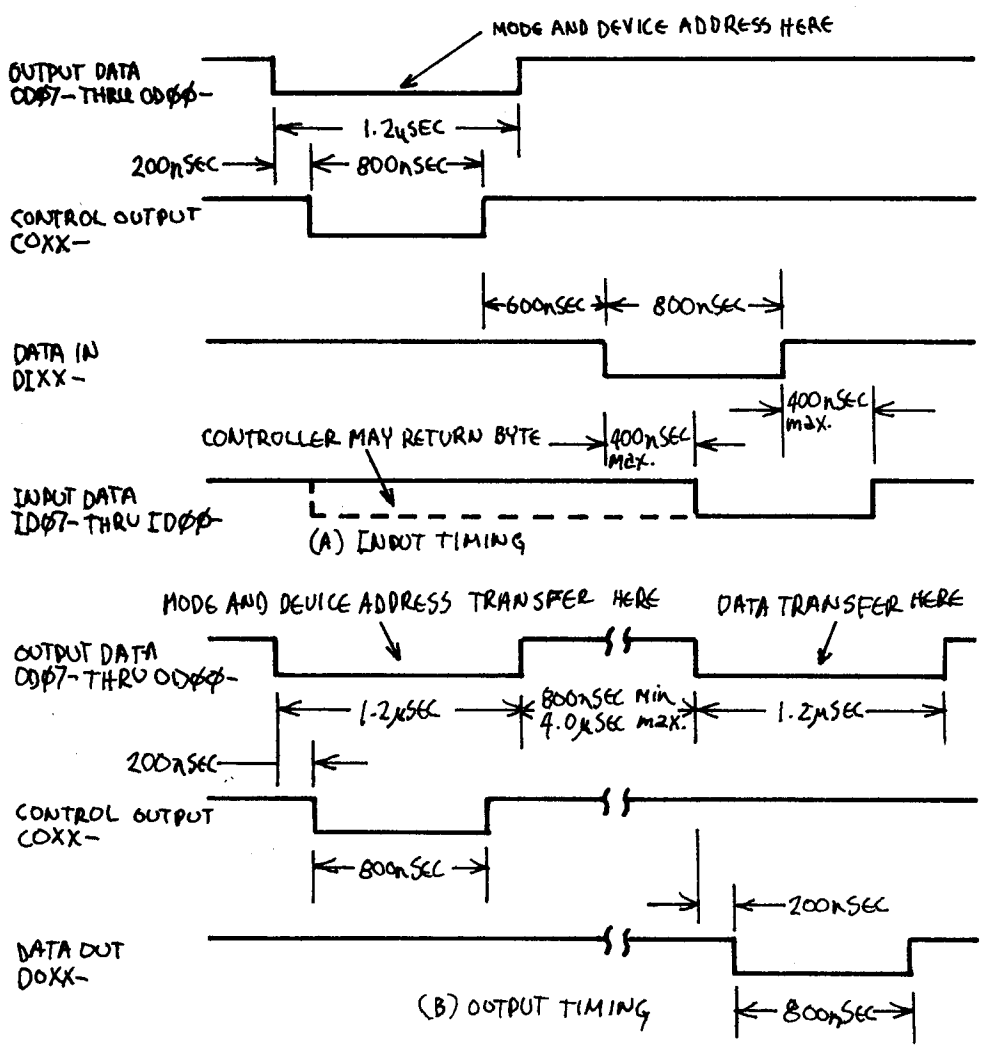


Figure 3-7. I/O Character Data Transfer Timing Diagram

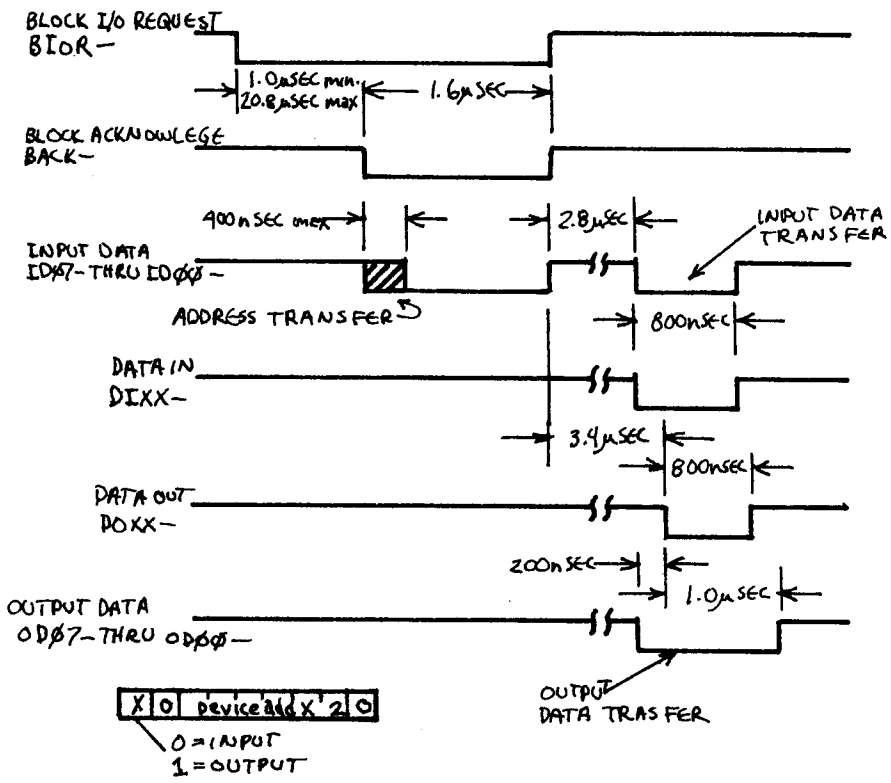


Figure 3-8. Block-of-Character I/O Timing Diagram

3.2.6.2 Direct Memory Access (DMA) Channel Busses

The DMA channel consists of two (2) physically independent busses that work in conjunction with one another to provide DMA to the CPU, Disc Drive Controller, and MTCD Controller (see Figure 3-2). DMA is a means of directly transferring data between the Disc Drive, MTCD, or CPU and Main Memory.

The memory data bus is 8-bit bi-directional, and provides the path for data transferred between Main Memory and the Disc Drive Controller, MTCD Controller, and CPU. The memory address bus is 16-bit uni-directional, and provides the path for memory address information sent from the Disc Drive Controller, MTCD Controller, and CPU to the Main Memory. Timing and control signals are sent on a set of lines that interconnect Main Memory, CPU, Disc Drive, and MTCD Controllers.

3.3 SOFTWARE

A discussion of the System 200/410 is not complete without an examination of the computer software structure. Software (or program) is the instructions which dictate the exact course of action the computer will take under a particular set of circumstances.

The System 200/410 utilizes three different software languages, all of which are sub-sets of one another as shown in Figure 3-9. The relationship between these three (3) levels of software is analogous to the structure of a sentence; the letters are the micro-instructions, the words are the machine level (macro) instructions, and the sentence is the BASIC instruction.

As previously discussed (refer to Section 3.2.1), the CPU recognizes only the machine level (macro) instructions which it decodes, and then in turn, executes a specified series of micro-instructions to perform a given task. Therefore, in order to run a BASIC program, it is necessary that each BASIC instruction be broken down (or compiled) into a functionally equivalent series of machine level (macro) instructions.

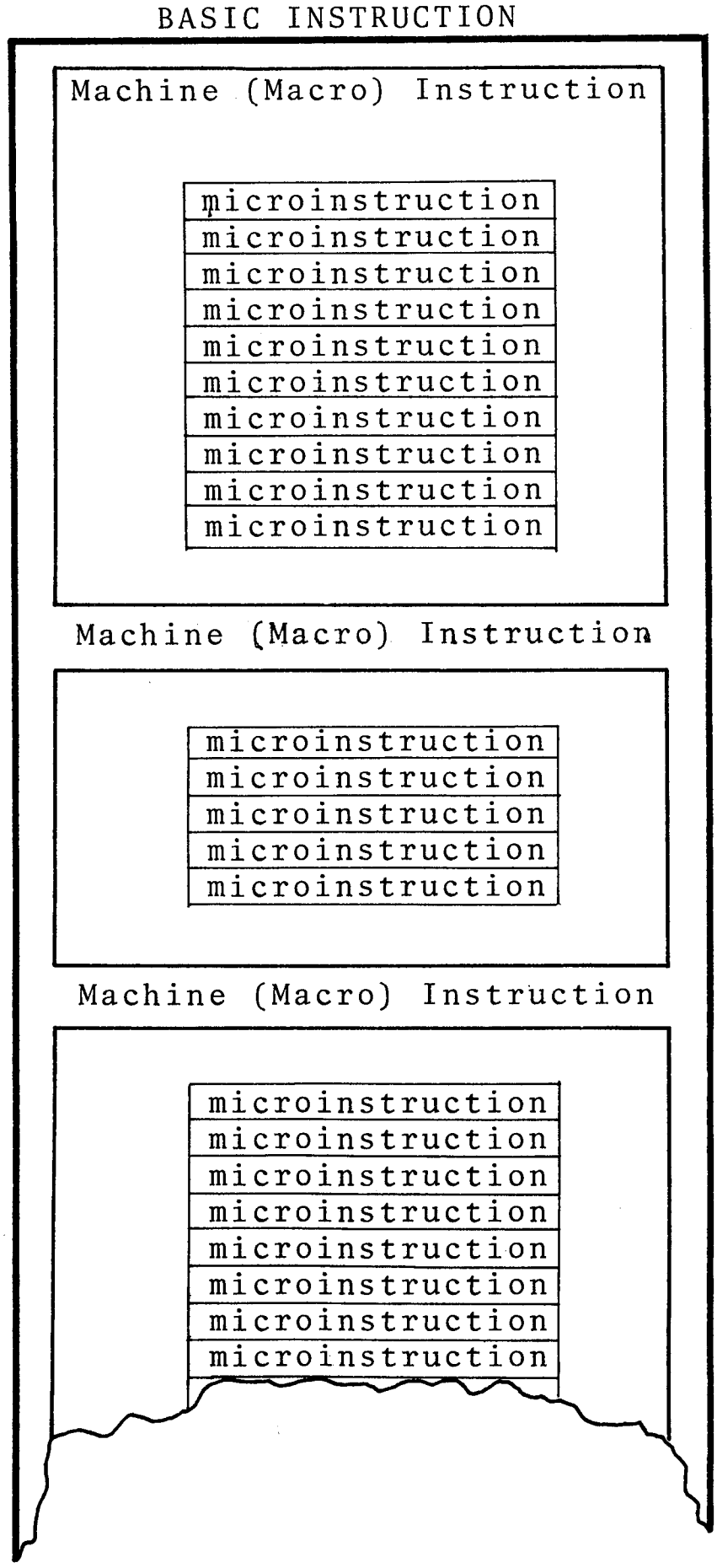


Figure 3-9. Software Language Relationship

Many of the internal functions of the System 200/410 are managed by a program called the Operating System. The Operating System performs the following functions.

- Execution Scheduling
- Peripheral Device Allocation and Control
- File Management
- Disc Control
- Error Management
- Job Control and Memory Management

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CHAPTER 4

MAINTENANCE

4.0 INTRODUCTION

This chapter contains information required to perform the recommended preventive maintenance procedures, adjustments, and to aid the Service Representative in corrective maintenance of the System 200/410.

4.1 PREVENTIVE MAINTENANCE

Preventive maintenance consists of performing the recommended inspection, cleaning, lubrication, adjustments, etc., at regular intervals to prevent equipment failure. Due to the electronic nature of the equipment, preventive maintenance tasks consume little of the Service Representative's time and are well worth the effort in terms of increasing equipment reliability. System 200/410 preventive maintenance is summarized in Table 4-1.

TABLE 4-1. PREVENTIVE MAINTENACE SUMMARY

Equipment	Frequency	Action	Reference
Processor	2 months*	Verify/Adjust power supply voltages, clean dust	This manual 2.3.5
Disc Drive	2 months*	Verify/Adjust power supply voltages, inspect belt, clean dust	2400 Service Manual
MTCD	2 months*	Verify/Adjust P.S., clean head and capstan, clean dust	6400 Service Manual
Printer	2 months*	Inspect/Adjust tractor belts, lube lead screw and carriage guide rods, clean chaf and dust	3200 Service Manual
VDT	2 months*	Verify/Adjust P.S., clean dust	VDT Service Manual

*2 months is nominal, Frequent/Infrequent use and mild/harsh environmental conditions require P.M. at shorter/longer intervals

4.2 CORRECTIVE MAINTENANCE

Corrective maintenance consists of rectifying unexpected equipment failures. This section is designed to provide a logical troubleshooting approach, and to aid in isolating a problem to a specific peripheral, at which time the Service Manual for that peripheral should be referenced to obtain procedures/flowcharts to further isolate the problem to a specific module or assembly.

4.2.1 SPECIAL TOOLS AND TEST EQUIPMENT

Maintenance procedures contained in this document require no special tools or test equipment.

4.2.2 TROUBLESHOOTING PROCEDURE

The procedures listed below are intended to provide a directed approach toward troubleshooting the System 200/410, thus reducing overall maintenance time.

When troubleshooting the system, it is suggested that the following steps be performed.

1. Get an accurate description of the problem from the operator or other responsible person, then verify the problem.

2. Perform the System Power-Up check (refer to Section 2.3.4) as a secondary verification of the suspected problem, or as confirmation, that basic system functions are in order.

3. If the problem is of an intermittent nature, run applicable diagnostic(s) in an effort to induce the problem on a controlled basis.

4. Perform a visual inspection and verify that all cabling is connected properly and all connectors and printed circuit boards are seated properly.

5. Check the AC line as a possible cause of problems, e.g., sharp drops in voltage, transients, and poor grounds are common problems. Also check DC voltage levels in suspected equipment.

6. If possible, disconnect the suspected peripheral from the system and operate it off-line to isolate the problem or to confirm proper operation.

7. Effective troubleshooting, in all situations, can be accomplished from a good working knowledge of the equipment's Theory of Operation. Reference the Service Manual's Functional Description section to help gain an understanding of circuit functions and their locations within the equipment.

8. When replacing a printed circuit board appears to solve the problem, reinstall the suspected PCB to verify the problem returns and was not caused by bad contacts or poor seating.

9. After it appears that the suspected problem has been solved, perform applicable diagnostic programs before placing the system back in its normal operation.

4.2.3 DIAGNOSTIC TESTS

The following paragraphs list the recommended diagnostic programs, functions, and implementation.

4.2.3.1 CPU and VDT Boot Checker Diagnostic

This is a short machine language routine entered manually at the keyboard to check that the basic communication functions between the VDT, CPU and memory are operational. This program should be used as a fault isolation tool when the machine level (refer to Section 4.2.3.2) and BASS (refer to Section 4.2.3.3) diagnostics cannot be run. Perform the CPU and VDT boot checker diagnostic as follows:

1. On VDT #0, set mode switch (rear Panel) to half (H) duplex.
2. Set CPU sense switches for VDT bootstrap load (see Figure 2-12).
3. Press VDT CLEAR key.
4. Press and release Processor LOAD switch.
5. Type in the following hexadecimal numbers:

   02000487FFBFEFAF48390097D000491AFD1FF500

6. Press VDT motor bar IV.
7. Type the following hexadecimal numbers: 0200, then press motor bar IV.
8. The VDT will display: "0123456789:; = ?" indicating the diagnostic ran sucessfully.

4.2.3.2 Machine Language Diagnostics

CPU Diagnostic (:CPU)

This diagnostic checks that the CPU and its firmware operate properly by performing each of the machine language instructions and verifying that the instruction(s) was performed correctly.

In general, the program is self explanatory. The Service Representative will be prompted to perform the required tasks. Run :CPU as follows:

1. Set CPU sense switches for Fixed Media Disc Alternate Load (see Figure 2-12).
2. Set VDT mode switch (rear panel) to full (F) duplex.
3. Press and release Processor Load switch.
4. The VDT will display the proprietary notice, then:

   BASS INITIALIZATION

   MAKE ENTRY OVERRIDE DEFAULT

5. Within 10 seconds, the operator will press the "CR" (carriage return) key on the VDT.
6. The operator will type ":CPU" then press the "CR" (carriage return) key in response to "ENTER PROGRAM NAME".
7. The operator will be asked to "DEPRESS CONSOLE INTERRUPT" to enable various test functions within the diagnostic. To enable a particular test function, the operator must press the Processor Front Panel CLEAR switch within 10 seconds after the question is displayed. To disable a particular test function, take no action.

Memory Diagnostic (:MEM 16)

This diagnostic checks that the memory PCB's are functioning properly by writing known data patterns into all memory locations, and then reading the memory locations and comparing the results with the known data patterns.

No operator intervention is required other than turning power off and on as prompted by the diagnostic. Run :MEM 16 as follows:

1. Set CPU sense switches for Fixed Media Disc Alternate Load (see Figure 2-12).
2. Set VDT mode switch (rear panel) to full (F) duplex.
3. Press and release Processor Load switch.
4. The VDT will display the Proprietary Notice:

   BASS INITIALIZATION

   MAKE ENTRY TO OVERRIDE DEFAULT

5. Within 10 seconds, the operator will press "CR" (carriage return) key.

6. The operator will type ":MEM 16" then press "CR" (carriage return) key in response to "ENTER PROGRAM NAME".

4.2.3.3 Basic All Purpose Service System (BASS) Diagnostics

It is recommended that the BASS diagnostics listed in Table 4-2 be run at the time of system installation to verify proper operation of the peripherals.

TABLE 4-2. RECOMMENDED BASS DIAGNOSTICS

Name	Description
% M11	Tape Cartridge Drive Exerciser
% M12	Read Only Functional Verification Test
% D21	Long/Short Disc Seek Test
% D22	Disc Scan/Restore Test
% D23	Disc/DMA Write Verfication Test
% D24	Direct File Disc Exerciser
% P01	Printer Quality Test
% P02	Printer Ripple Test
% P06	Printer Function - Burn In Test
% P07	Printer Function Test
% V01	Keyboard Echo Test - Single VDT
% V02	Control Interaction Test - Single VDT
% V03	Terminal Exerciser - Multiple VDT
% V04	VDT Scrolling Test - Multiple VDT
% V05	VDT Print @ Test - Multiple VDT
% V06	VDT Control Function Test - Multiple VDT

All BASS diagnostics, except % M11 and % M12 (Tape Cartridge Diagnostics), are selected as follows:

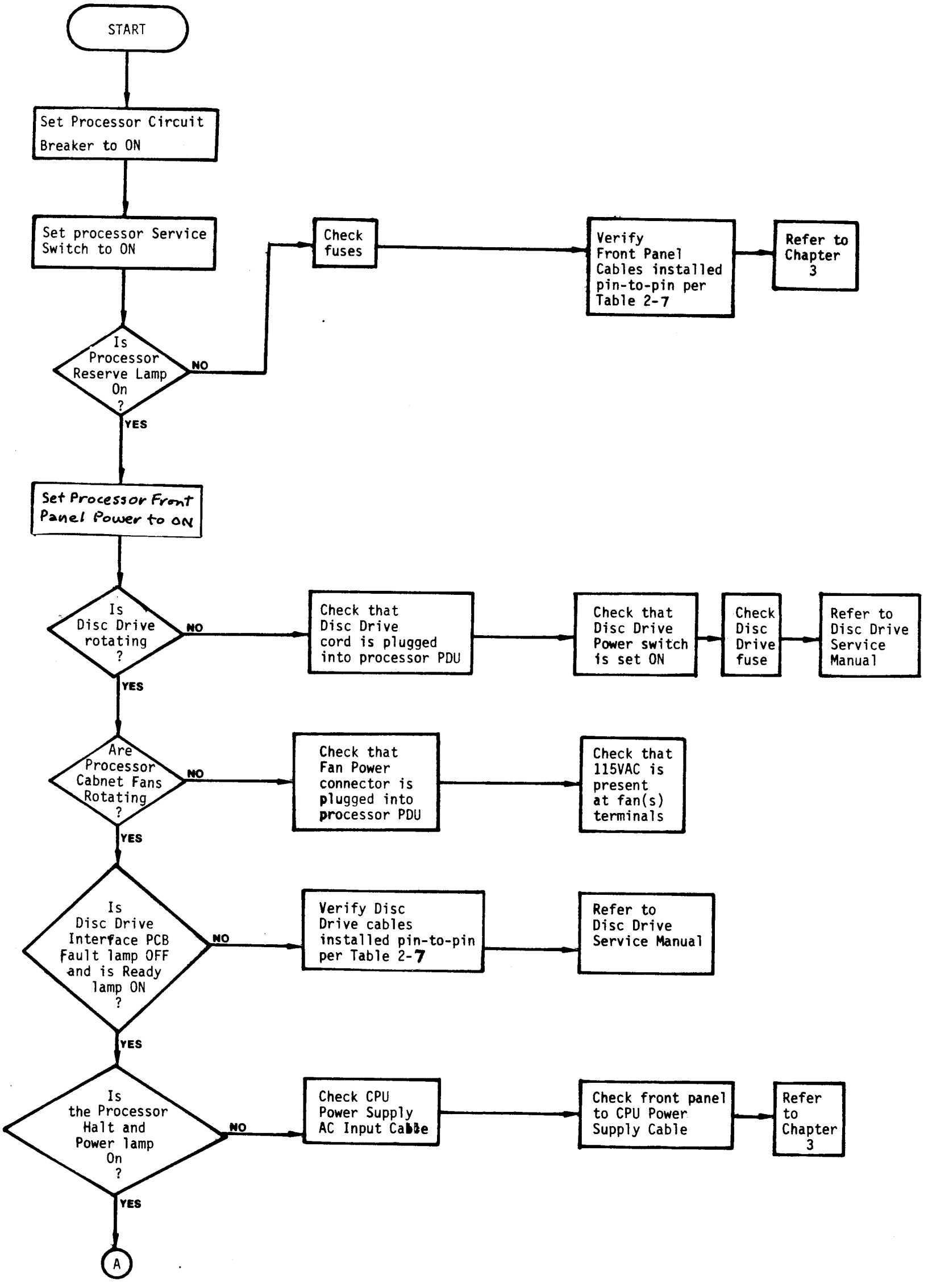
1. Set CPU sense switches for Fixed Media Disc System Load (see Figure 2-12).
2. Press and release Processor Load switch.
3. Type "N" in response to "DO YOU WANT SPOOLING?"
4. Type "RUN BASS" in response to "READY".
5. Enter date and time as requested.
6. Select B/4 SERVICE SYSTEM.
7. Select the BASS programs listed in Table 4-2, except % M11 and % M12.
8. Enable and reset error file as requested by diagnostic. At the completion of all selected BASS diagnostics, the error file will be displayed.

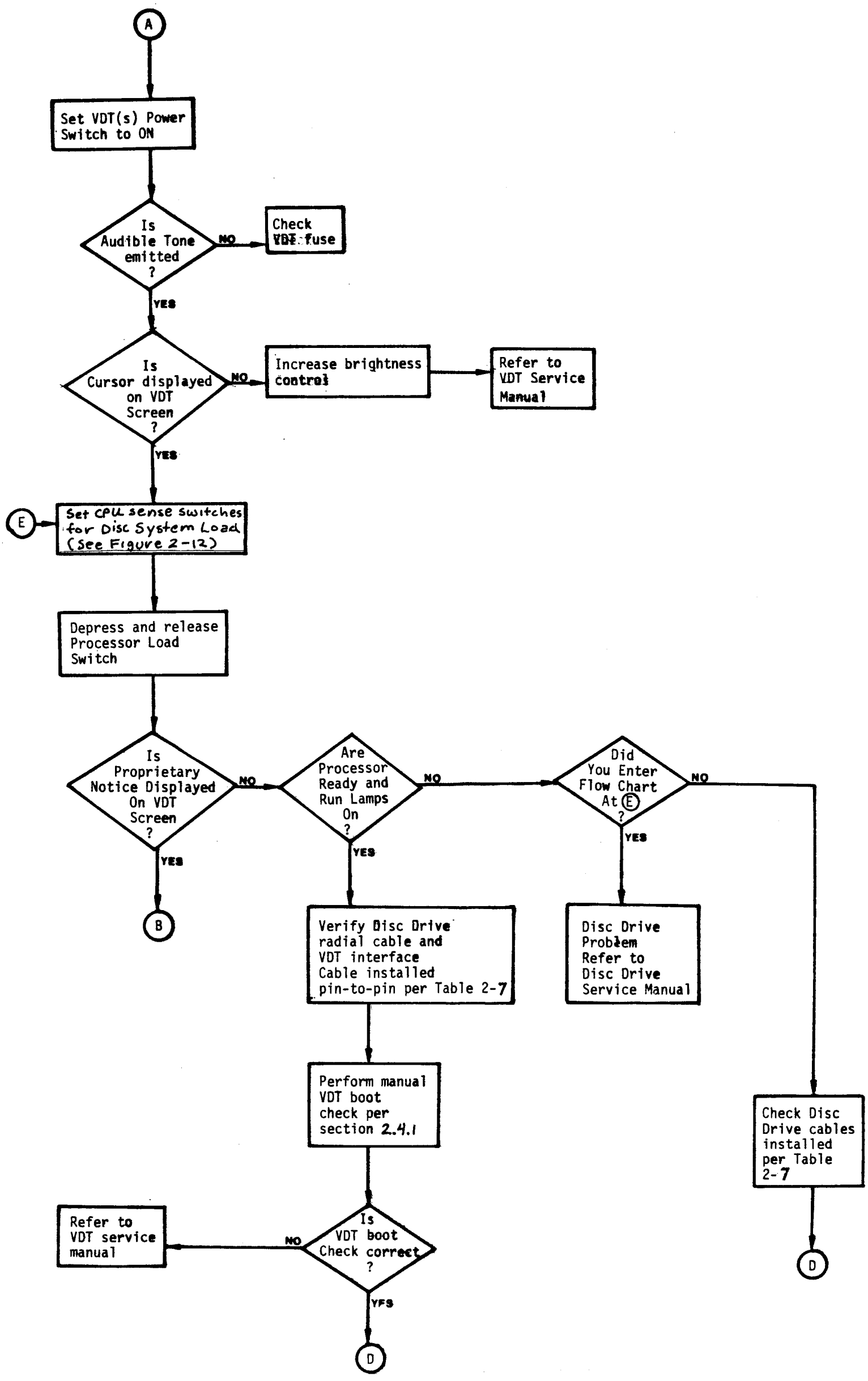
Tape Cartridge diagnostics % M11 and % M12 are selected as follows:

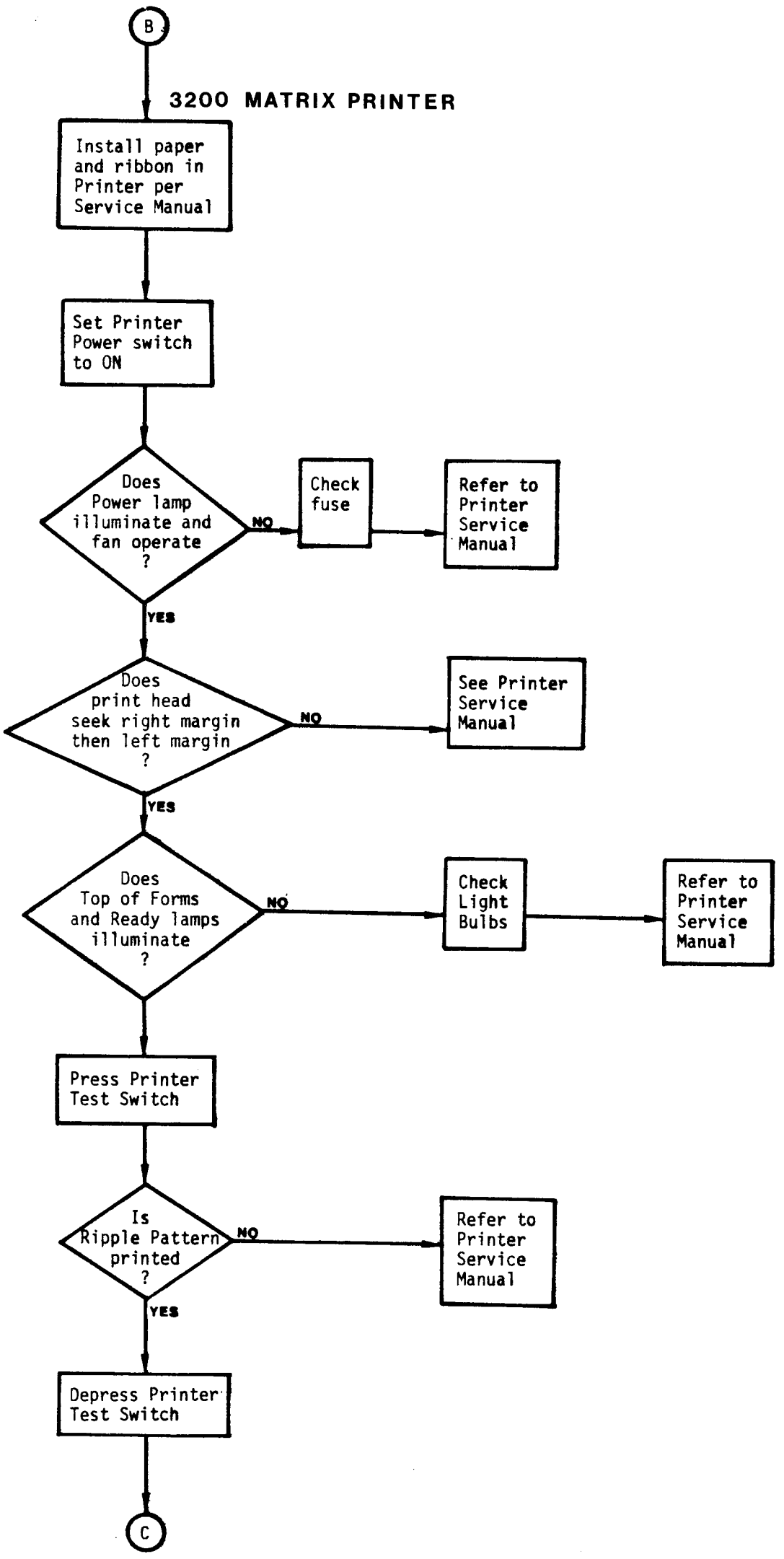
1. Set CPU sense switches for Fixed Media Disc Alternate Load (see Figure 2-12).
2. Insert scratch tape media into tape drive.
3. Press and release Processor LOAD switch.
4. The VDT will display "MAKE ENTRY TO OVERRIDE DEFAULT", within 10 seconds press the VDT space bar.
5. Type "BB11TC" followed by "CR" (carriage return) key in response to "ENTER PROGRAM NAME".
6. Type "BASS" in response to "ENTER PROGRAM NAME (*MTC or BASS)".
7. Enter the date and time as requested.
8. Select B/4 SERVICE SYSTEM.
9. Select % M11 and/or % M12.
10. Enable and reset error file as requested by diagnostic. At the completion of the diagnostic(s), the error file will be displayed.

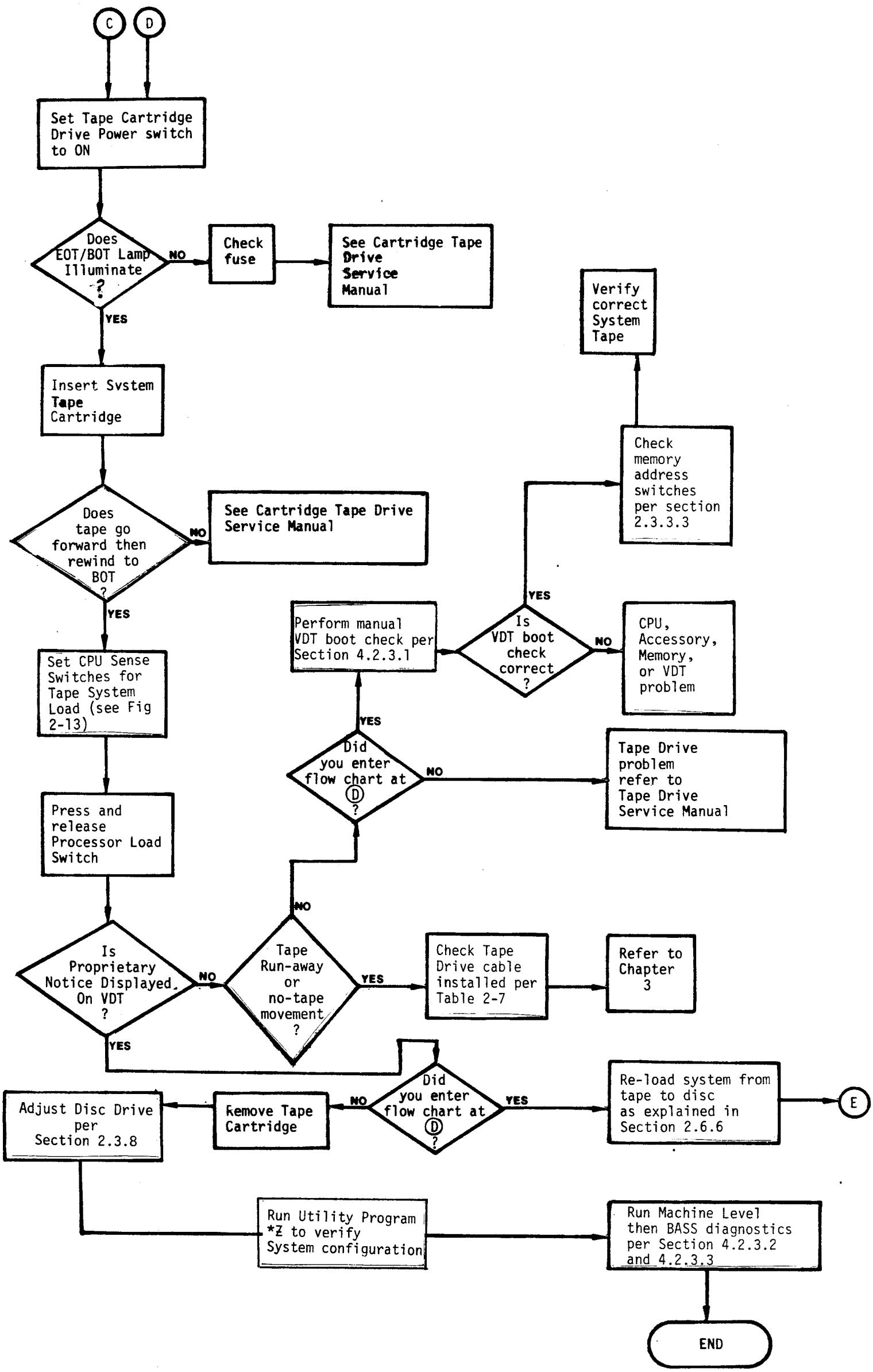
4.2.3.4 System Power-Up Check

The following flowchart presents a logical approach to verifying that the system is operating properly and identifying common equipment problems.


START
Set Processor Circuit Breaker to ON
Set processor Service Switch to ON
Check fuses
Verify Front Panel Cables installed pin-to-pin per Table 2-7
Refer to Chapter 3
Is Processor Reserve Lamp On ?
NO
YES
Set Processor Front Panel Power to ON
Is Disc Drive rotating ?
NO
Check that Disc Drive cord is plugged into processor PDU
Check that Disc Drive Power switch is set ON
Check Disc Drive fuse
Refer to Disc Drive Service Manual
YES
Are Processor Cabnet Fans Rotating ?
NO
Check that Fan Power connector is plugged into processor PDU
Check that 115VAC is present at fan(s) terminals
YES
Is Disc Drive Interface PCB Fault lamp OFF and is Ready lamp ON ?
NO
Verify Disc Drive cables installed pin-to-pin per Table 2-7
Refer to Disc Drive Service Manual
YES
Is the Processor Halt and Power lamp On ?
NO
Check CPU Power Supply AC Input Cable
Check front panel to CPU Power Supply Cable
Refer to Chapter 3
YES
A


A
Set VDT(s) Power Switch to ON
Is Audible Tone emitted ?
NO
Check VDT fuse
YES
Is Cursor displayed on VDT Screen ?
NO
Increase brightness control
Refer to VDT Service Manual
YES
E
Set CPU sense switches for Disc System Load (See Figure 2-12)
Depress and release Processor Load Switch
Is Proprietary Notice Displayed On VDT Screen ?
NO
Are Processor Ready and Run Lamps On ?
NO
Did You Enter Flow Chart At E ?
NO
YES
YES
YES
B
Verify Disc Drive radial cable and VDT interface Cable installed pin-to-pin per Table 2-7
Disc Drive Problem Refer to Disc Drive Service Manual
Perform manual VDT boot check per section 2.4.1
Check Disc Drive cables installed per Table 2-7
Refer to VDT service manual
NO
Is VDT boot Check correct ?
YES
D
D


B
3200 MATRIX PRINTER
Install paper and ribbon in Printer per Service Manual
Set Printer Power switch to ON
Does Power lamp illuminate and fan operate ?
NO
Check fuse
Refer to Printer Service Manual
YES
Does print head seek right margin then left margin ?
NO
See Printer Service Manual
YES
Does Top of Forms and Ready lamps illuminate ?
NO
Check Light Bulbs
Refer to Printer Service Manual
Press Printer Test Switch
Is Ripple Pattern printed ?
NO
Refer to Printer Service Manual
YES
Depress Printer Test Switch
C


C
D
Set Tape Cartridge Drive Power switch to ON
Does EOT/BOT Lamp Illuminate ?
NO
Check fuse
See Cartridge Tape Drive Service Manual
YES
Insert Svstem Tape Cartridge
Does tape go forward then rewind to BOT ?
NO
See Cartridge Tape Drive Service Manual
YES
Set CPU Sense Switches for Tape System Load (see Fig 2-13)
Press and release Processor Load Switch
Is Proprietary Notice Displayed On VDT ?
NO
YES
Tape Run-away or no-tape movement ?
NO
YES
Check Tape Drive cable installed per Table 2-7
Refer to Chapter 3
Perform manual VDT boot check per Section 4.2.3.1
YES
Did you enter flow chart at (D) ?
NO
Tape Drive problem refer to Tape Drive Service Manual
Is VDT boot check correct ?
NO
CPU, Accessory, Memory, or VDT problem
YES
Check memory address switches per section 2.3.3.3
Verify correct System Tape
Did you enter flow chart at (D) ?
NO
YES
Remove Tape Cartridge
Adjust Disc Drive per Section 2.3.8
Re-load system from tape to disc as explained in Section 2.6.6
E
Run Utility Program *Z to verify System configuration
Run Machine Level then BASS diagnostics per Section 4.2.3.2 and 4.2.3.3
END

CHAPTER 5

REMOVAL/REPLACEMENT PROCEDURES

5.0 INTRODUCTION

This chapter contains information and procedures to aid in the removal/replacement of the System 200/410 Processor/Disc Drive Cabinet assemblies/sub-assemblies. Also, contained in this chapter is a listing of spared parts for the Model 1340/1345 Processor. Removal/replacement procedures for peripheral sub-assemblies can be found in the respective peripheral Service Manual.

5.1 MODEL 2400 DISC DRIVE

The following is the recommended procedure to remove/replace the entire Model 2400 Disc Drive unit mounted in the System 200/410 Processor/Disc Drive Cabinet (see Figures 2-4 and 2-8).

5.1.1 REMOVAL/REPLACEMENT

1. Set Processor front panel POWER switch to OFF.
2. Set Processor SERVICE switch to OFF.
3. Set Processor CIRCUIT BREAKER to OFF.
4. Unplug Processor ac line cord from wall.
5. Unplug Disc Drive ac line cord from Processor Power Distribution Unit (PDU).
6. Remove Processor/Disc Drive Cabinet top, rear, and side covers.
7. Remove Disc Drive interface cable strain relief strap located at the front of the Disc Drive (the strap is secured with three screws).
8. Unplug the two (2) Disc Drive cables at the Disc Drive PCB connectors.
9. Remove the Disc Drive PDU top cover and remove the three (3) Power Supply ac wires (Barrier Strip TB-100 #13, #14, #15) and the three (3) Power Supply ac wires (Barrier Strip TB-100 #6, #7, #10).
10. Remove the 10 pin dc power cable connector located inside the Disc Drive PDU.

11. Rotate the head actuator lock counter-clockwise to the locked position (refer to Section 2.3.2.1).

12. Set the spindle lock mechanism to the locked position (refer to Section 2.3.2.2).

13. Remove the three (3) 1/4 inch nuts (use a 7/16 inch wrench) that secure the Disc Drive to the cabinet frame.

14. Lifting the Disc Drive out of the cabinet requires two (2) persons; the Disc Drive weighs 85 pounds. With one person at each side of the Disc Drive, grasp the base casting firmly (being careful not to damage the Disc Drive backplane pins) and lift the Disc Drive out of the cabinet. Set the Disc Drive down gently, being careful not to damage the Motor Brake.

15. Remove the three (3) rubber shock mounts, as the replacement drive is shipped without these mounts.

16. Set the Disc Drive unit on the special shipping pallet designed for the Model 2400. Secure the Disc Drive to the pallet mounting points with three (3) 1/4 inch - N.C. x 1/2 inch bolts. Be sure that the spindle lock and head actuator lock are set to the locked position.

17. To replace the Model 2400 Disc Drive, reverse the preceding steps (16 thru 1)

5.2 SPARE PARTS LIST

The following lists the Spare Parts for the Model 1340 and 1345 Processor.

Item No.	BFC MM Number	Vendor Part Number	Part Description	1340/200 115/60	1340/200 220/50	1345/410 115/60	1345/410 220/50
01	831000	903055	PCBA, BACKPLANE (1340)	1	1	0	0
02	820090	902140	PCBA, 1320 CPU BD	1	1	I	I
03	831060	903046	PCBA, 1340 ACCESSORY BD	1	1	0	0
04	831001	903145-001	PCBA, BACKPLANE - 12 SLOT	I	I	1	1
05	820091	903044	PCBA, 1300 SERIES CPU BD	I	I	1	1
06	831061	903149-002	PCBA, 1345 ACCESSORY BD	I	I	1	1
07	831030	930034-001	PCBA, POWER SUPPLY-MEM	1	1	1	1
08	831040	930038-001	PCBA, POWER SUPPLY-CPU	1	1	1	1
09	831071	903081	PCBA, CONTROL PANEL	1	1	1	1
10	834010	902074-002	OVERLAY, CONTROL PANEL	1	1	1	1
11	837030	330003	SWITCH ASM, CONTROL PANEL	1	1	1	1
12	081007	901490	CABLE, RIBBON-CPU-ACC BD	1	1	1	1
13	837130	901662-001	CABLE, FRONT PANEL	2	2	2	2
14	824010	100564	FAN, AIR-100 CPM	3	3	3	3
15	837040	180005	TRANSFORMER	1	1	1	1
16	837050	183000	BATTERY, 12V	1	1	1	1
17	837060	133001	BRIDGE RECTIFIER	1	1	1	1
18	837070	181004-001	FILTER, A/C LINE	1	1	1	1
19	837080	105002-002	CAPACITOR, 6.3K MFD 40V	1	1	1	1
20	837090	330002-001	SWITCH, ROCKER	1	1	1	1
21	837100	340000-001	CIRCUIT BREAKER, 115V*	1	0	1	0
22	837110	340002	RELAY, POWER-25A	1	1	1	1
23	837120	108004-001	CAPACITOR, 1 MFD-600V	1	1	1	1
24	837910	340000-002	CIRCUIT BREAKER, 220V	0	1	0	1
25	160191	MDX-03.200	FUSE, 3.2A-MDX-SB	2	1	2	1
26	160192	MDX-01.600	FUSE, 1.6A-MDX-SB	0	1	0	1

I = Interchangeable
0,1,2,3... = 0,1,2,3 required
*For earlier production of the System 200, order Circuit Breaker MM82402 (black lever)

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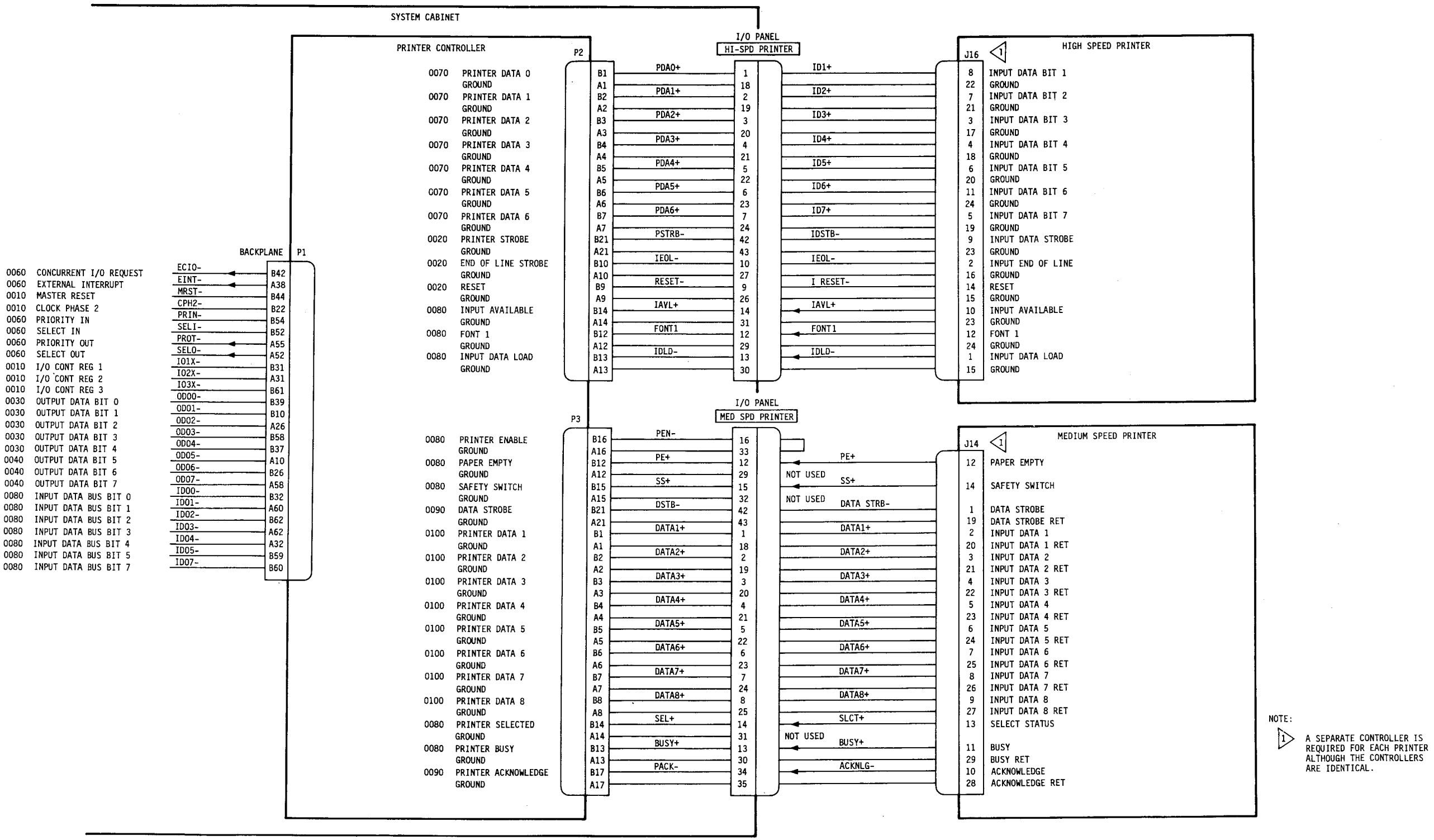
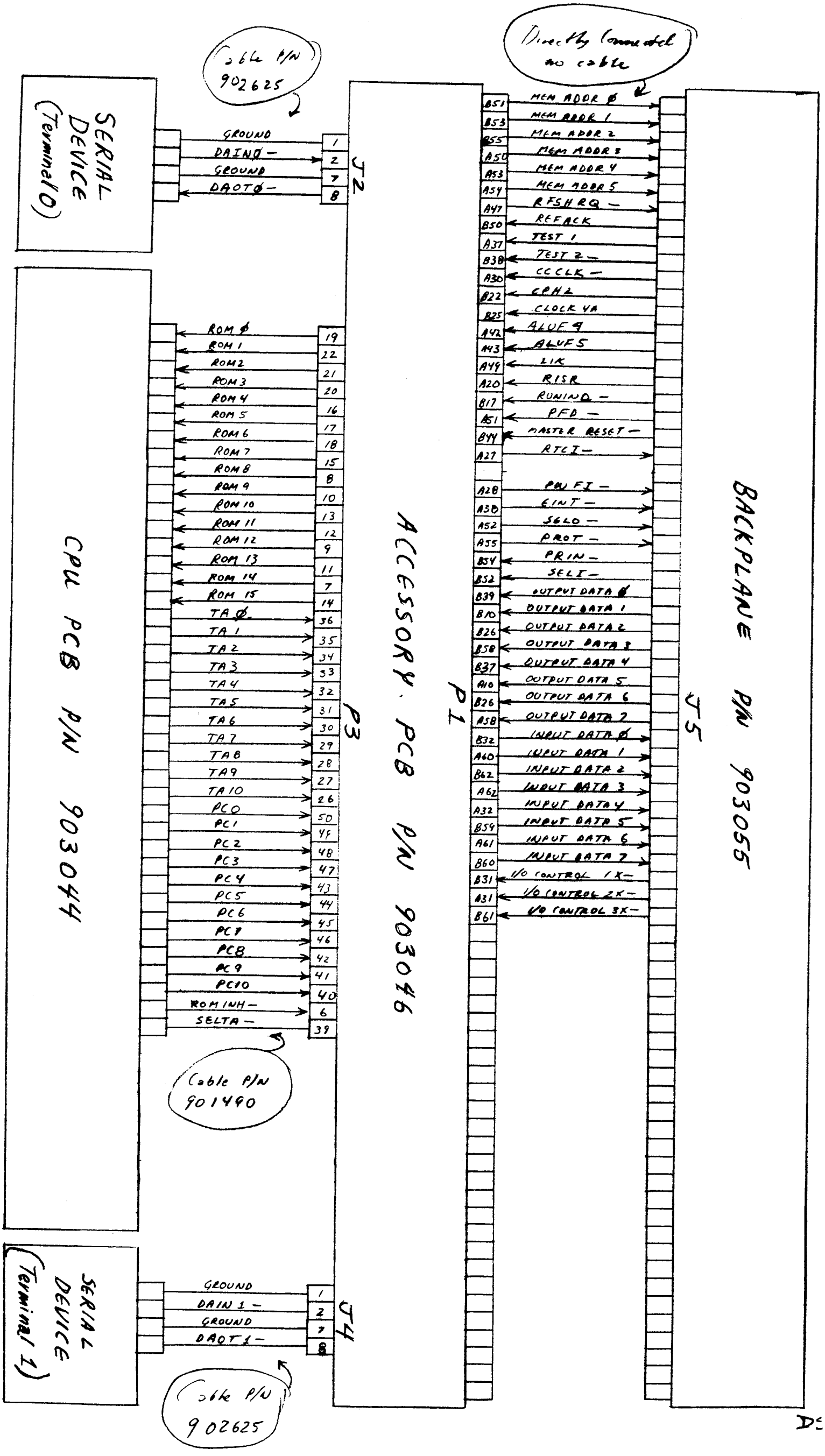
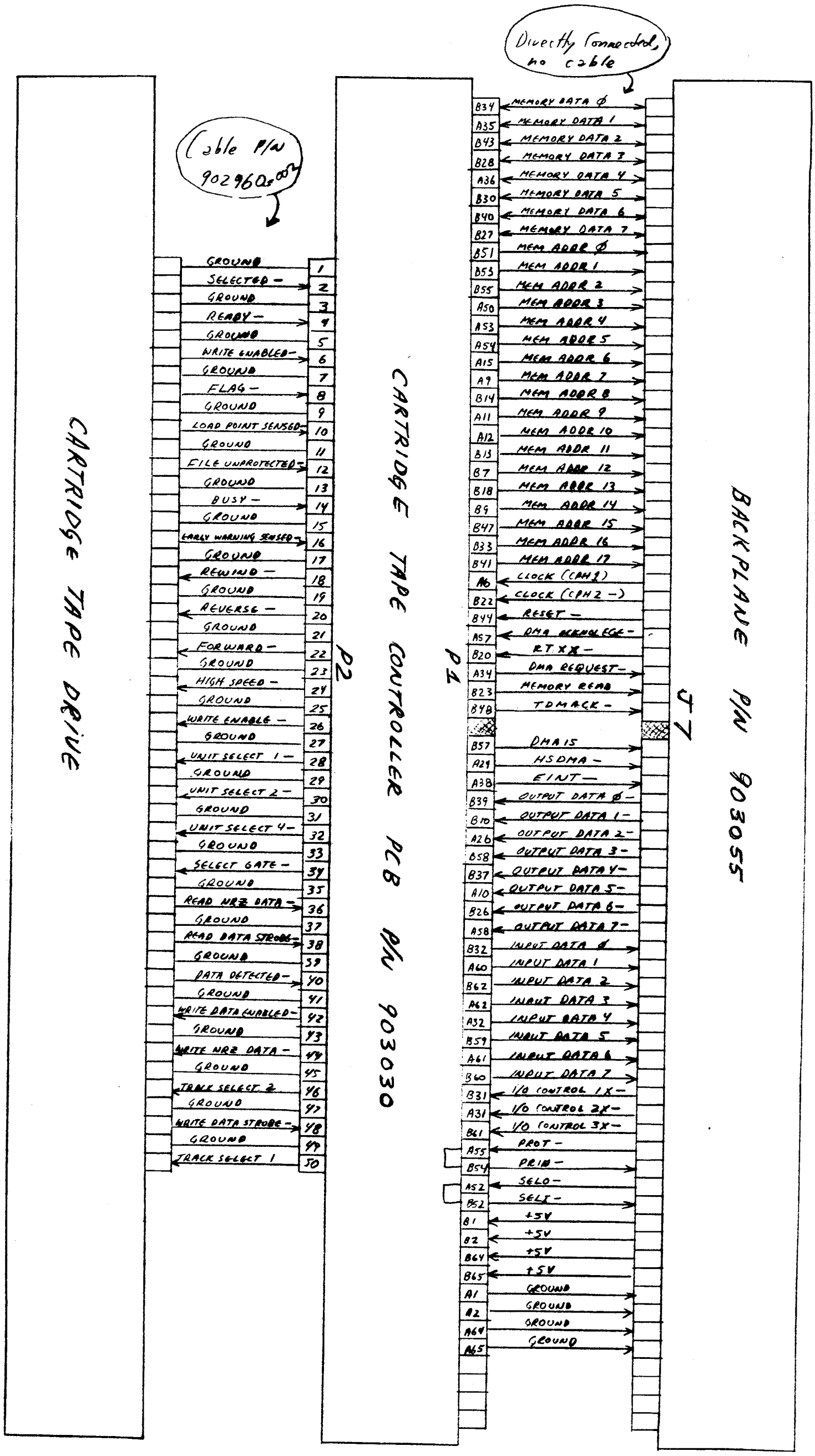
CHAPTER 6

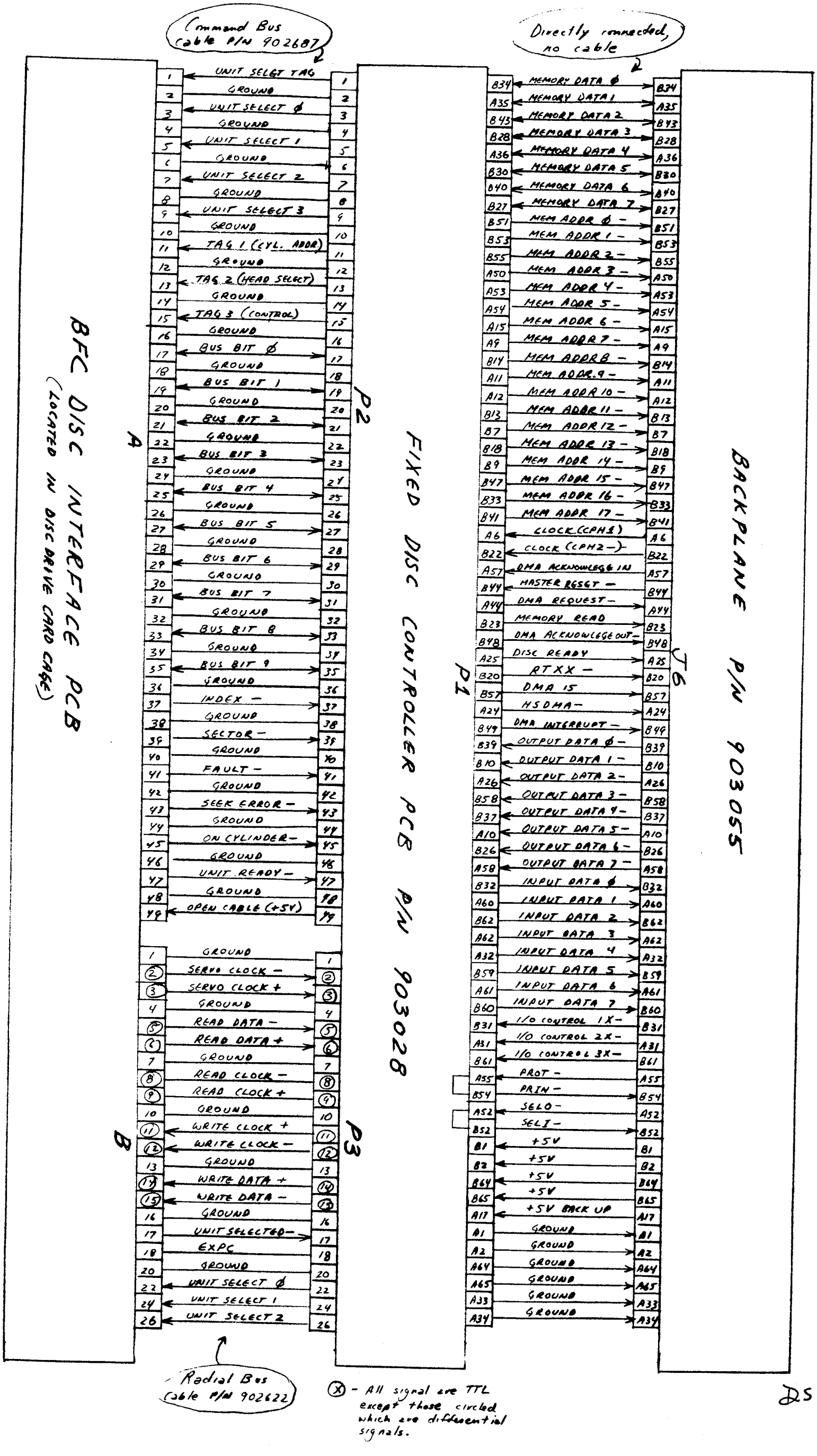
REFERENCE DATA

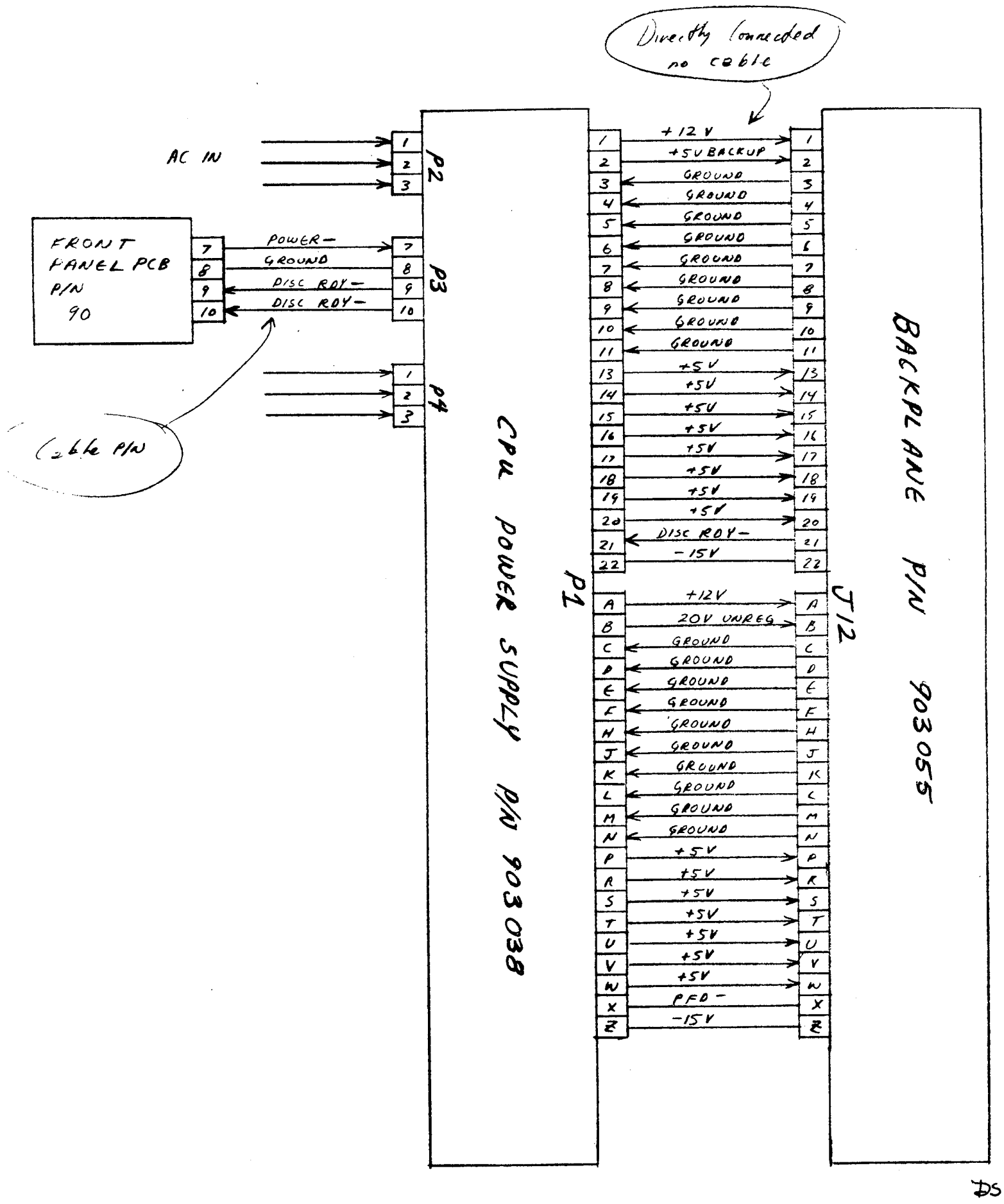

SYSTEM CABINET
PRINTER CONTROLLER
BACKPLANE P1
P2
P3
I/O PANEL
HI-SPD PRINTER
I/O PANEL
MED SPD PRINTER
HIGH SPEED PRINTER
J16
MEDIUM SPEED PRINTER
J14
0060 CONCURRENT I/O REQUEST
0060 EXTERNAL INTERRUPT
0010 MASTER RESET
0010 CLOCK PHASE 2
0060 PRIORITY IN
0060 SELECT IN
0060 PRIORITY OUT
0060 SELECT OUT
0010 I/O CONT REG 1
0010 I/O CONT REG 2
0010 I/O CONT REG 3
0030 OUTPUT DATA BIT 0
0030 OUTPUT DATA BIT 1
0030 OUTPUT DATA BIT 2
0030 OUTPUT DATA BIT 3
0030 OUTPUT DATA BIT 4
0040 OUTPUT DATA BIT 5
0040 OUTPUT DATA BIT 6
0040 OUTPUT DATA BIT 7
0080 INPUT DATA BUS BIT 0
0080 INPUT DATA BUS BIT 1
0080 INPUT DATA BUS BIT 2
0080 INPUT DATA BUS BIT 3
0080 INPUT DATA BUS BIT 4
0080 INPUT DATA BUS BIT 5
0080 INPUT DATA BUS BIT 7
ECIO- B42
EINT- A38
MRST- B44
CPH2- B22
PRIN- B54
SELI- B52
PROT- A55
SELO- A52
IO1X- B31
IO2X- A31
IO3X- B61
ODO0- B39
ODO1- B10
ODO2- A26
ODO3- B58
ODO4- B37
ODO5- A10
ODO6- B26
ODO7- A58
IDO0- B32
IDO1- A60
IDO2- B62
IDO3- A62
IDO4- A32
IDO5- B59
IDO7- B60
0070 PRINTER DATA 0
GROUND
0070 PRINTER DATA 1
GROUND
0070 PRINTER DATA 2
GROUND
0070 PRINTER DATA 3
GROUND
0070 PRINTER DATA 4
GROUND
C070 PRINTER DATA 5
GROUND
0070 PRINTER DATA 6
GROUND
0020 PRINTER STROBE
GROUND
0020 END OF LINE STROBE
GROUND
0020 RESET
GROUND
0080 INPUT AVAILABLE
GROUND
0080 FONT 1
GROUND
0080 INPUT DATA LOAD
GROUND
B1 A1 B2 A2 B3 A3 B4 A4 B5 A5 B6 A6 B7 A7 B21 A21 B10 A10 B9 A9 B14 A14 B12 A12 B13 A13
PDA0+ PDA1+ PDA2+ PDA3+ PDA4+ PDA5+ PDA6+ PSTRB- IEOL- RESET- IAVL+ FONT1 IDLD-
1 18 2 19 3 20 4 21 5 22 6 23 7 24 42 43 10 27 9 26 14 31 12 29 13 30
ID1+ ID2+ ID3+ ID4+ ID5+ ID6+ ID7+ IDSTB- IEOL- I RESET- IAVL+ FONT1 IDLD-
J16
8 INPUT DATA BIT 1
22 GROUND
7 INPUT DATA BIT 2
21 GROUND
3 INPUT DATA BIT 3
17 GROUND
4 INPUT DATA BIT 4
18 GROUND
6 INPUT DATA BIT 5
20 GROUND
11 INPUT DATA BIT 6
24 GROUND
5 INPUT DATA BIT 7
19 GROUND
9 INPUT DATA STROBE
23 GROUND
2 INPUT END OF LINE
16 GROUND
14 RESET
15 GROUND
10 INPUT AVAILABLE
23 GROUND
12 FONT 1
24 GROUND
1 INPUT DATA LOAD
15 GROUND
0080 PRINTER ENABLE
GROUND
0080 PAPER EMPTY
GROUND
0080 SAFETY SWITCH
GROUND
0090 DATA STROBE
GROUND
0100 PRINTER DATA 1
GROUND
0100 PRINTER DATA 2
GROUND
0100 PRINTER DATA 3
GROUND
0100 PRINTER DATA 4
GROUND
0100 PRINTER DATA 5
GROUND
0100 PRINTER DATA 6
GROUND
0100 PRINTER DATA 7
GROUND
0100 PRINTER DATA 8
GROUND
0080 PRINTER SELECTED
GROUND
0080 PRINTER BUSY
GROUND
0090 PRINTER ACKNOWLEDGE
GROUND
B16 A16 B12 A12 B15 A15 B21 A21 B1 A1 B2 A2 B3 A3 B4 A4 B5 A5 B6 A6 B7 A7 B8 A8 B14 A14 B13 A13 B17 A17
PEN- PE+ SS+ DSTB- DATA1+ DATA2+ DATA3+ DATA4+ DATA5+ DATA6+ DATA7+ DATA8+ SEL+ BUSY+ PACK-
16 33 12 29 15 32 42 43 1 18 2 19 3 20 4 21 5 22 6 23 7 24 8 25 14 31 13 30 34 35
PE+ NOT USED SS+ NOT USED DATA STRB- DATA1+ DATA2+ DATA3+ DATA4+ DATA5+ DATA6+ DATA7+ DATA8+ SLCT+ NOT USED BUSY+ ACKNLG-
J14
12 PAPER EMPTY
14 SAFETY SWITCH
1 DATA STROBE
19 DATA STROBE RET
2 INPUT DATA 1
20 INPUT DATA 1 RET
3 INPUT DATA 2
21 INPUT DATA 2 RET
4 INPUT DATA 3
22 INPUT DATA 3 RET
5 INPUT DATA 4
23 INPUT DATA 4 RET
6 INPUT DATA 5
24 INPUT DATA 5 RET
7 INPUT DATA 6
25 INPUT DATA 6 RET
8 INPUT DATA 7
26 INPUT DATA 7 RET
9 INPUT DATA 8
27 INPUT DATA 8 RET
13 SELECT STATUS
11 BUSY
29 BUSY RET
10 ACKNOWLEDGE
28 ACKNOWLEDGE RET
NOTE:
1 A SEPARATE CONTROLLER IS REQUIRED FOR EACH PRINTER ALTHOUGH THE CONTROLLERS ARE IDENTICAL.


Cable P/N 902625
SERIAL DEVICE (Terminal 0)
GROUND
DAIN0 –
GROUND
DAOT0 –
1
2
7
8
J2
CPU PCB P/N 903044
ROM 0
ROM 1
ROM 2
ROM 3
ROM 4
ROM 5
ROM 6
ROM 7
ROM 8
ROM 9
ROM 10
ROM 11
ROM 12
ROM 13
ROM 14
ROM 15
TA 0
TA 1
TA 2
TA 3
TA 4
TA 5
TA 6
TA 7
TA 8
TA 9
TA 10
PC 0
PC 1
PC 2
PC 3
PC 4
PC 5
PC 6
PC 7
PC 8
PC 9
PC 10
ROM INH –
SELTA –
19
22
21
20
16
17
18
15
8
10
13
12
9
11
7
14
36
35
34
33
32
31
30
29
28
27
26
50
49
48
47
43
44
45
46
42
41
40
6
39
P3
Cable P/N 901490
ACCESSORY PCB P/N 903046
P1
Directly connected no cable
MEM ADDR 0
MEM ADDR 1
MEM ADDR 2
MEM ADDR 3
MEM ADDR 4
MEM ADDR 5
RFSH RQ –
REFACK
TEST 1
TEST 2 –
CCCLK –
CPH2
CLOCK 4A
ALUF 4
ALUF 5
LIK
RISR
RUNIND –
PFD –
MASTER RESET –
RTCI –
PWFI –
EINT –
SGLO –
PROT –
PRIN –
SELI –
OUTPUT DATA 0
OUTPUT DATA 1
OUTPUT DATA 2
OUTPUT DATA 3
OUTPUT DATA 4
OUTPUT DATA 5
OUTPUT DATA 6
OUTPUT DATA 7
INPUT DATA 0
INPUT DATA 1
INPUT DATA 2
INPUT DATA 3
INPUT DATA 4
INPUT DATA 5
INPUT DATA 6
INPUT DATA 7
I/O CONTROL 1X –
I/O CONTROL 2X –
I/O CONTROL 3X –
A51
B53
A55
A50
A53
A54
A47
B50
A37
B38
A30
B22
B25
A42
A43
A44
A20
B17
A51
B44
A27
A28
A30
A52
A55
B54
B52
B39
B10
B26
B58
B37
A10
B26
A58
B32
A60
B62
A62
A32
B54
A61
B60
B31
A31
B61
J5
BACKPLANE P/N 903055
SERIAL DEVICE (Terminal 1)
GROUND
DAIN 1 –
GROUND
DAOT 1 –
1
2
7
8
J4
Cable P/N 902625

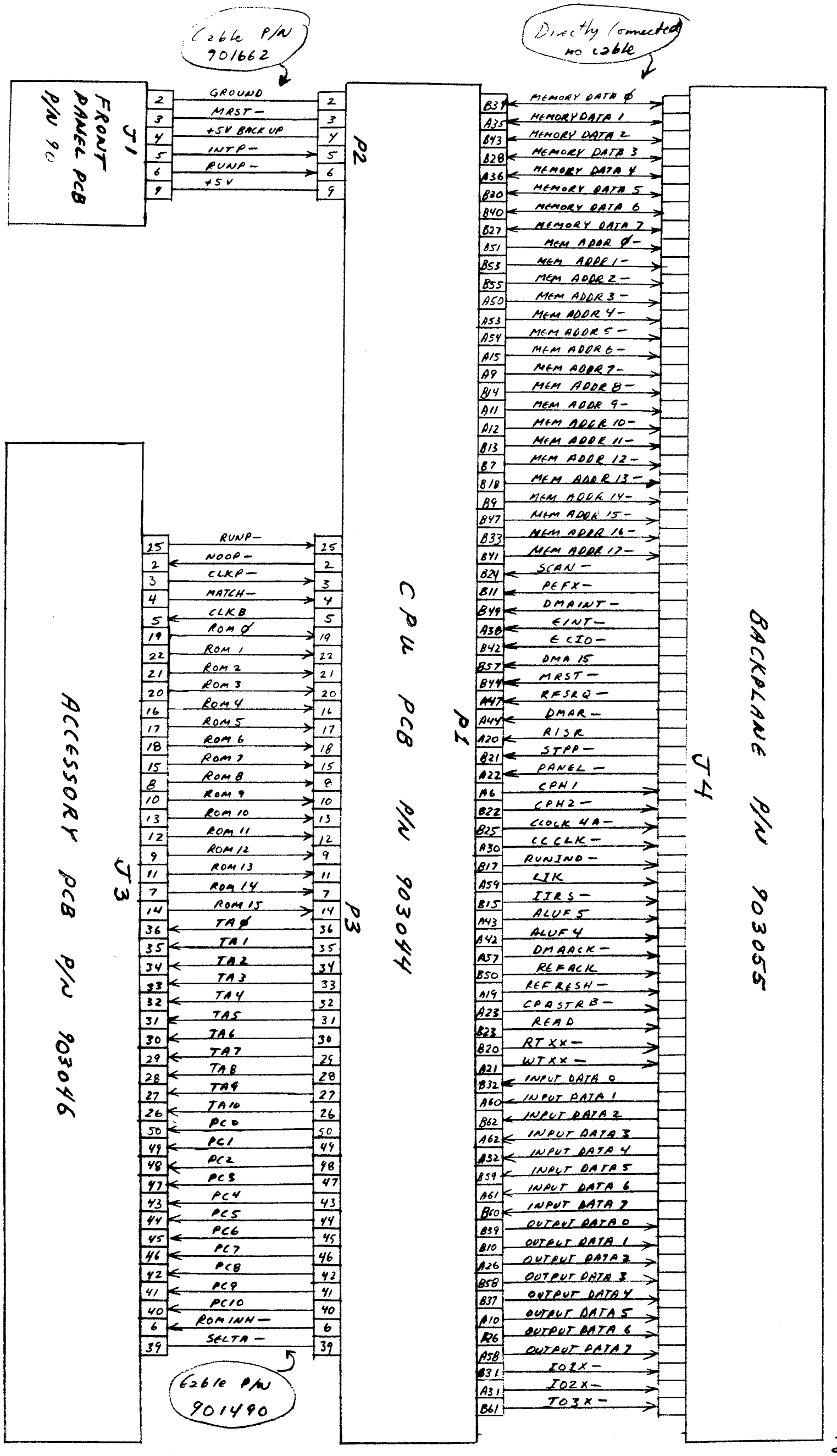

Directly Connected, no cable
Cable P/N 902960-00
CARTRIDGE TAPE DRIVE
CARTRIDGE TAPE CONTROLLER PCB P/N 903030
BACKPLANE P/N 903055
P1
P2
J7
GROUND
SELECTED –
READY –
WRITE ENABLED –
FLAG –
LOAD POINT SENSED
FILE UNPROTECTED –
BUSY –
EARLY WARNING SENSED –
REWIND –
REVERSE –
FORWARD –
HIGH SPEED –
WRITE ENABLE –
UNIT SELECT 1 –
UNIT SELECT 2 –
UNIT SELECT 4 –
SELECT GATE –
READ NRZ DATA –
READ DATA STROBE –
DATA DETECTED –
WRITE DATA ENABLED –
WRITE NRZ DATA –
TRACK SELECT 2
WRITE DATA STROBE –
TRACK SELECT 1
MEMORY DATA 0
MEMORY DATA 1
MEMORY DATA 2
MEMORY DATA 3
MEMORY DATA 4
MEMORY DATA 5
MEMORY DATA 6
MEMORY DATA 7
MEM ADDR 0
MEM ADDR 1
MEM ADDR 2
MEM ADDR 3
MEM ADDR 4
MEM ADDR 5
MEM ADDR 6
MEM ADDR 7
MEM ADDR 8
MEM ADDR 9
MEM ADDR 10
MEM ADDR 11
MEM ADDR 12
MEM ADDR 13
MEM ADDR 14
MEM ADDR 15
MEM ADDR 16
MEM ADDR 17
CLOCK (CPH2)
CLOCK (CPH2 –)
RESET –
DMA ACKNOLEGE –
RTXX –
DMA REQUEST –
MEMORY REQB
TDMACK –
DMA 15
HSDMA –
EINT –
OUTPUT DATA 0 –
OUTPUT DATA 1 –
OUTPUT DATA 2 –
OUTPUT DATA 3 –
OUTPUT DATA 4 –
OUTPUT DATA 5 –
OUTPUT DATA 6 –
OUTPUT DATA 7 –
INPUT DATA 0
INPUT DATA 1
INPUT DATA 2
INPUT DATA 3
INPUT DATA 4
INPUT DATA 5
INPUT DATA 6
INPUT DATA 7
I/O CONTROL 1X –
I/O CONTROL 2X –
I/O CONTROL 3X –
PROT –
PRIB –
SELO –
SELI –
+5V
GROUND

D.S.


Command Bus cable P/N 902687
Directly connected, no cable
BFC DISC INTERFACE PCB (LOCATED IN DISC DRIVE CARD CAGE)
A
B
P2
P3
P1
J6
FIXED DISC CONTROLLER PCB P/N 903028
BACKPLANE P/N 903055
1 UNIT SELCT TAG
2 GROUND
3 UNIT SELECT Ø
4 GROUND
5 UNIT SELECT 1
6 GROUND
7 UNIT SELECT 2
8 GROUND
9 UNIT SELECT 3
10 GROUND
11 TAG 1 (CYL. ADDR)
12 GROUND
13 TAG 2 (HEAD SELECT)
14 GROUND
15 TAG 3 (CONTROL)
16 GROUND
17 BUS BIT Ø
18 GROUND
19 BUS BIT 1
20 GROUND
21 BUS BIT 2
22 GROUND
23 BUS BIT 3
24 GROUND
25 BUS BIT 4
26 GROUND
27 BUS BIT 5
28 GROUND
29 BUS BIT 6
30 GROUND
31 BUS BIT 7
32 GROUND
33 BUS BIT 8
34 GROUND
35 BUS BIT 9
36 GROUND
37 INDEX –
38 GROUND
39 SECTOR –
40 GROUND
41 FAULT –
42 GROUND
43 SEEK ERROR –
44 GROUND
45 ON CYLINDER –
46 GROUND
47 UNIT READY –
48 GROUND
49 OPEN CABLE (+5V)
1 GROUND
2 SERVO CLOCK –
3 SERVO CLOCK +
4 GROUND
5 READ DATA –
6 READ DATA +
7 GROUND
8 READ CLOCK –
9 READ CLOCK +
10 GROUND
11 WRITE CLOCK +
12 WRITE CLOCK –
13 GROUND
14 WRITE DATA +
15 WRITE DATA –
16 GROUND
17 UNIT SELECTED –
18 EXPC
20 GROUND
22 UNIT SELECT Ø
24 UNIT SELECT 1
26 UNIT SELECT 2
B34 MEMORY DATA Ø
A35 MEMORY DATA 1
B43 MEMORY DATA 2
B28 MEMORY DATA 3
A36 MEMORY DATA 4
B30 MEMORY DATA 5
B40 MEMORY DATA 6
B27 MEMORY DATA 7
B51 MEM ADDR Ø –
B53 MEM ADDR 1 –
B55 MEM ADDR 2 –
A50 MEM ADDR 3 –
A53 MEM ADDR 4 –
A54 MEM ADDR 5 –
A15 MEM ADDR 6 –
A9 MEM ADDR 7 –
B14 MEM ADDR 8 –
A11 MEM ADDR 9 –
A12 MEM ADDR 10 –
B13 MEM ADDR 11 –
B7 MEM ADDR 12 –
B18 MEM ADDR 13 –
B9 MEM ADDR 14 –
B47 MEM ADDR 15 –
B33 MEM ADDR 16 –
B41 MEM ADDR 17 –
A6 CLOCK (CPH2)
B22 CLOCK (CPH2 –)
A57 DMA ACKNOWLEGE IN
B44 MASTER RESET –
A44 DMA REQUEST –
B23 MEMORY READ
B48 DMA ACKNOWLEGE OUT –
A25 DISC READY
B20 RTXX –
B57 DMA 15
A24 HSDMA –
B49 DMA INTERRUPT –
B39 OUTPUT DATA Ø –
B10 OUTPUT DATA 1 –
A26 OUTPUT DATA 2 –
B58 OUTPUT DATA 3 –
B37 OUTPUT DATA 4 –
A10 OUTPUT DATA 5 –
B26 OUTPUT DATA 6 –
A58 OUTPUT DATA 7 –
B32 INPUT DATA Ø
A60 INPUT DATA 1
B62 INPUT DATA 2
A62 INPUT DATA 3
A32 INPUT DATA 4
B59 INPUT DATA 5
A61 INPUT DATA 6
B60 INPUT DATA 7
B31 I/O CONTROL 1X –
A31 I/O CONTROL 2X –
B61 I/O CONTROL 3X –
A55 PROT –
B54 PRIN –
A52 SELO –
B52 SELI –
B1 +5V
B2 +5V
B64 +5V
B65 +5V
A17 +5V BACK UP
A1 GROUND
A2 GROUND
A64 GROUND
A65 GROUND
A33 GROUND
A34 GROUND
Radial Bus cable P/N 902622
Ⓧ - All signal are TTL except those circled which are differential signals.


Directly connected no cable
AC IN
P2
FRONT PANEL PCB P/N 90
POWER–
GROUND
DISC RDY–
DISC RDY–
P3
P4
Cable P/N
CPU POWER SUPPLY P/N 903038
P1
+12 V
+5V BACKUP
GROUND
+5V
DISC RDY–
–15V
+12V
20V UNREG
PFD–
J12
BACKPLANE P/N 903055

DS

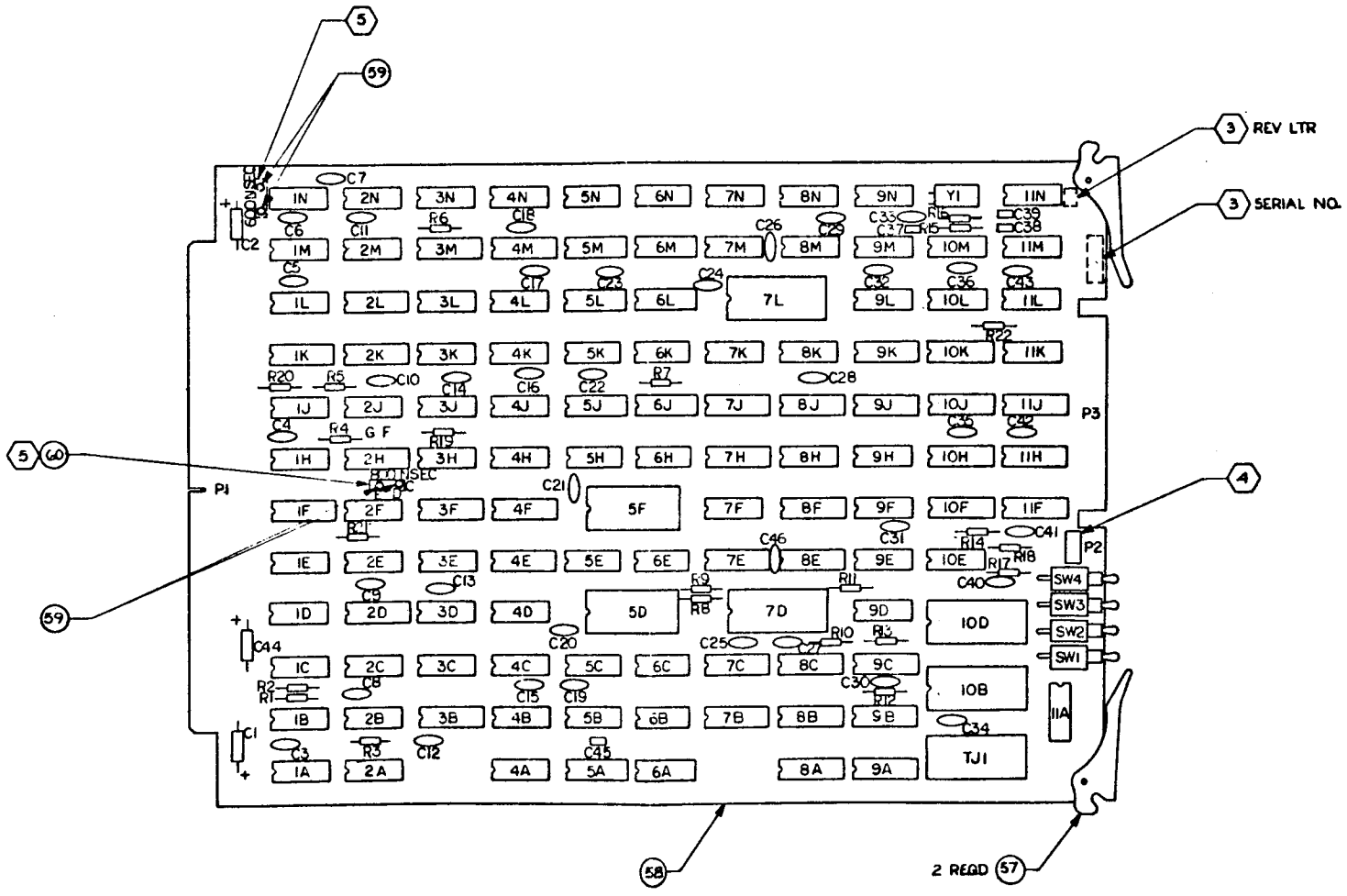

Cable P/N 901662
Directly connected no cable
J1 FRONT PANEL PCB P/N 90
GROUND
MRST—
+5V BACK UP
INTP—
RUNP—
+5V
P2
CPU PCB P/N 903044
P1
BACKPLANE P/N 903055
J4
MEMORY DATA Ø
MEMORY DATA 1
MEMORY DATA 2
MEMORY DATA 3
MEMORY DATA 4
MEMORY DATA 5
MEMORY DATA 6
MEMORY DATA 7
MEM ADDR Ø—
MEM ADDR 1—
MEM ADDR 2—
MEM ADDR 3—
MEM ADDR 4—
MEM ADDR 5—
MEM ADDR 6—
MEM ADDR 7—
MEM ADDR 8—
MEM ADDR 9—
MEM ADDR 10—
MEM ADDR 11—
MEM ADDR 12—
MEM ADDR 13—
MEM ADDR 14—
MEM ADDR 15—
MEM ADDR 16—
MEM ADDR 17—
SCAN—
PEFX—
DMAINT—
EINT—
ECIO—
DMA 15
MRST—
RFSRQ—
DMAR—
RISR
STPP—
PANEL—
CPH1
CPH2—
CLOCK 4A—
CCCLK—
RUNIND—
CLK
IIRS—
ALUF5
ALUF4
DMAACK—
REFACK
REFRESH—
CPASTRB—
READ
RTXX—
WTXX—
INPUT DATA Ø
INPUT DATA 1
INPUT DATA 2
INPUT DATA 3
INPUT DATA 4
INPUT DATA 5
INPUT DATA 6
INPUT DATA 7
OUTPUT DATA Ø
OUTPUT DATA 1
OUTPUT DATA 2
OUTPUT DATA 3
OUTPUT DATA 4
OUTPUT DATA 5
OUTPUT DATA 6
OUTPUT DATA 7
IO1X—
IO2X—
IO3X—
ACCESSORY PCB P/N 903046
J3
RUNP—
NOOP—
CLKP—
MATCH—
CLKB
ROM Ø
ROM 1
ROM 2
ROM 3
ROM 4
ROM 5
ROM 6
ROM 7
ROM 8
ROM 9
ROM 10
ROM 11
ROM 12
ROM 13
ROM 14
ROM 15
TA Ø
TA 1
TA 2
TA 3
TA 4
TA 5
TA 6
TA 7
TA 8
TA 9
TA 10
PC Ø
PC 1
PC 2
PC 3
PC 4
PC 5
PC 6
PC 7
PC 8
PC 9
PC 10
ROM INH—
SELTA—
P3
Cable P/N 901490

DS

NOTES: UNLESS OTHERWISE SPECIFIED

1. REF LOGIC DIAGRAM 903045, LATEST REV.
2. REF BD DETAIL 904024
3. MARK DESIGNATION APPROXIMATELY WHERE SHOWN PER BFC SPECIFICATION 800000.
4. KEY P2 BY CLIPPING OFF PIN 1.
5. JUMPER (ITEM 60) SHOWN IN 800 NSEC CONFIGURATION. FOR 600 NSEC CONFIGURATION INSTALL JUMPER IN 600 NSEC POSITION.
6. THIS ASSY IS A DIRECT REPLACEMENT FOR 901425 & 902140 ASSY'S BY RELOCATING JUMPER.

A	[illegible]	PRODUCTION RELEASE	[illegible]	[illegible]
A1	[illegible]	SEE ECN [illegible]	[illegible]	[illegible]
A2	2/78	REVISED ITEM 55 OF P/L ONLY	[illegible]	10-30-78



OUTSTANDING ECN'S

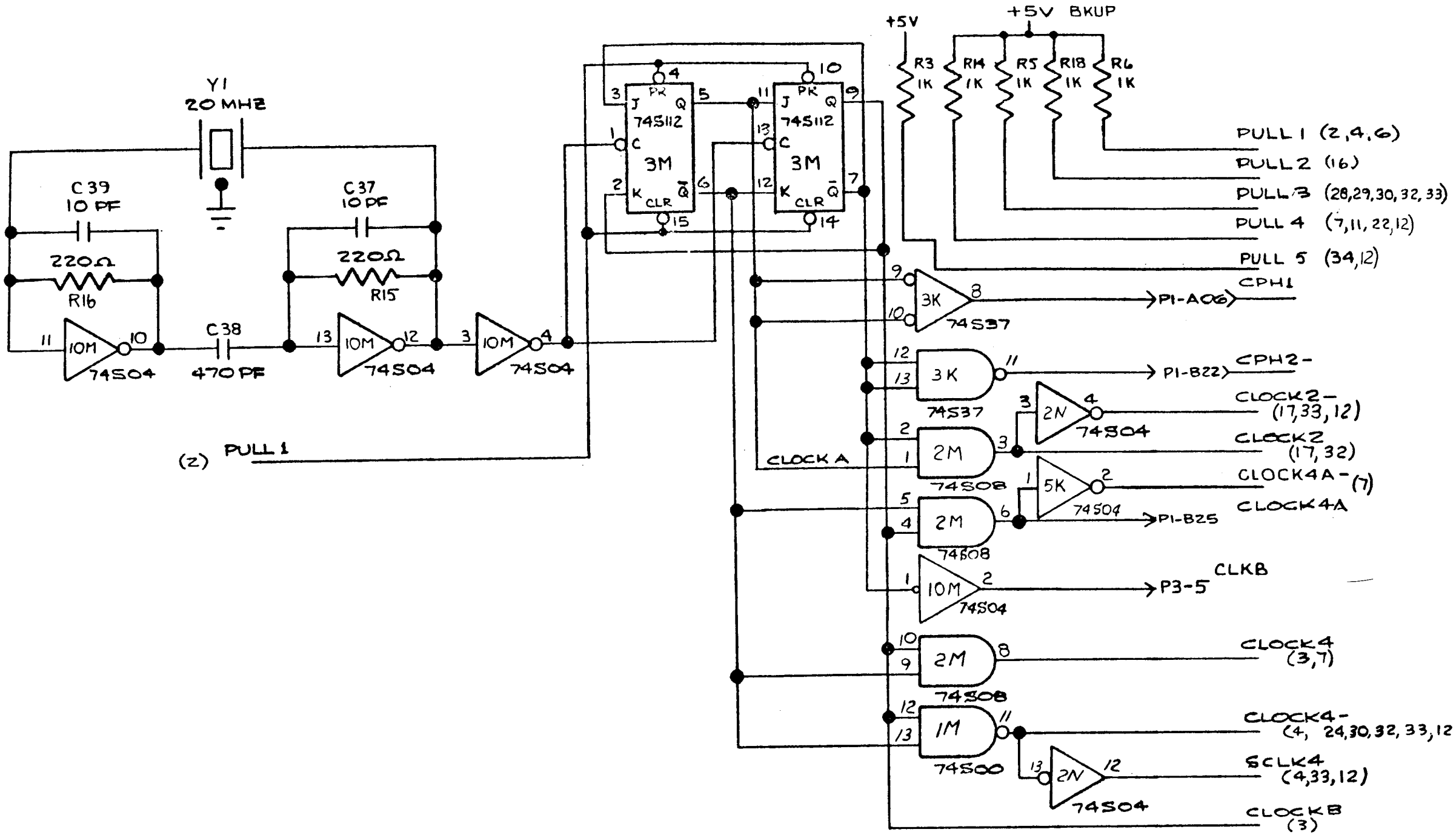
3031

3041

REWORK PER ECN 2364

RELEASED PRINT

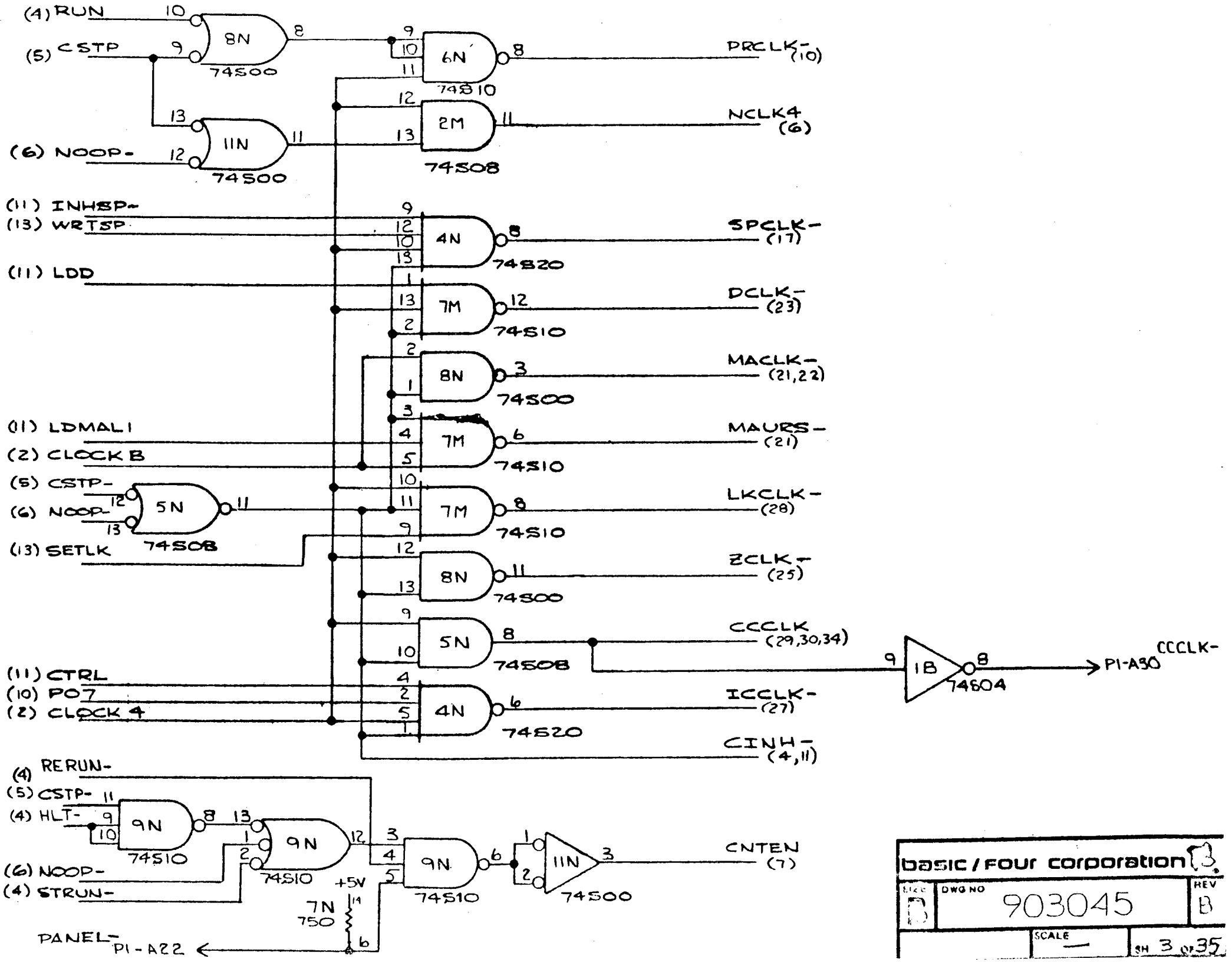
902021		DIMENSIONS ARE IN INCHES	basic/four corporation, 1335 South Claudina Street, Anaheim, California 92805
902020		TOLERANCES UNLESS OTHERWISE SPECIFIED: X ± 1, XX ± 03, XXX ± 010, ANGLES ± 1.0°	DRAWN [illegible] [illegible]
901929			CHKD [illegible] 1/25/79
901928			ENG [illegible]
901730			MFG
901729		MACHINED SURFACES √	APP
901721			TITLE: PCB ASSY CPU 1300 SERIES
901427			SIZE D, DWG NO 903044, REV A2
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	SCALE —, SH 1 OF 1



basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 2 OF 35

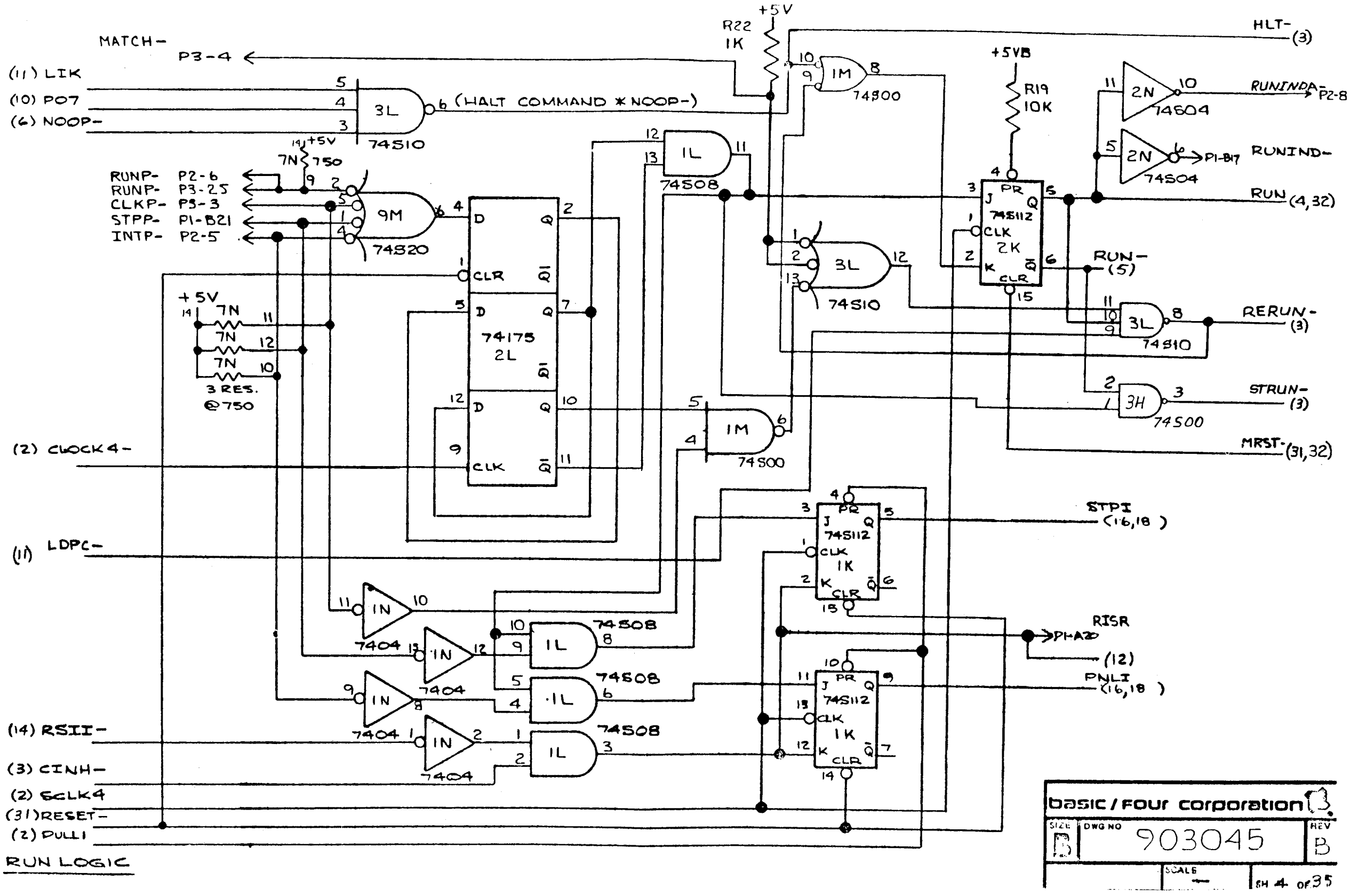
SYSTEM CLOCK



CLOCK GATES

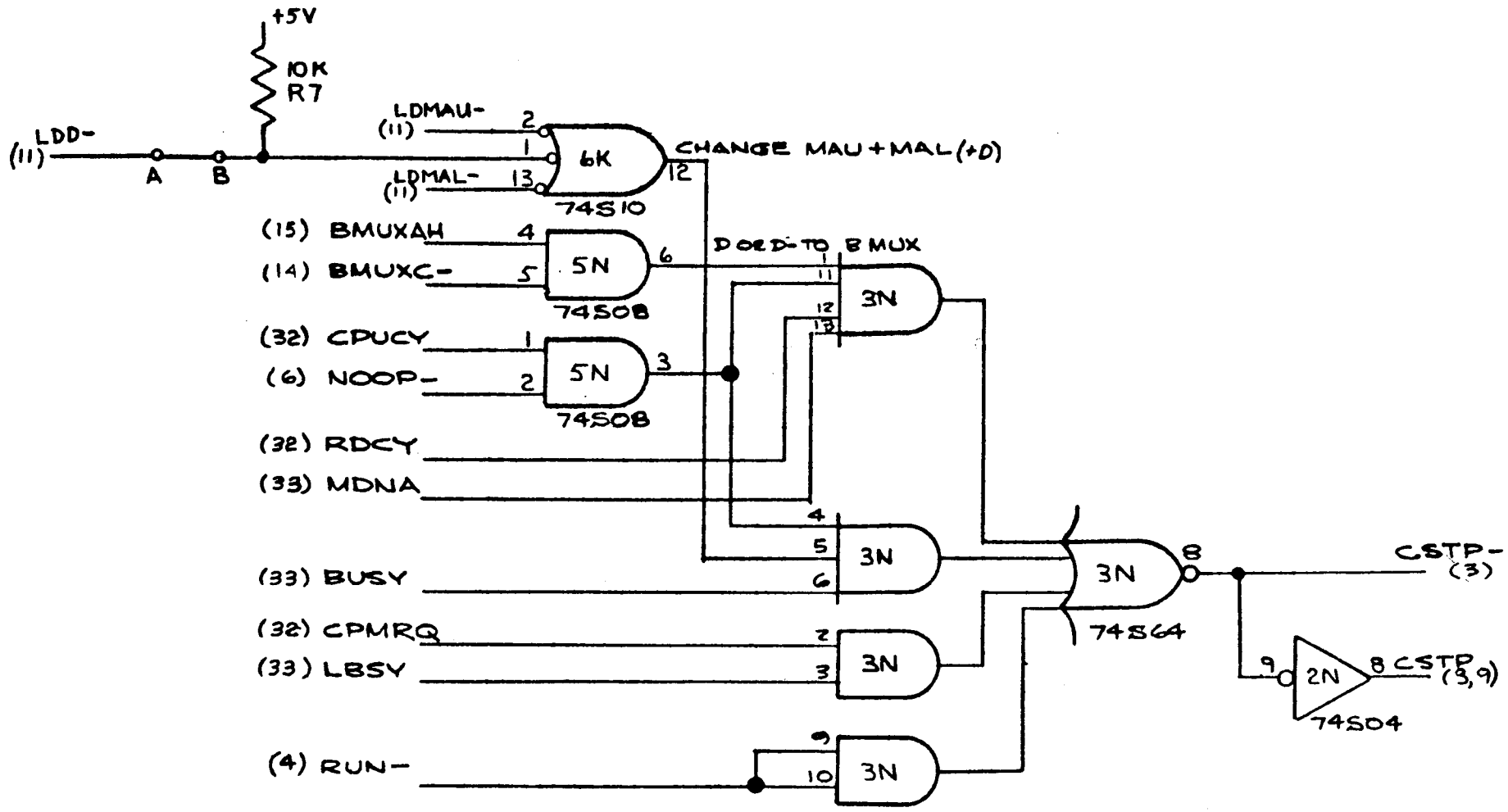
basic/four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 3 OF 35



basic / four corporation

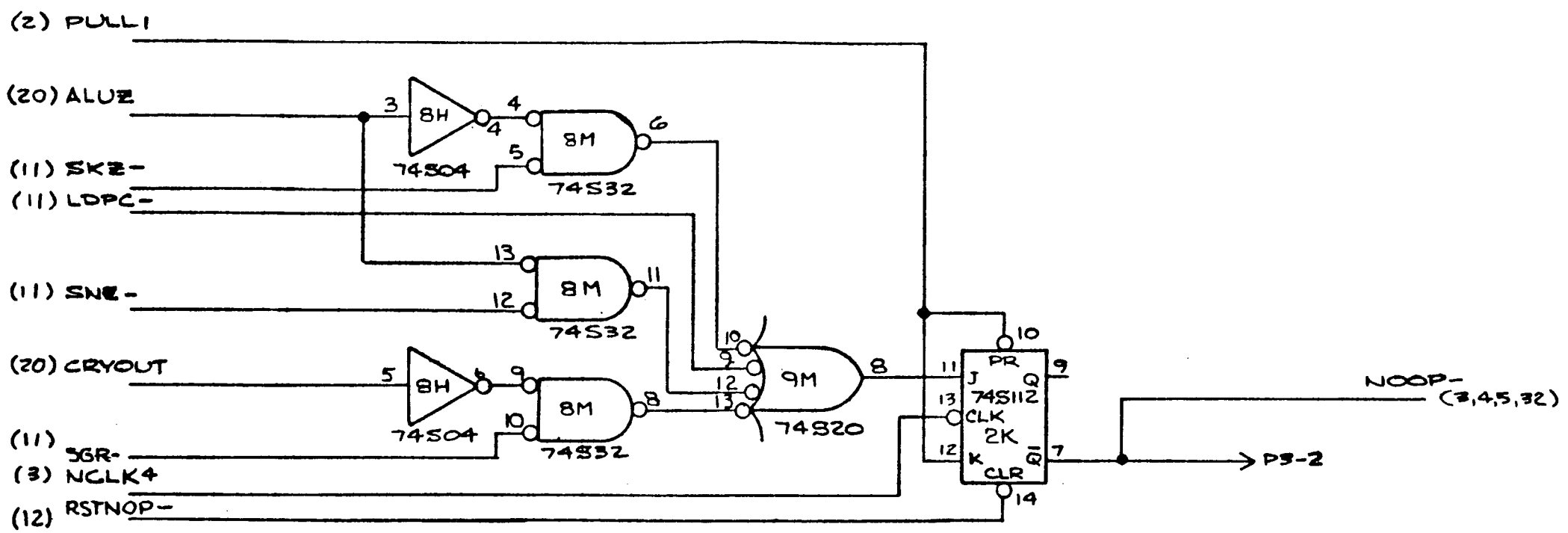
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 4 OF 35



CLOCK STOP LOGIC

basic / four corporation

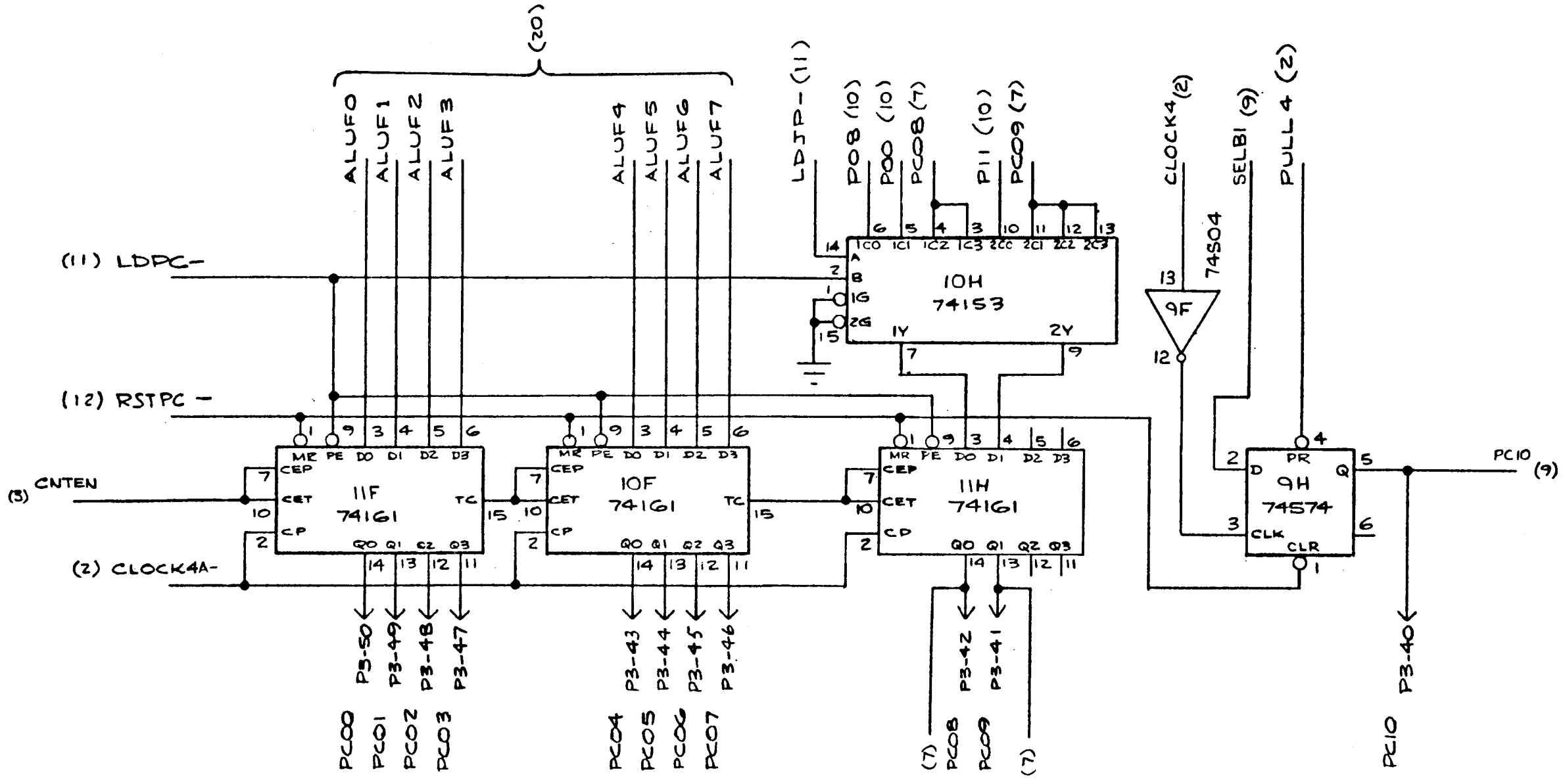
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 5 OF 25



NO-OP LOGIC

basic / four corporation

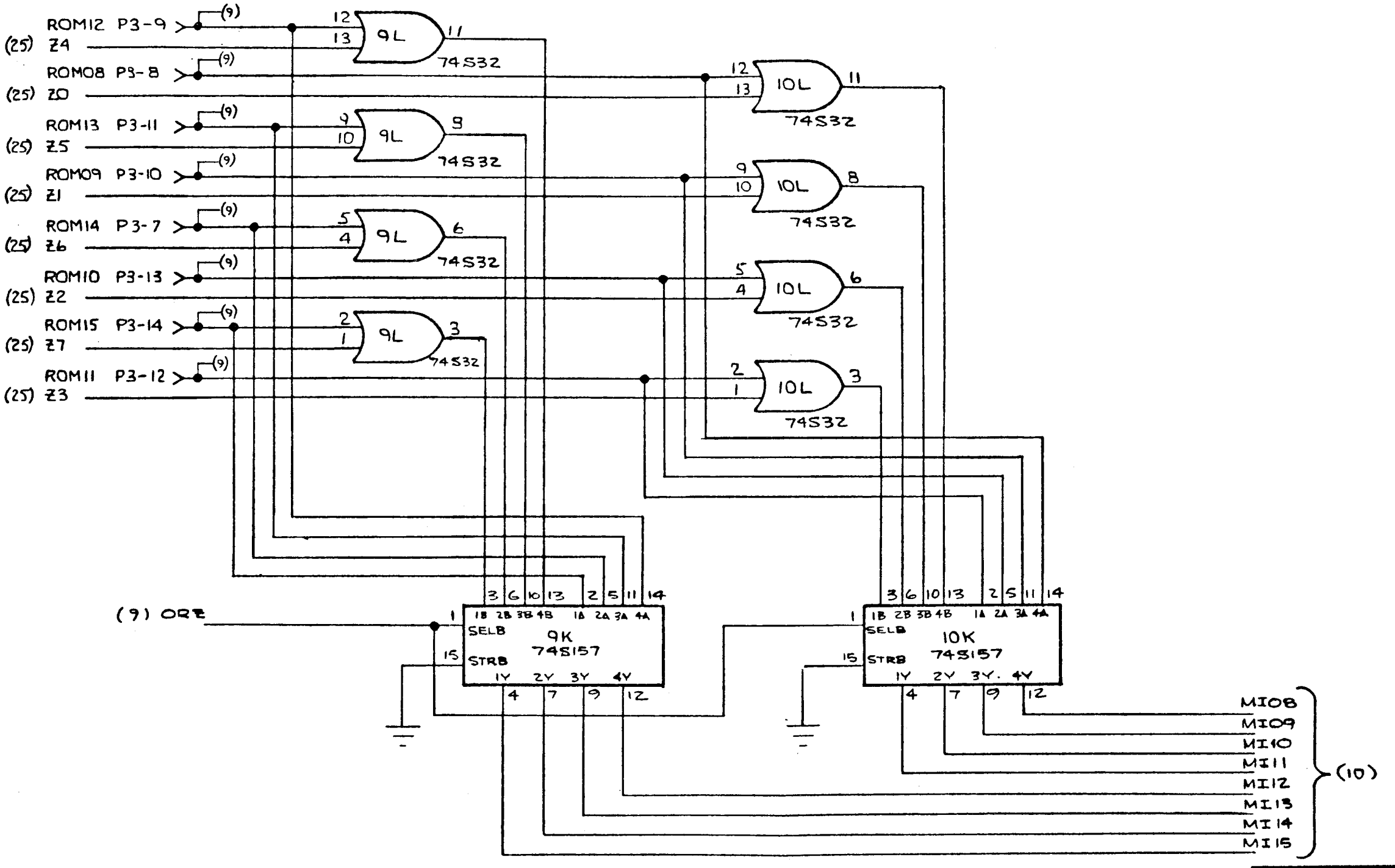
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 6 OF 35



PC REGISTER

basic / four corporation

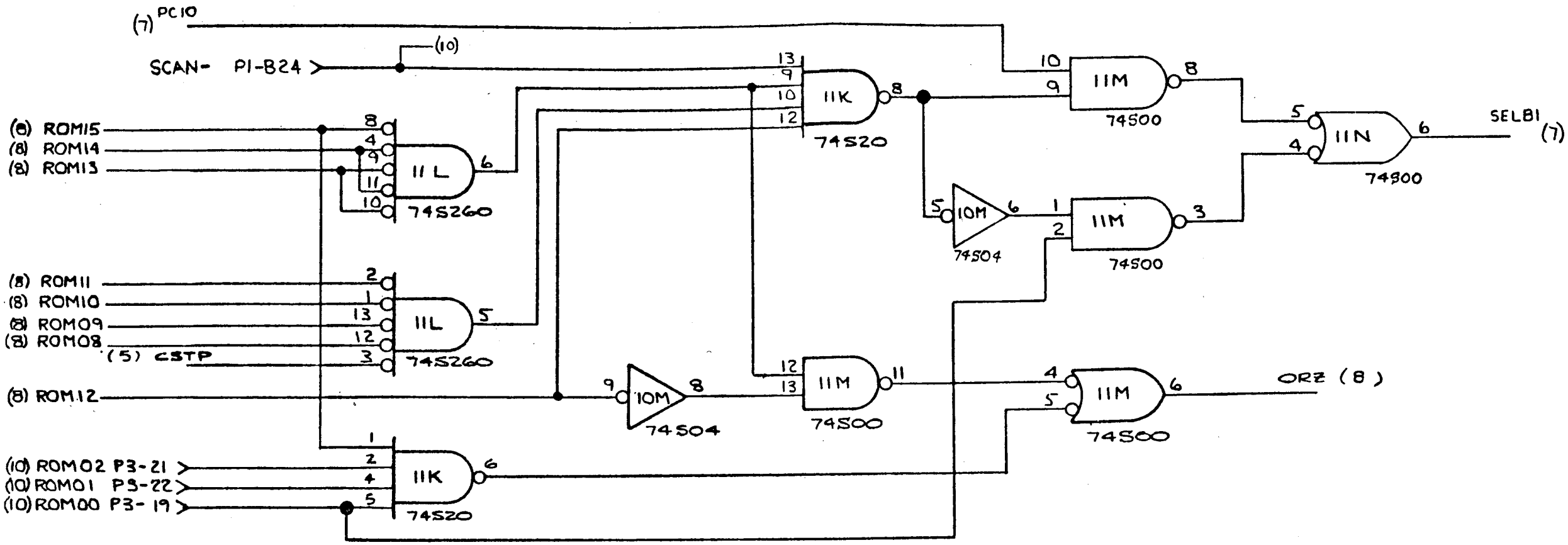
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 7 OF 35



basic/four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 8 OF 35

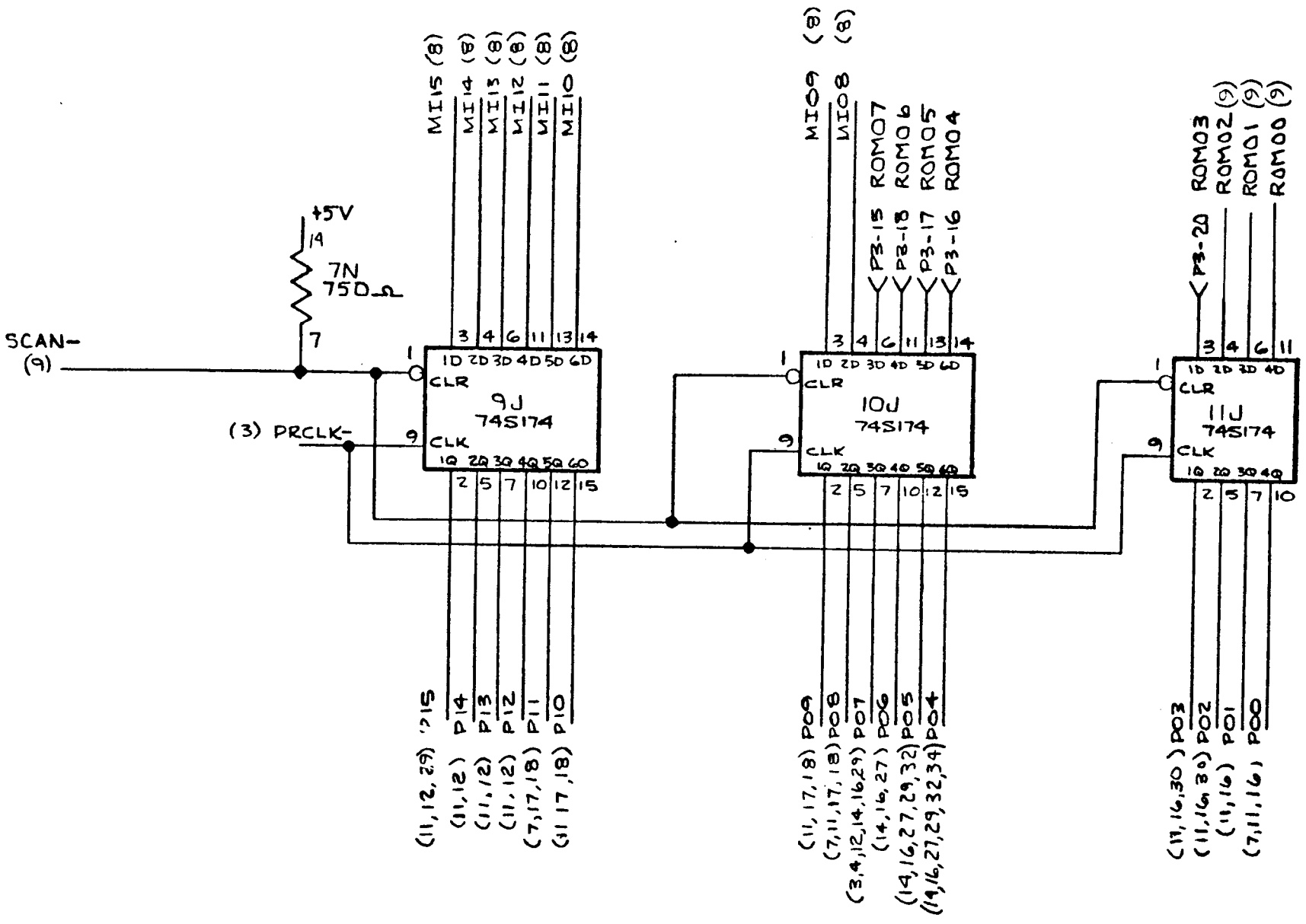
OP CODE MUX



BANK SELECT AND MODIFY LOGIC

basic / four corporation

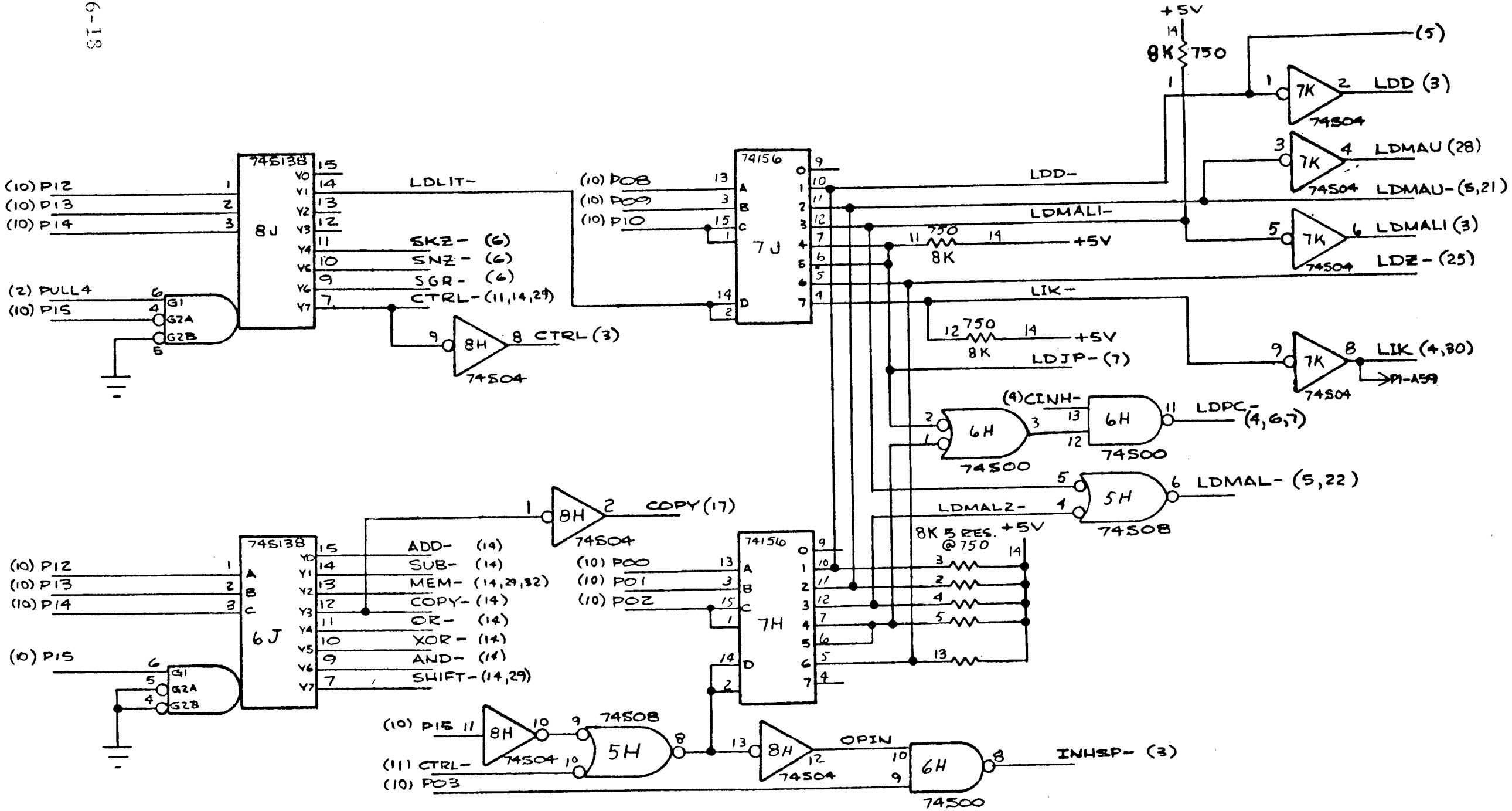
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 9 OF 35



PIPELINE REGISTER

basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 10 OF 35

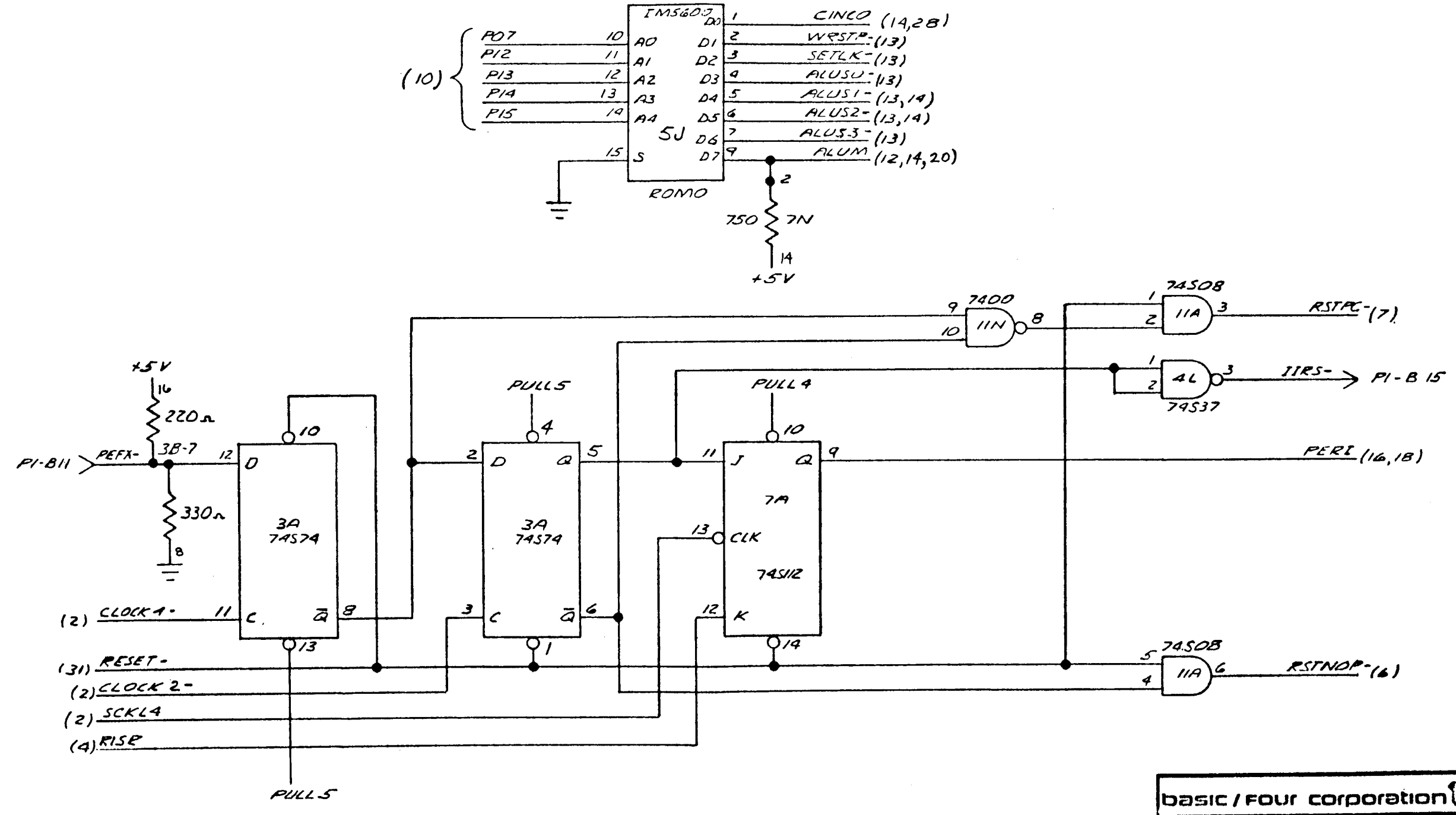


OP CODE DECODE

DESTINATION DECODE

basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 11 OF 35

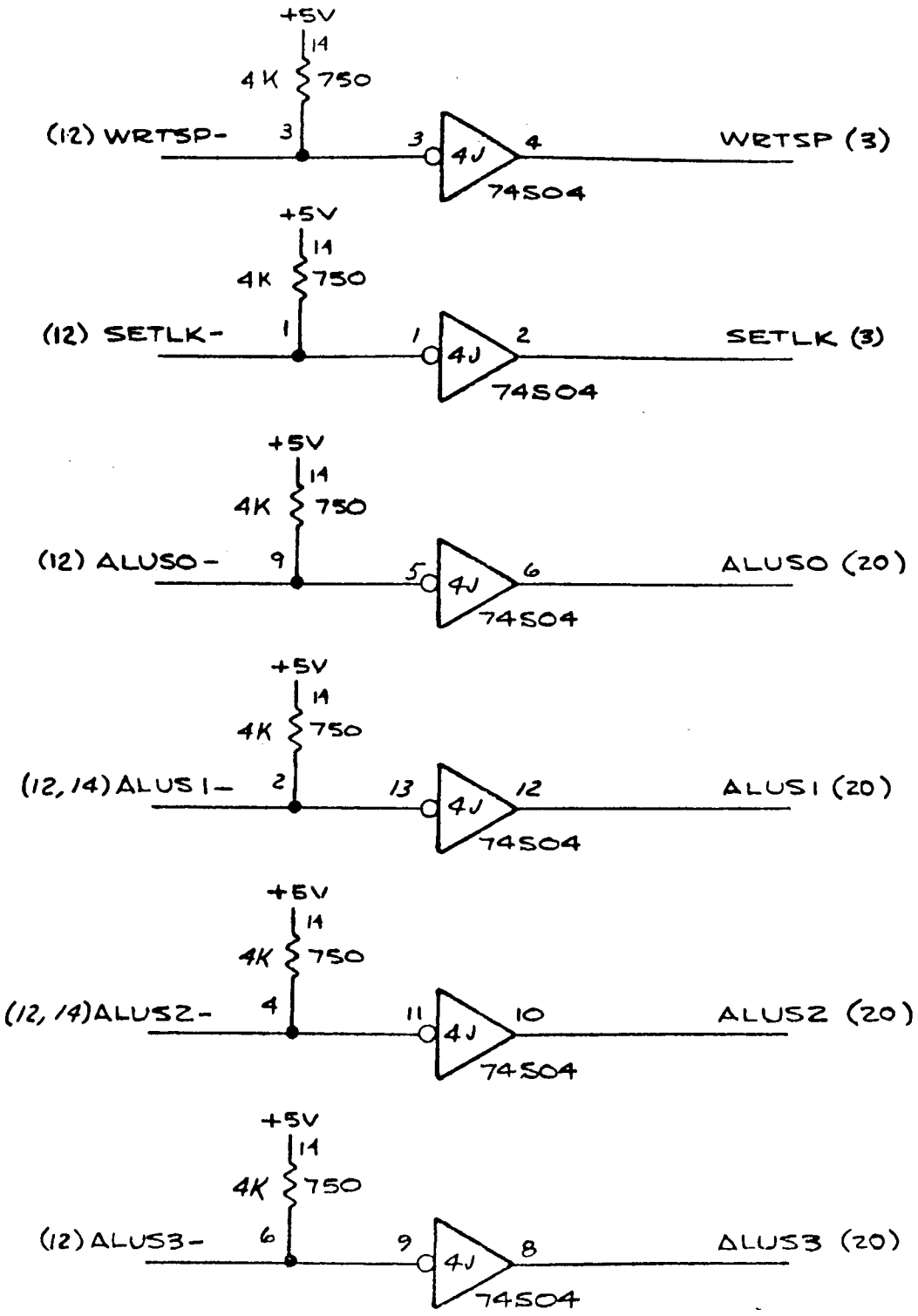


TRANSLATION ROM 0

basic / four corporation

SIZE	DWG NO	REV
B	903045	B

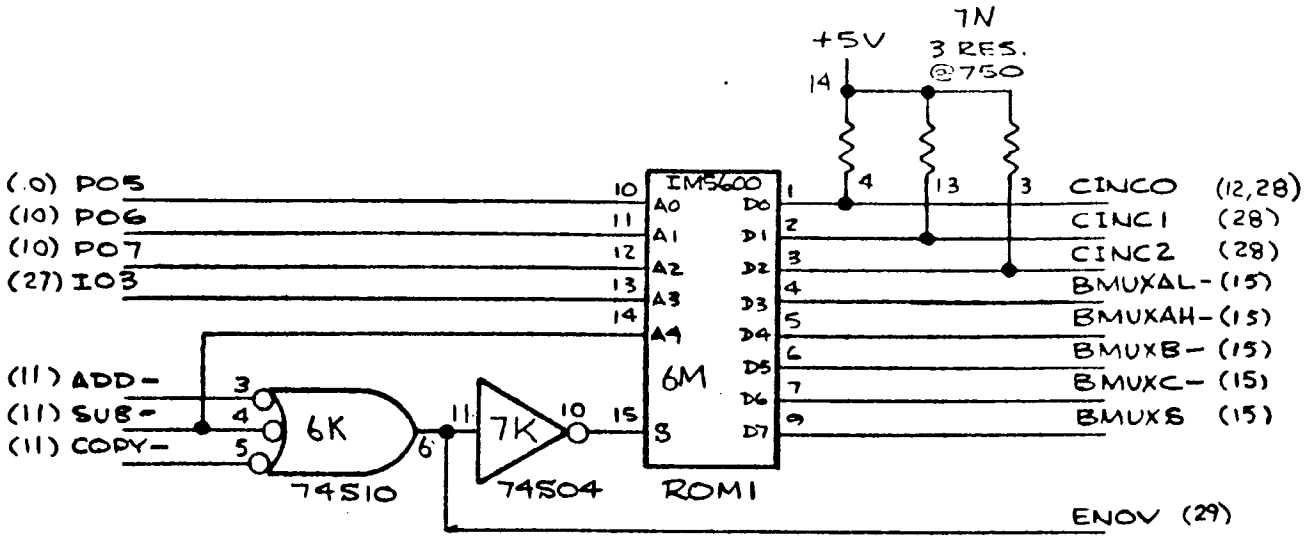
SCALE — SH 12 OF 14

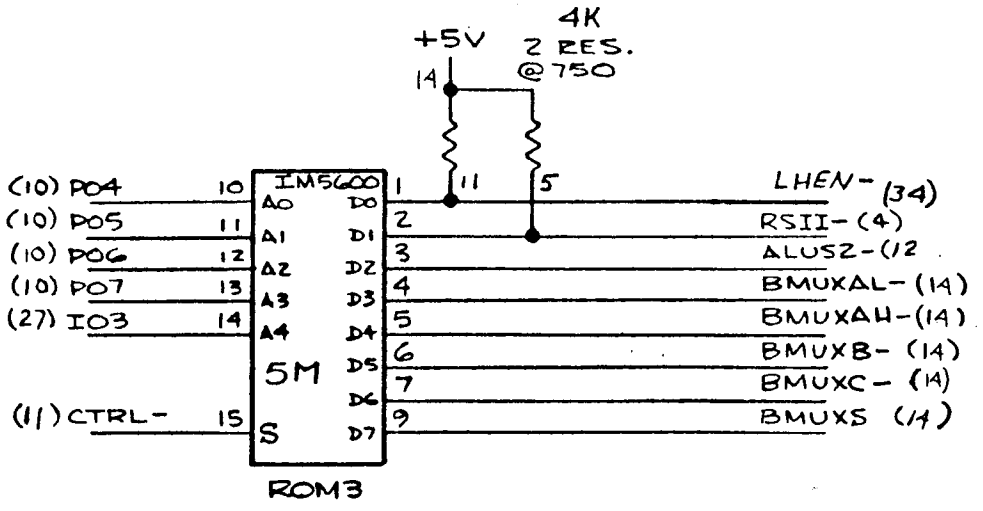


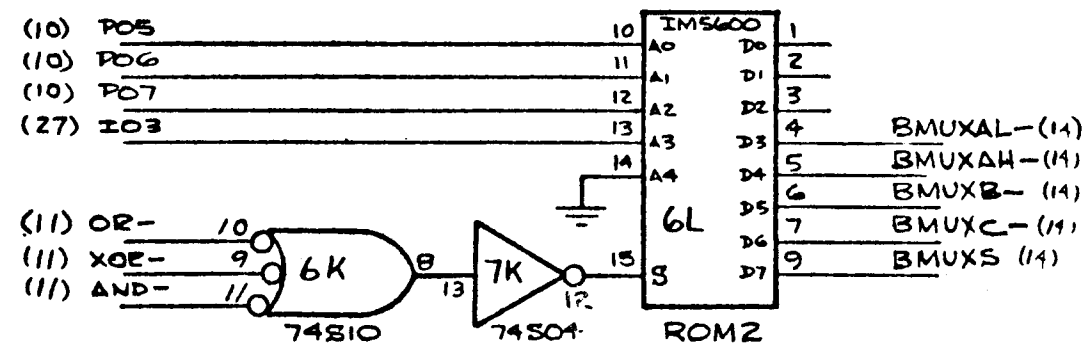
ROM O BUFFERS

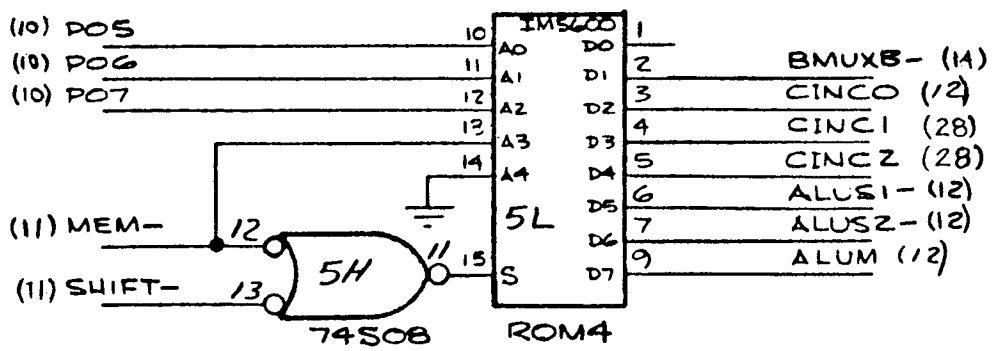
basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 13 OF 35





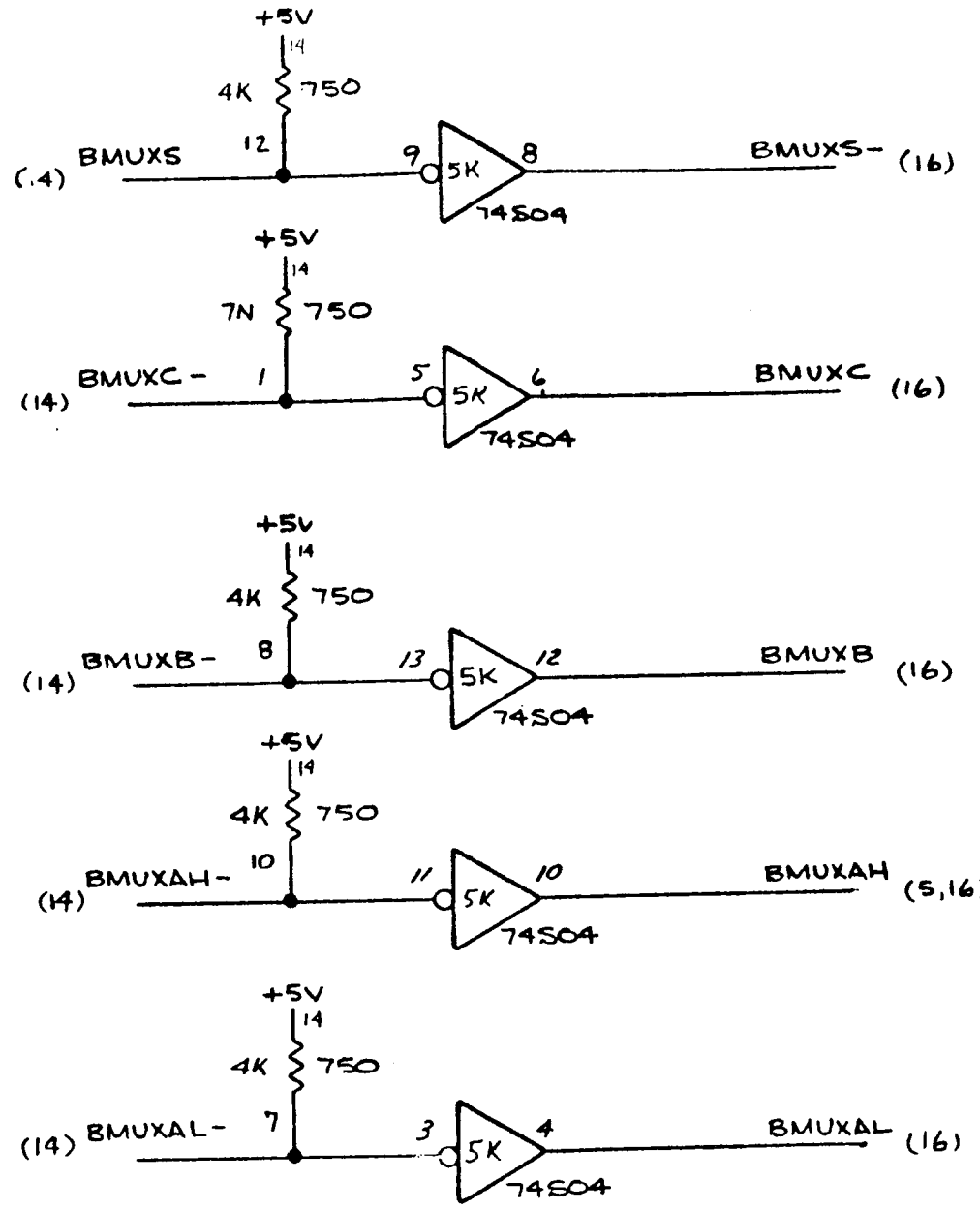




TRANSLATION ROMS 1-4

basic / four corporation

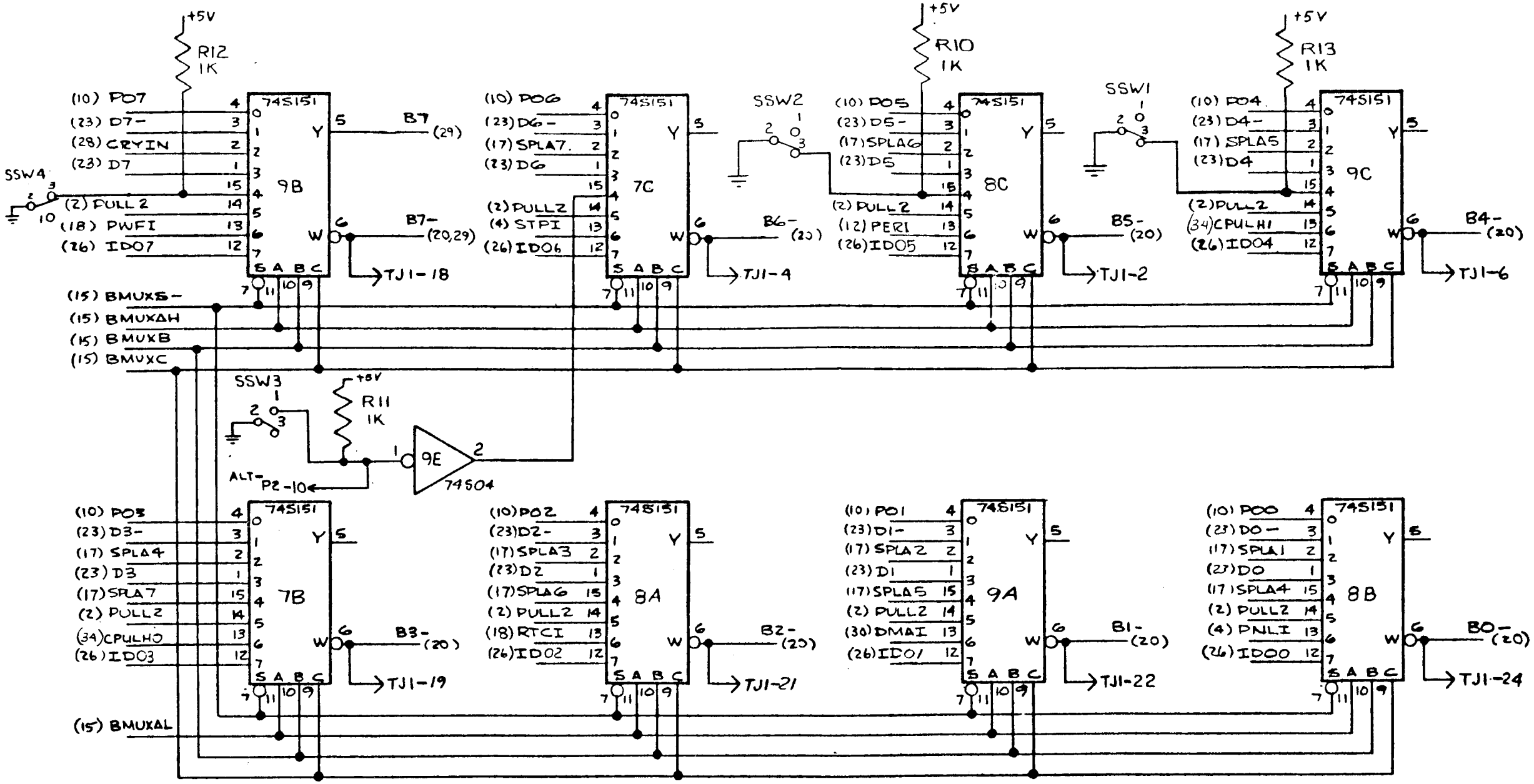
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 14 OF 35



BMUX ADDRESS BUFFERS

basic / four corporation

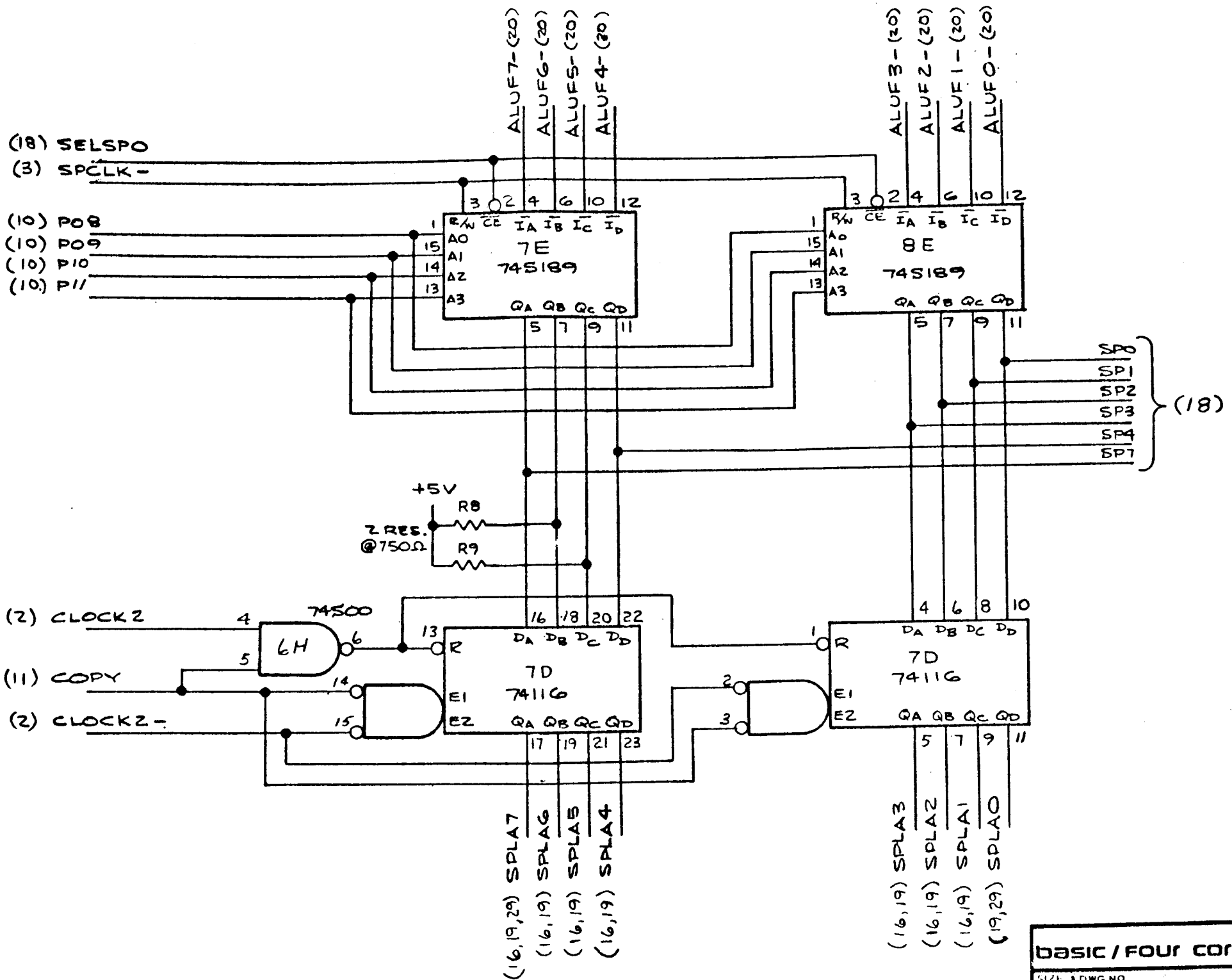
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 15 OF 35



B MUX

basic/four corporation

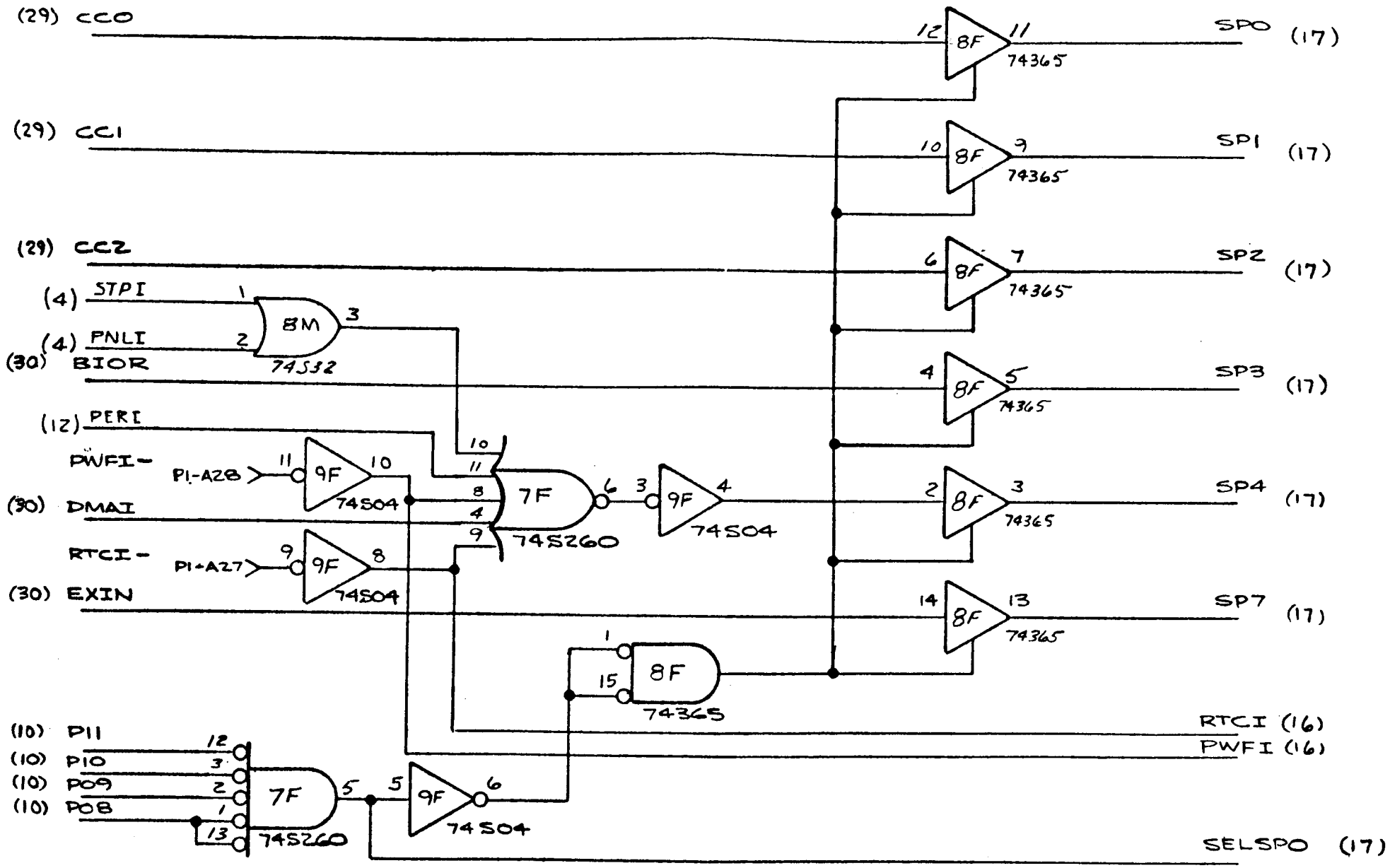
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 16 OF 35



SCRATCH PADS 1-15

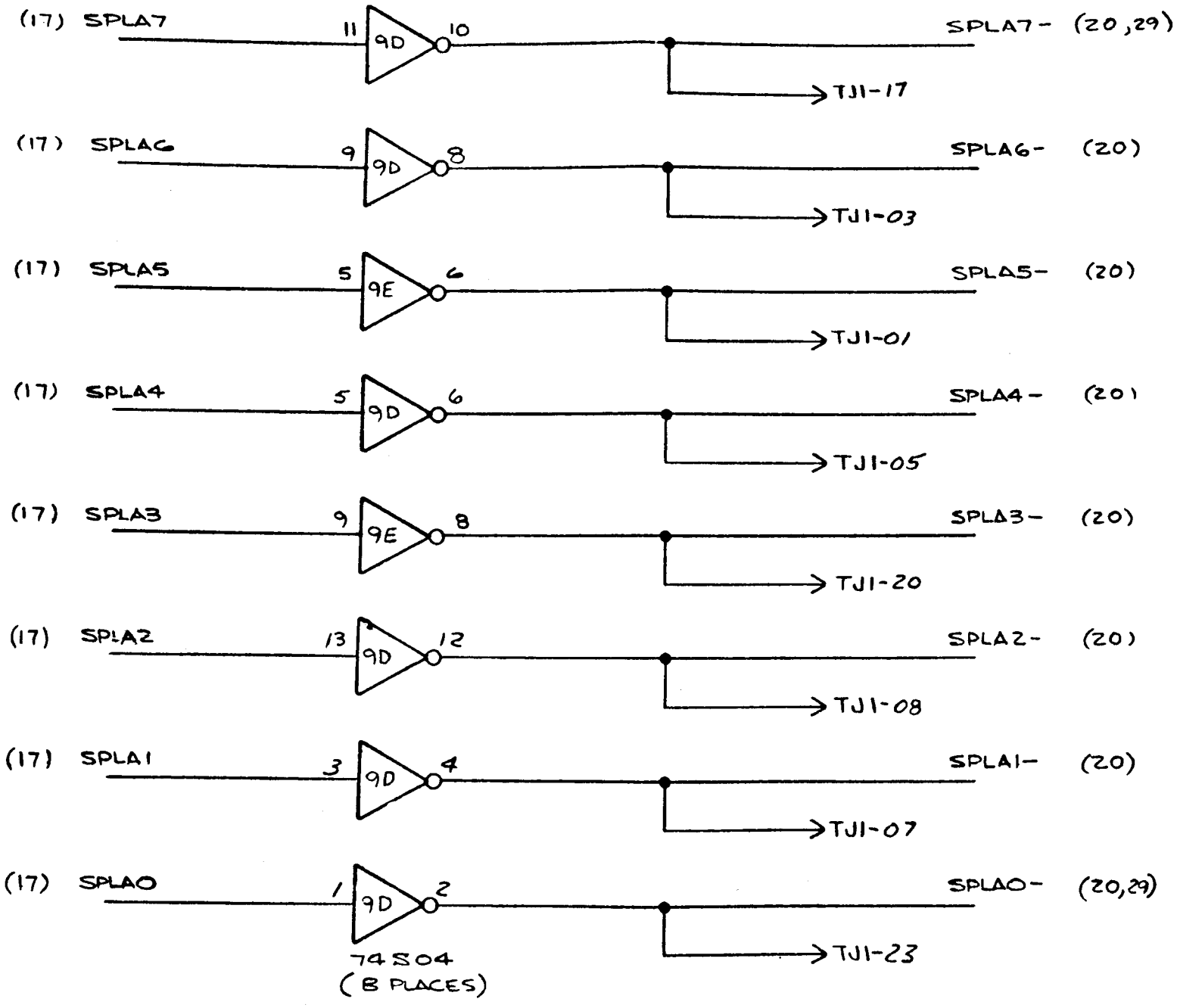
basic/four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 17 OF 35



SCRATCH PAD O

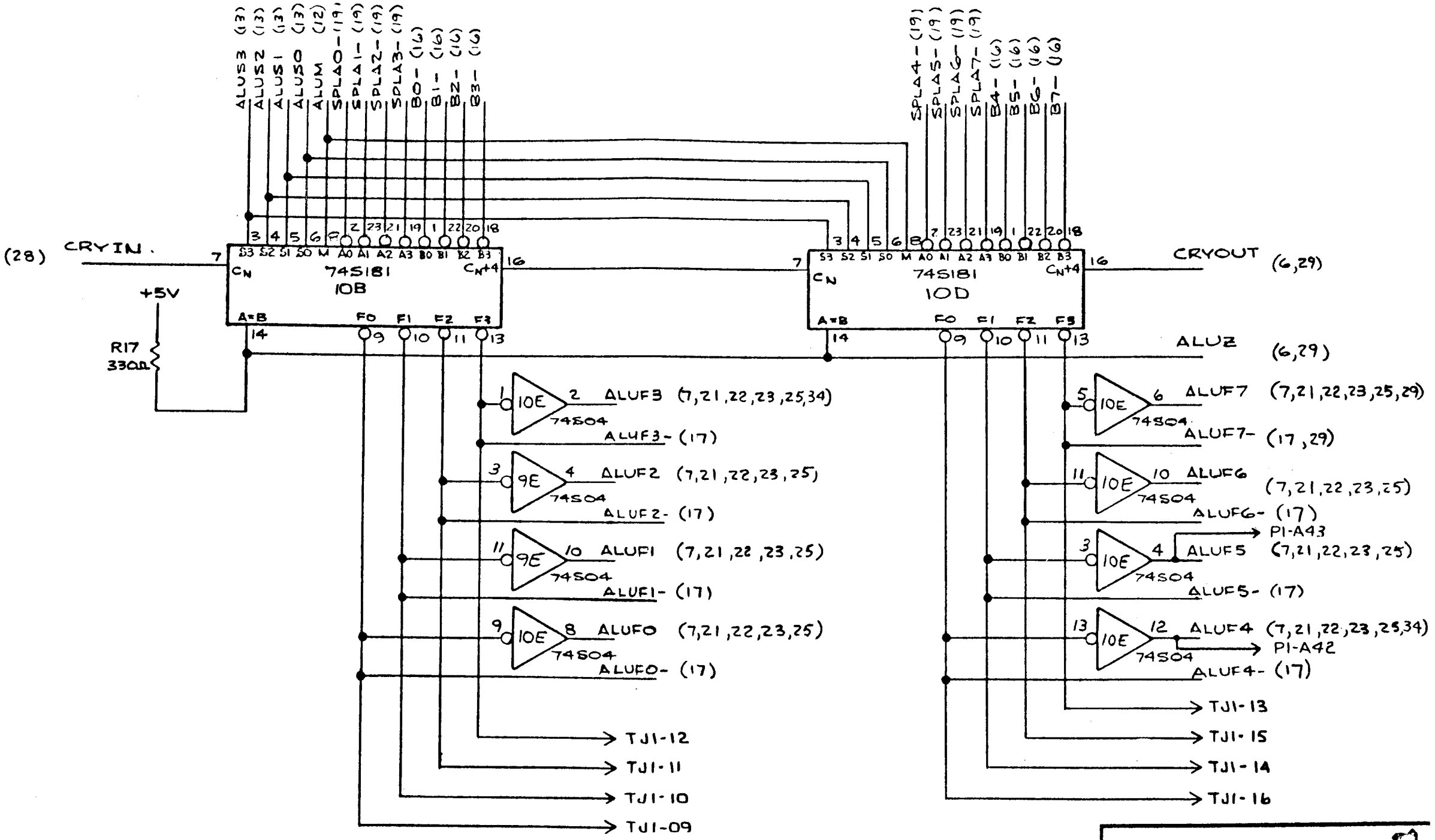
basic / four corporation		
SIZE B	DWG NO 903045	REV B
	SCALE —	SH 18 OF 25



SCRATCH PAD BUFFERS

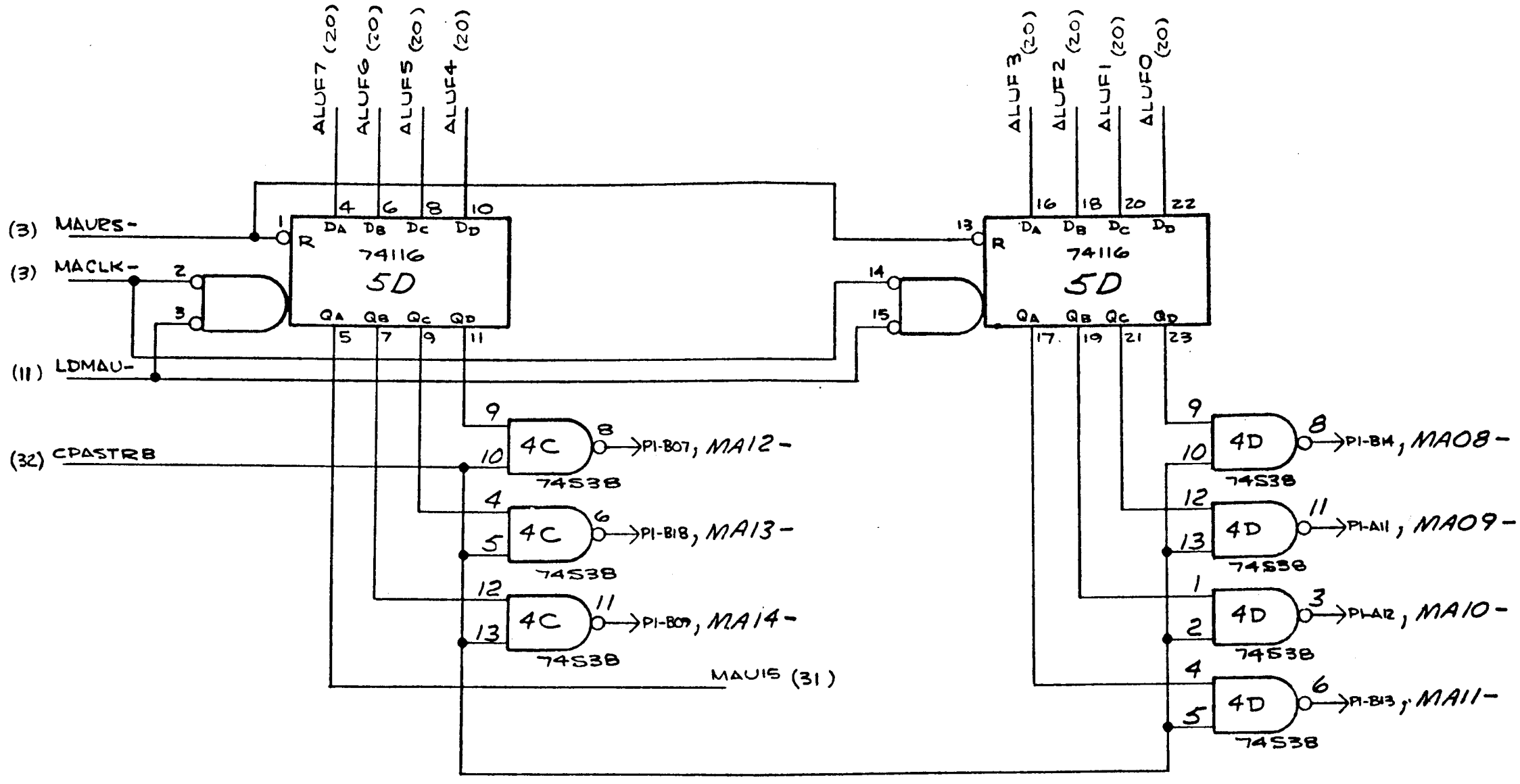
basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 19 OF 35



basic / four corporation

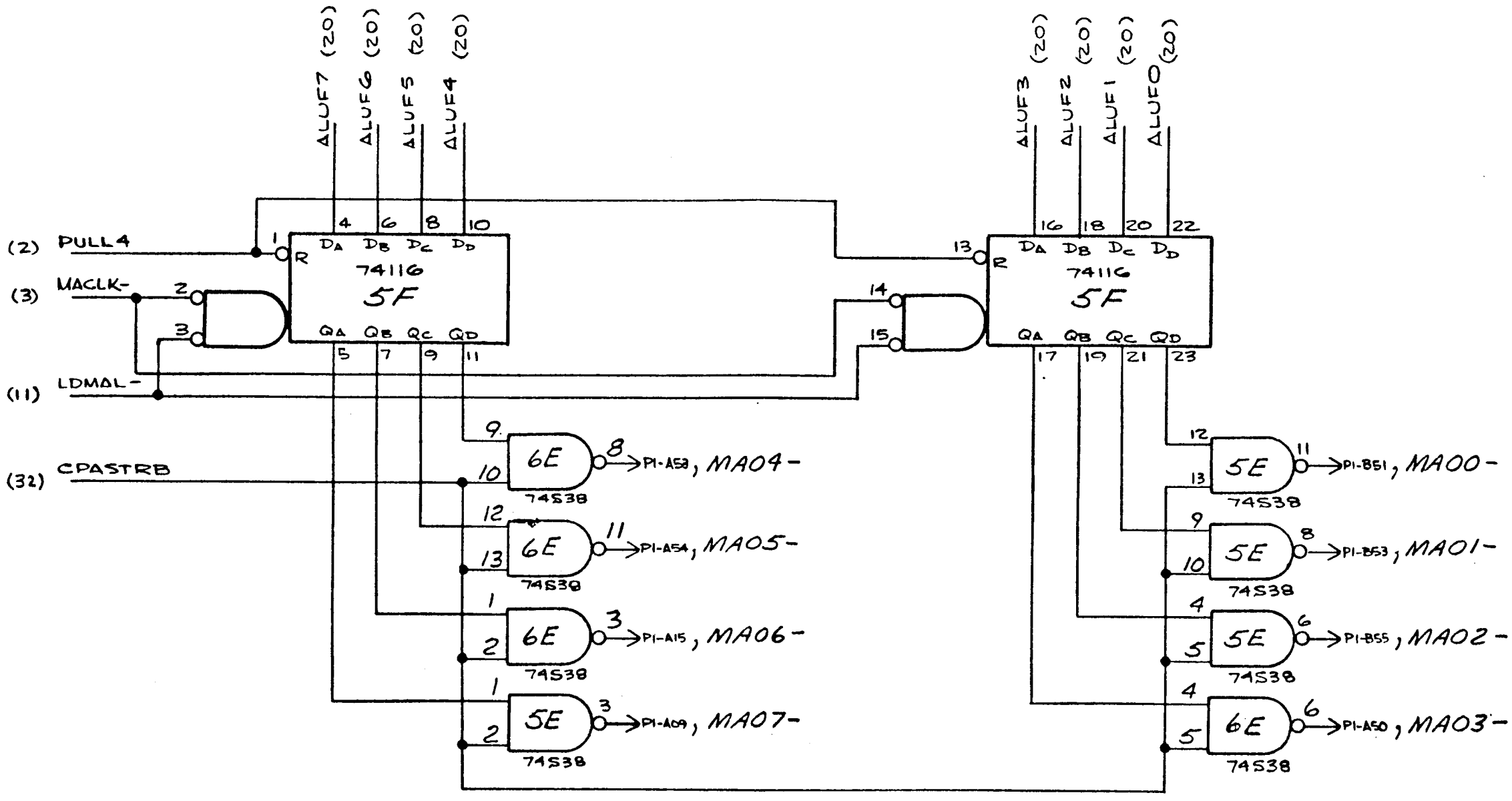
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 20 OF 34



MAU REGISTER

basic / four corporation

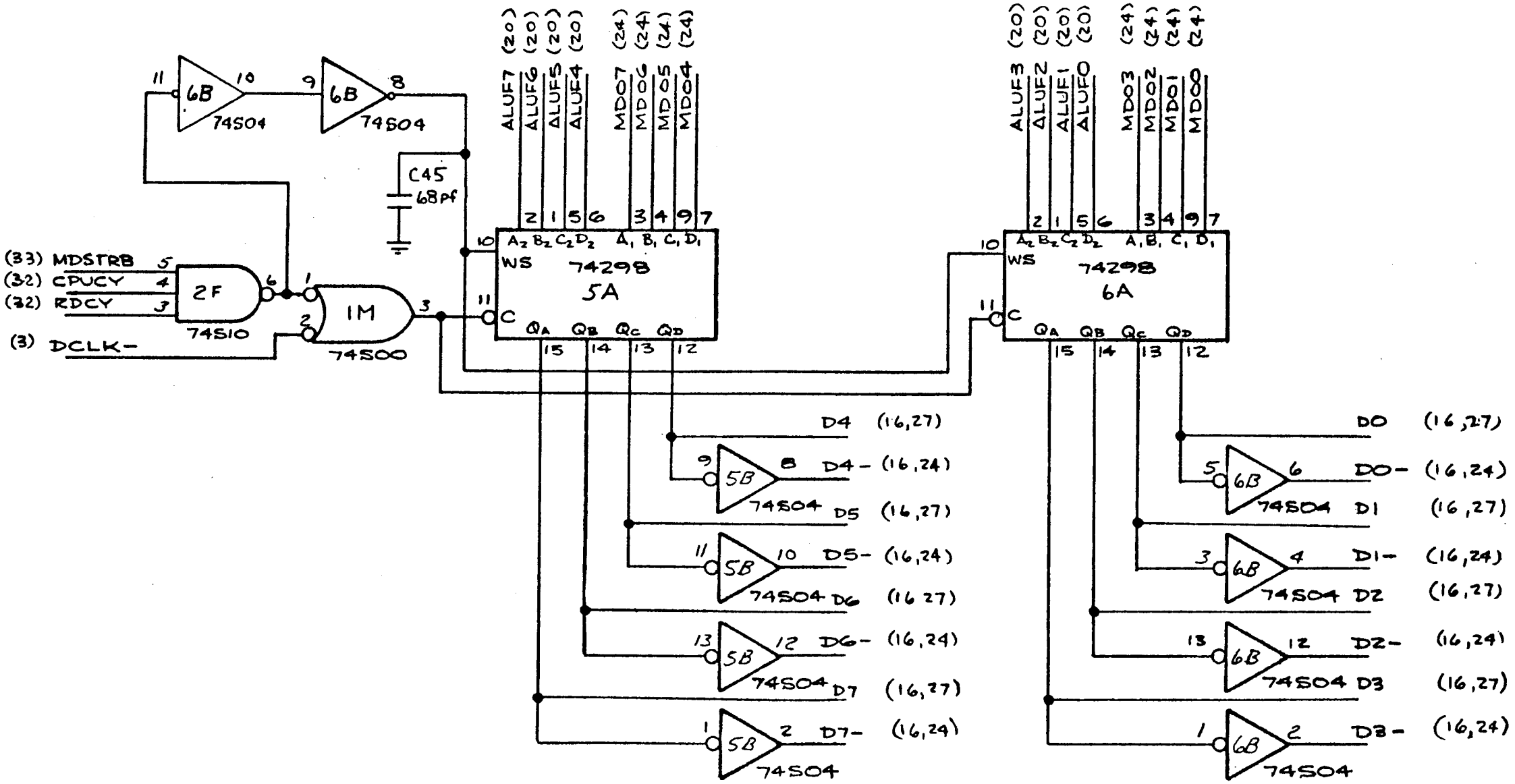
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 21 OF 35



MAL REGISTER

basic / four corporation

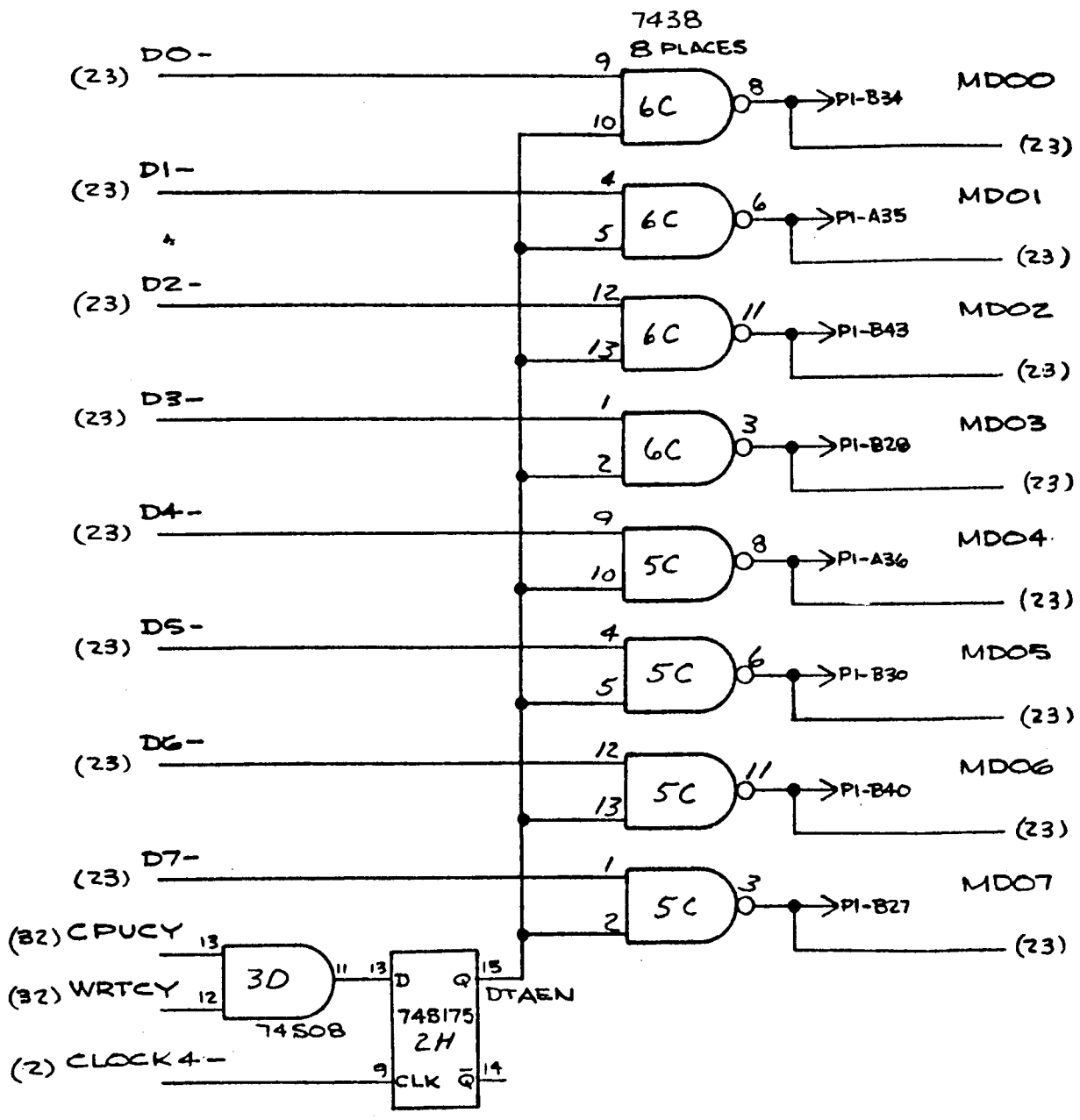
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 22 OF 35



D REGISTER

basic/four corporation

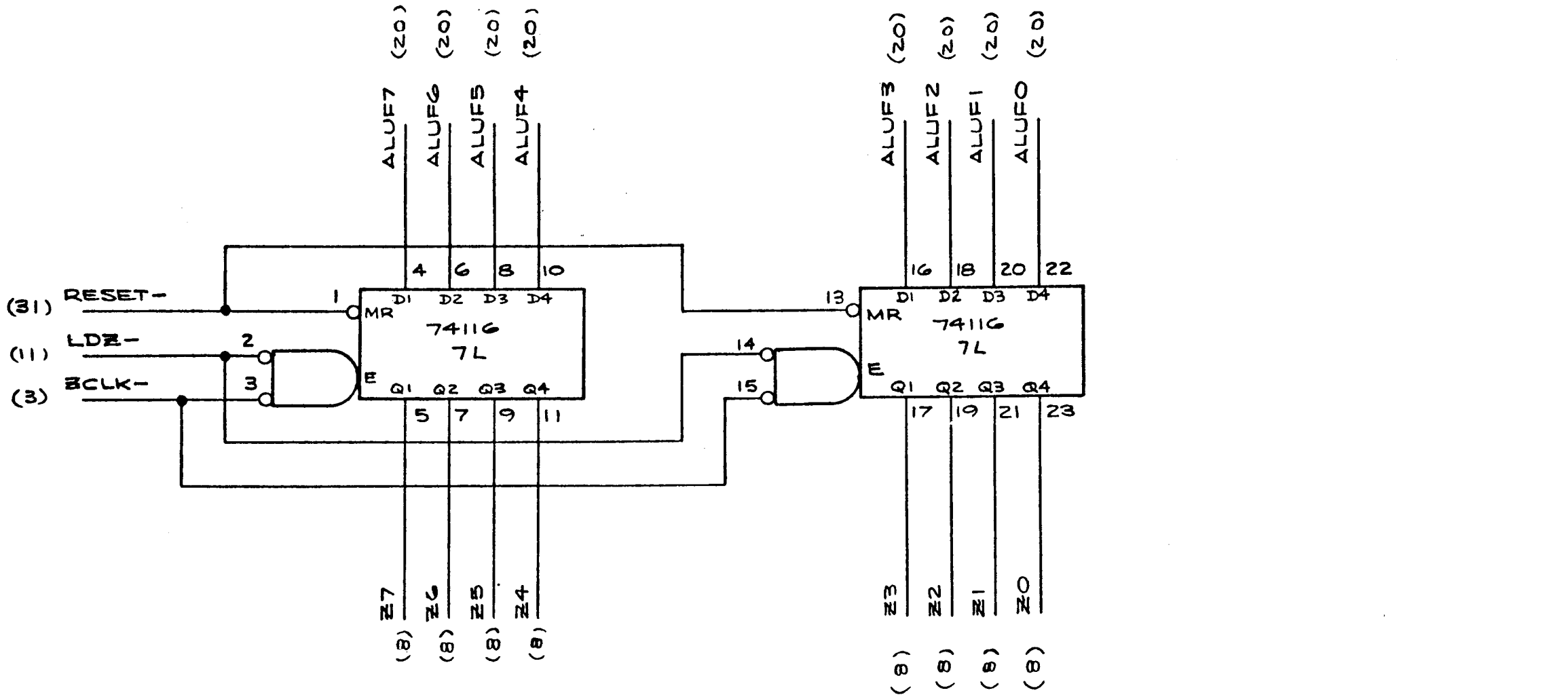
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 23 OF 35



MEMORY DATA DRIVERS

basic / four corporation

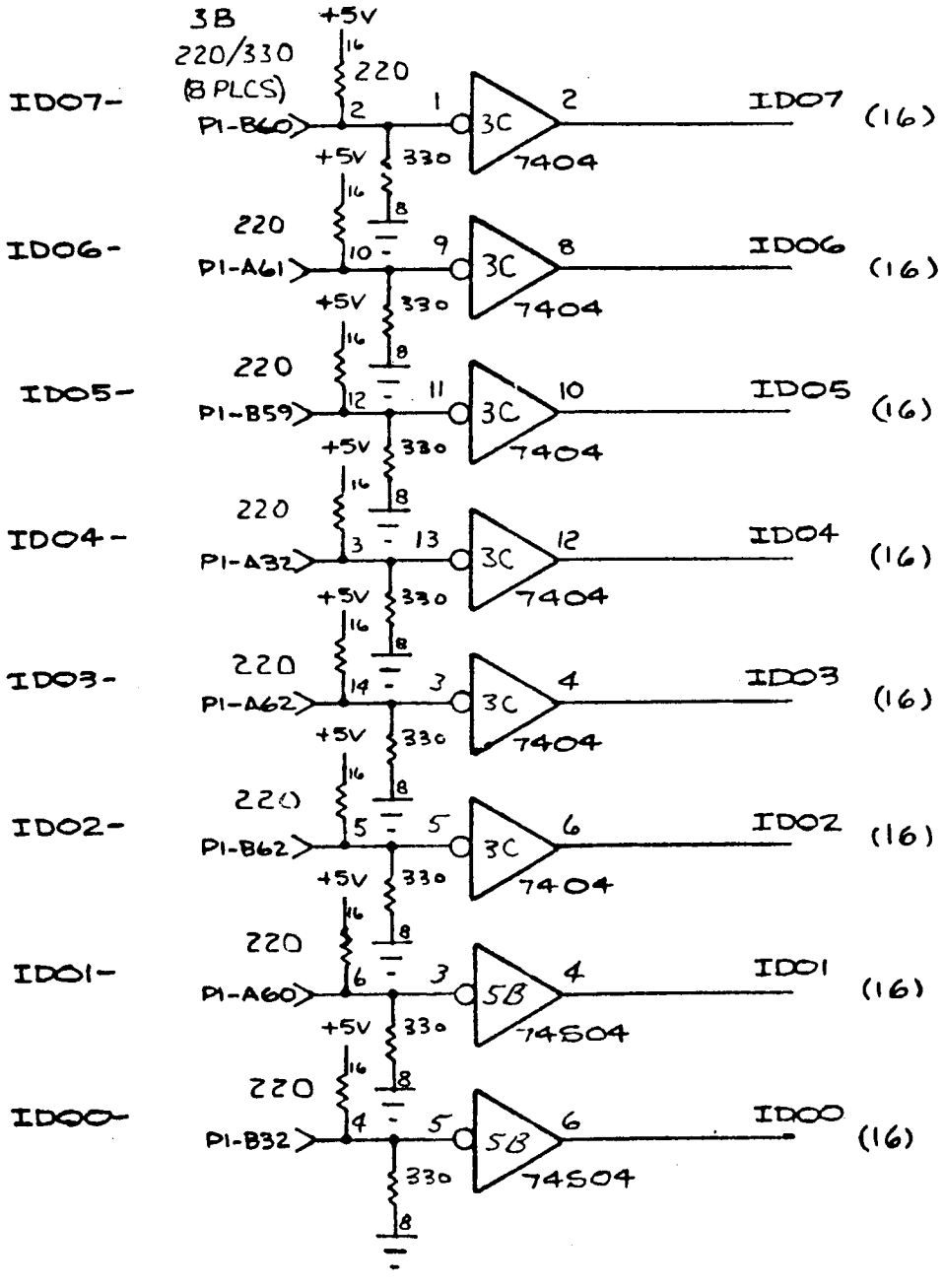
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 24 OF 55



Z REGISTER

basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 25 OF 35

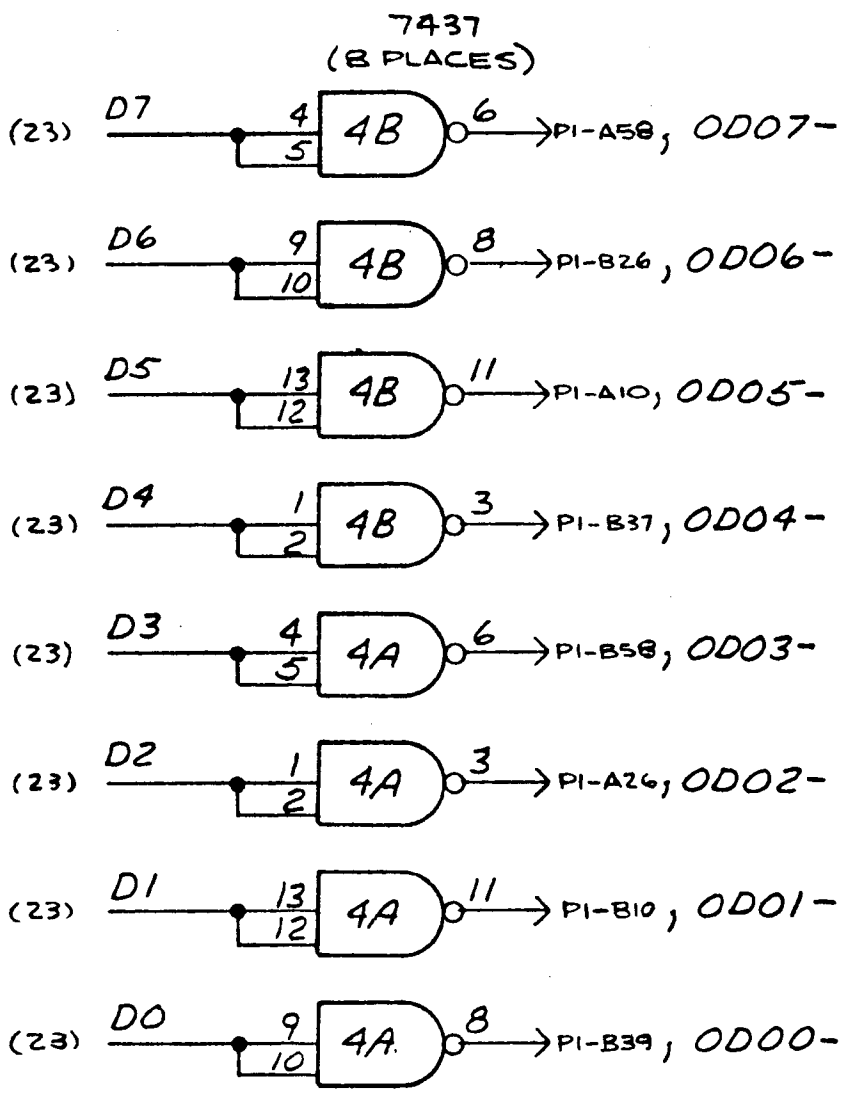


INPUT DATA BUS

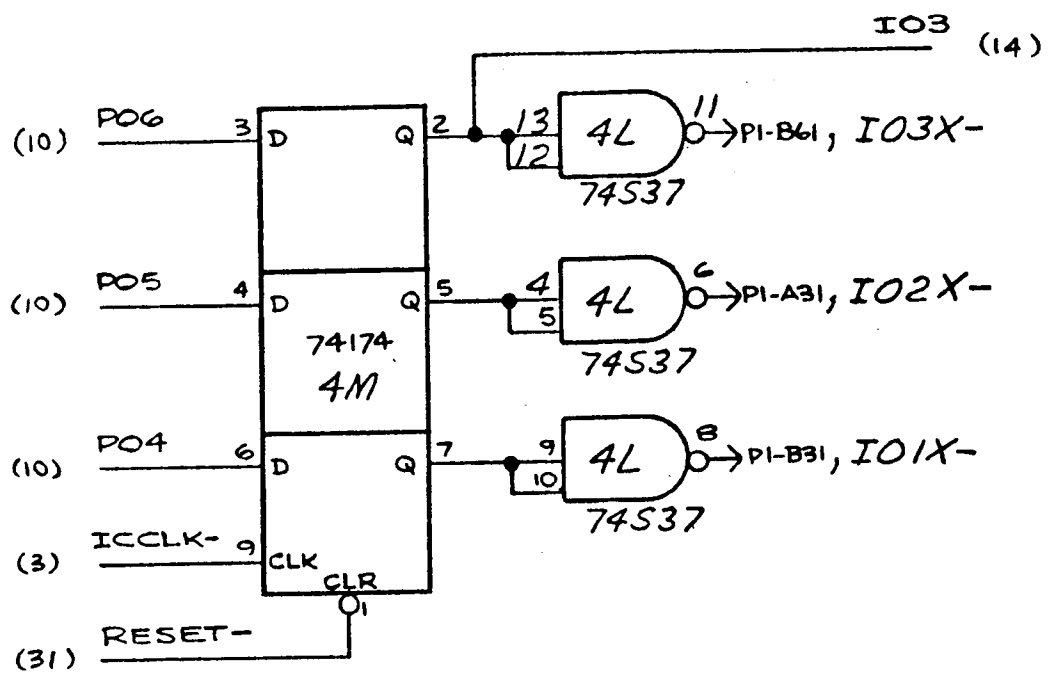
basic / four corporation

SIZE	DWG NO	REV
B	903045	B

SCALE —



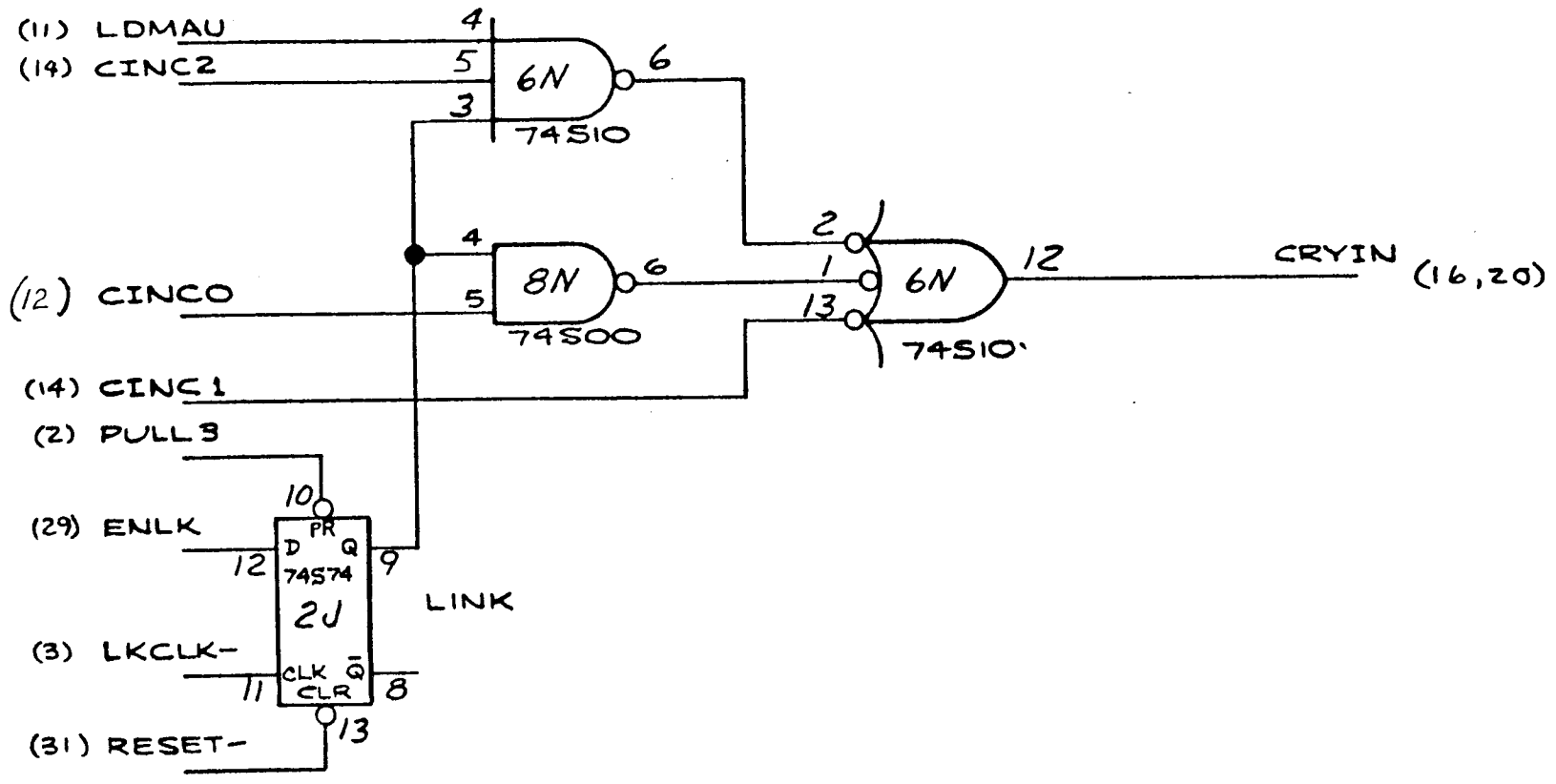
OUTPUT DATA BUS



IC REGISTER

basic / four corporation

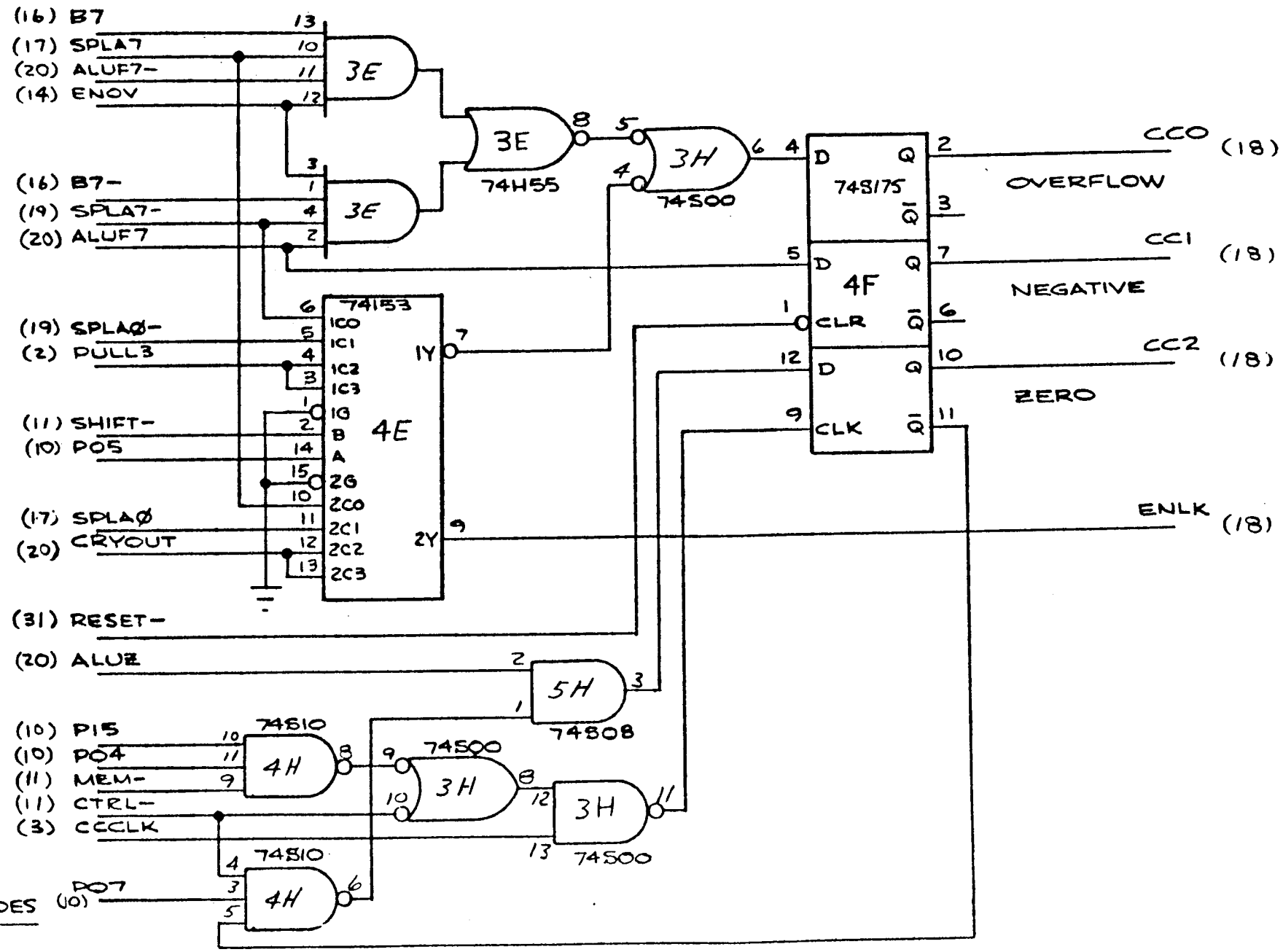
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 27 OF 35



LINK AND CARRY LOGIC

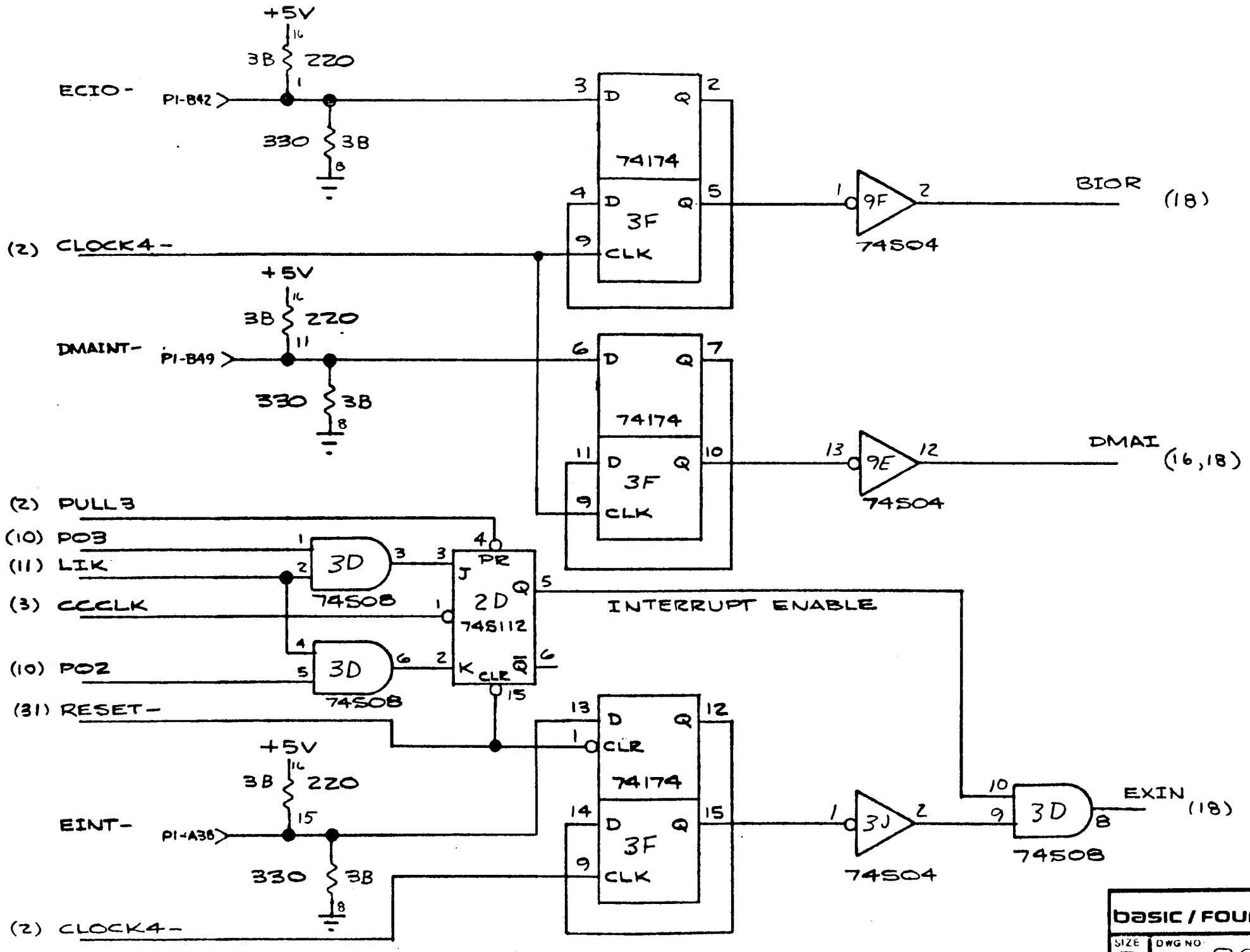
basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 28 OF 35



basic / four corporation

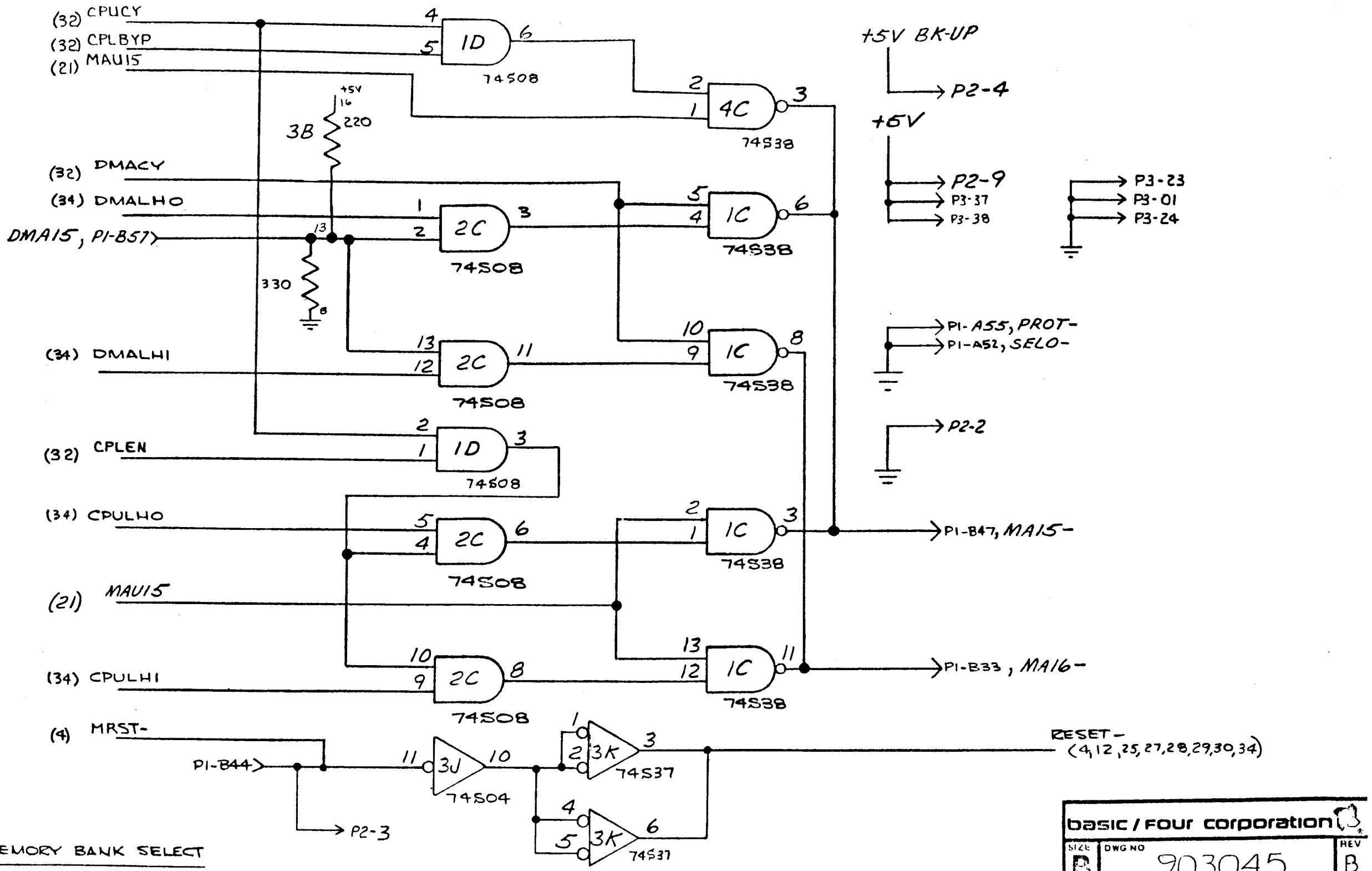
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 29 OF 35



INTERRUPT LOGIC

basic / four corporation

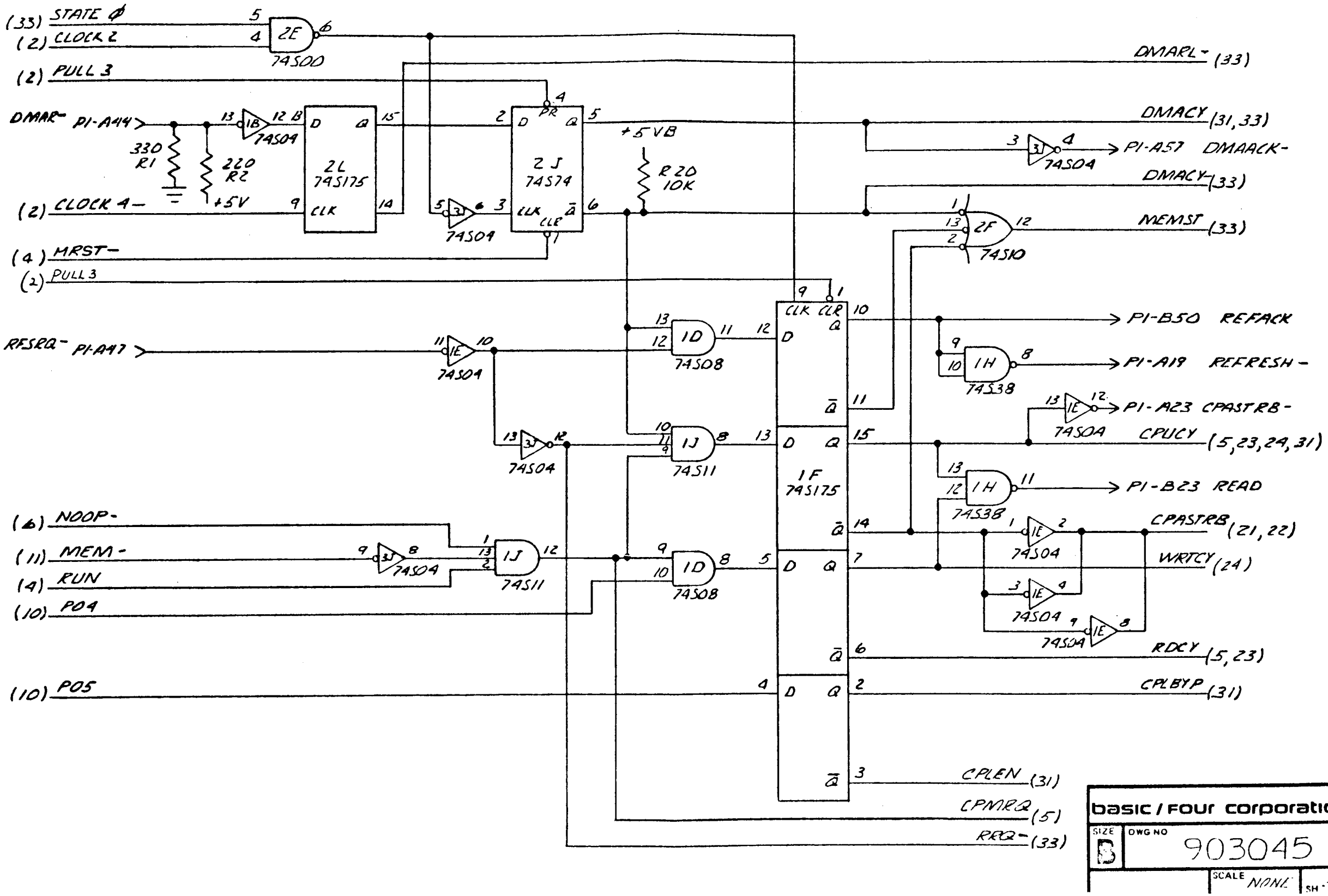
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 30 OF 35



MEMORY BANK SELECT

basic / four corporation

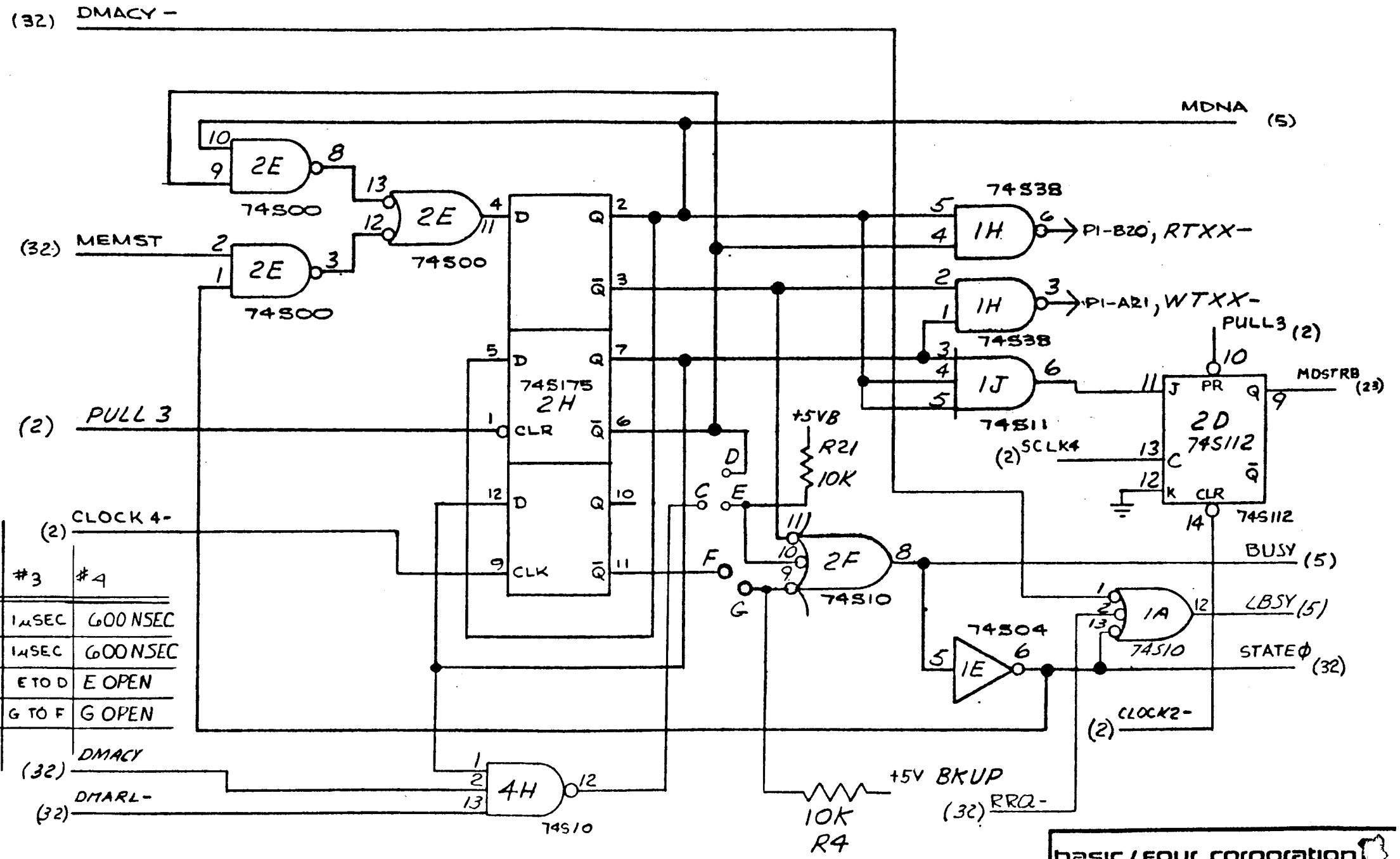
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 31 OF 35



basic / four corporation

SIZE	DWG NO	REV
B	903045	B

SCALE NONE SH 32 OF 35

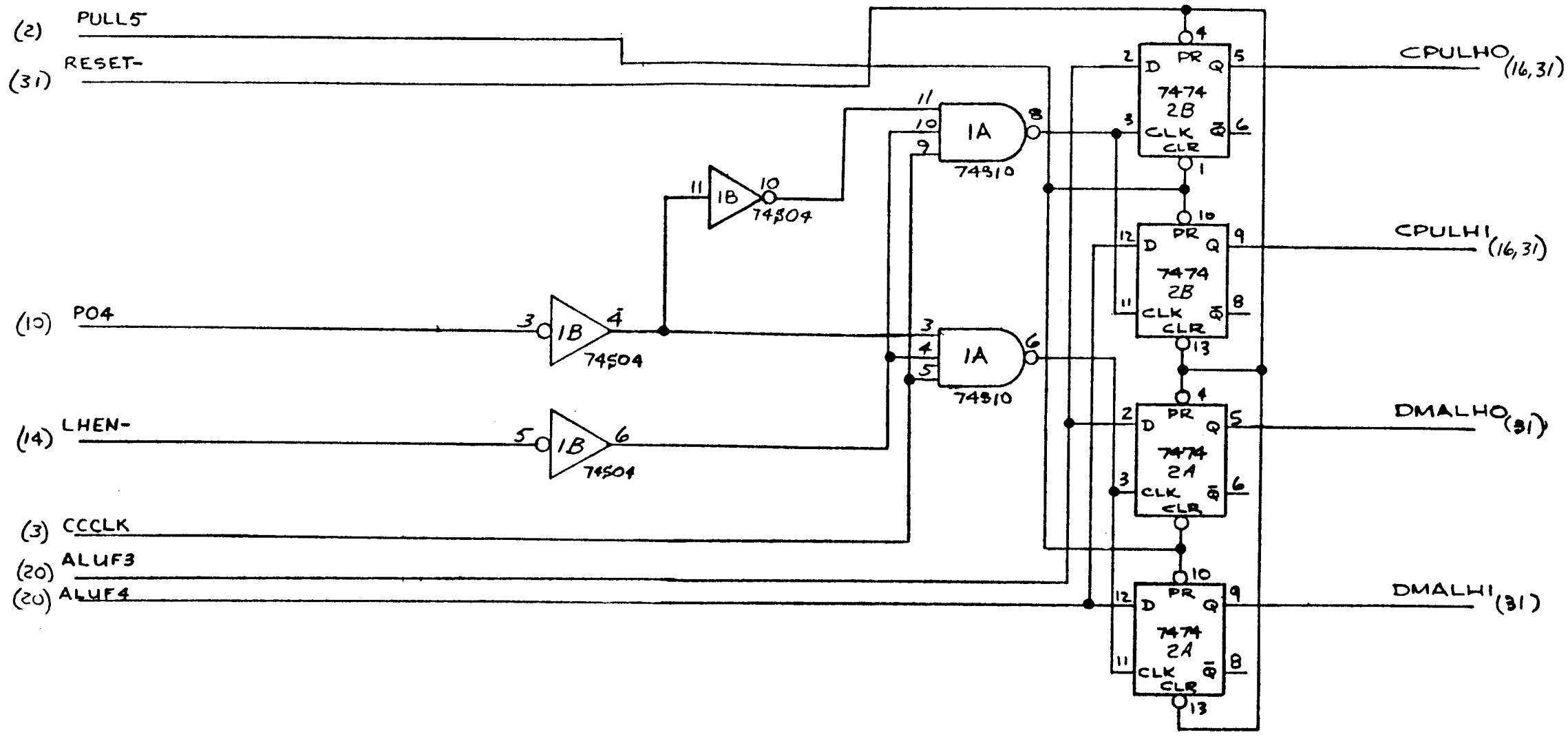


OPTION / CYCLE	#1	#2	#3	#4
CPU	600 NSEC	800 NSEC	1μSEC	600 NSEC
DMA	800 NSEC	800 NSEC	1μSEC	600 NSEC
CONNECT	E TO C	E TO D	E TO D	E OPEN
	G OPEN	G OPEN	G TO F	G OPEN

MEMORY CONTROL

basic / four corporation

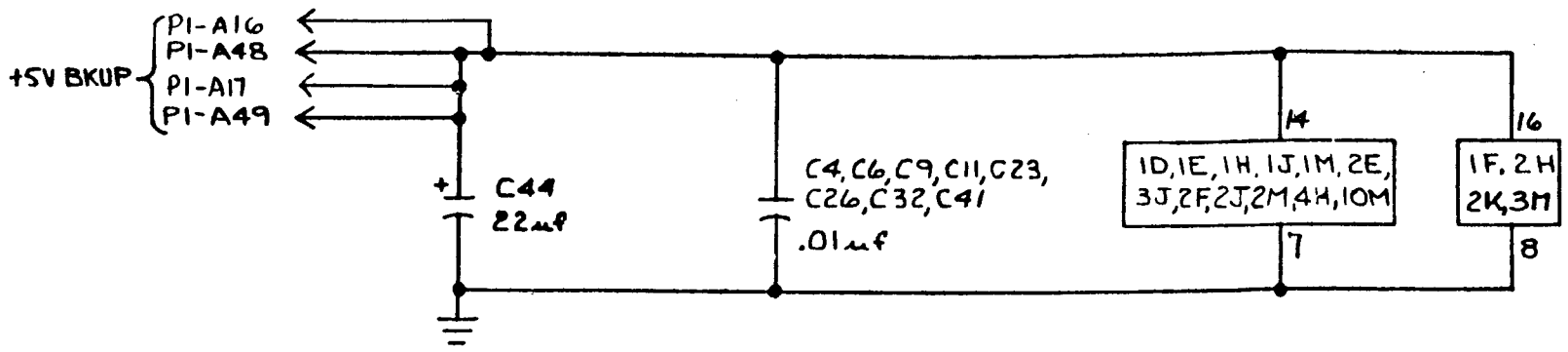
SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 33 OF 95

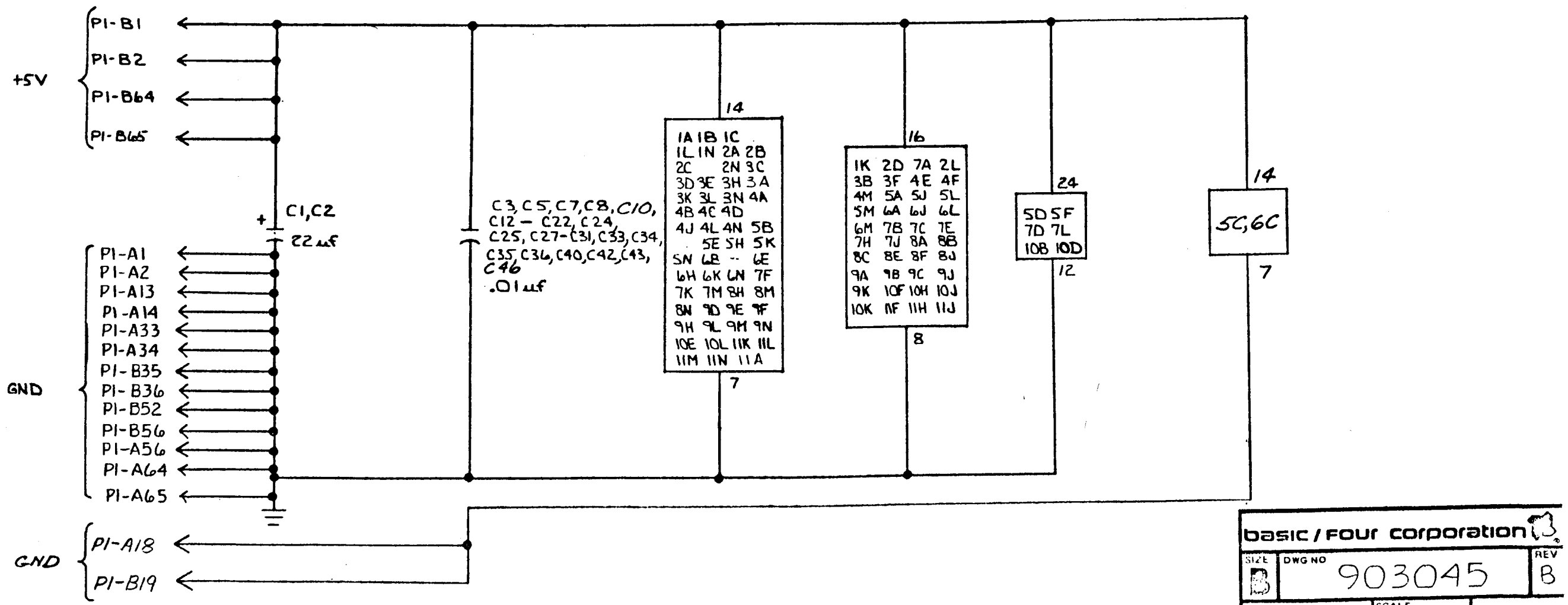


MEMORY BANK LATCHES

basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 34 OF 35



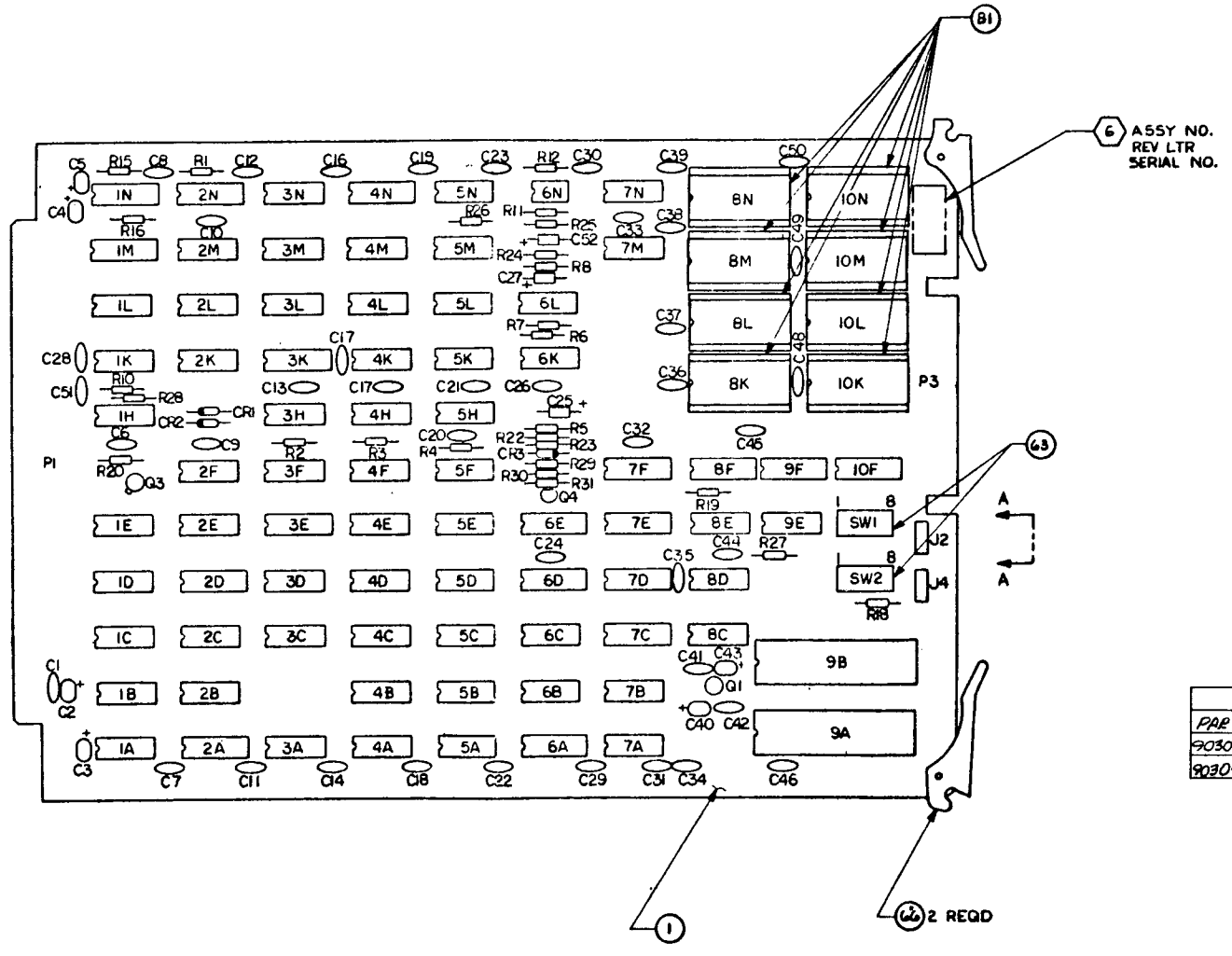


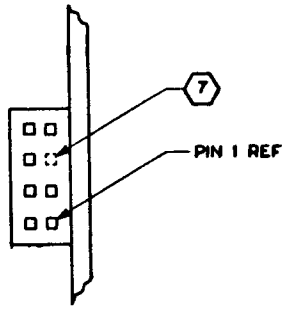
basic / four corporation

SIZE	DWG NO	REV
B	903045	B
	SCALE —	SH 35 OF 35

1. REF LOGIC DIAGRAM 901434, BASIC & 903150 FOR -001
2. REF BOARD DETAIL 901431
3. MARK DESIGNATION APPROXIMATLY WHERE SHOWN PER BFC SPECIFICATION 800000.
4. KEY J2 & J4 BY CLIPPING OFF PIN 5, PER VIEW A.

AX1	5/25	PROTOTYPE RELEASE	[illegible]	[illegible]
AX1	6/29	PRE-PRODUCTION RELEASE	[illegible]	[illegible]
AX2	[illegible]	SEE ECN	[illegible]	[illegible]
AX3	2161	SEE ECN	[illegible]	[illegible]
AX4	[illegible]	REVISED PROMS	[illegible]	[illegible]
AX5	2661	ADDED -001 VERSION	[illegible]	[illegible]
AX6	2315	PL CHG ONLY	[illegible]	[illegible]





VIEW A
2 PLACES (J2 & J4)
SCALE: NONE

TABULATION CHART	
PART NO	DESCRIPTION
903046	MODEL 1340
903046-001	MODEL 1345

OUTSTANDING ECN'S
3012
3089

REWORK PER ECN 2661 . (FOR -001 ONLY)

SEE PARTS LIST 903046

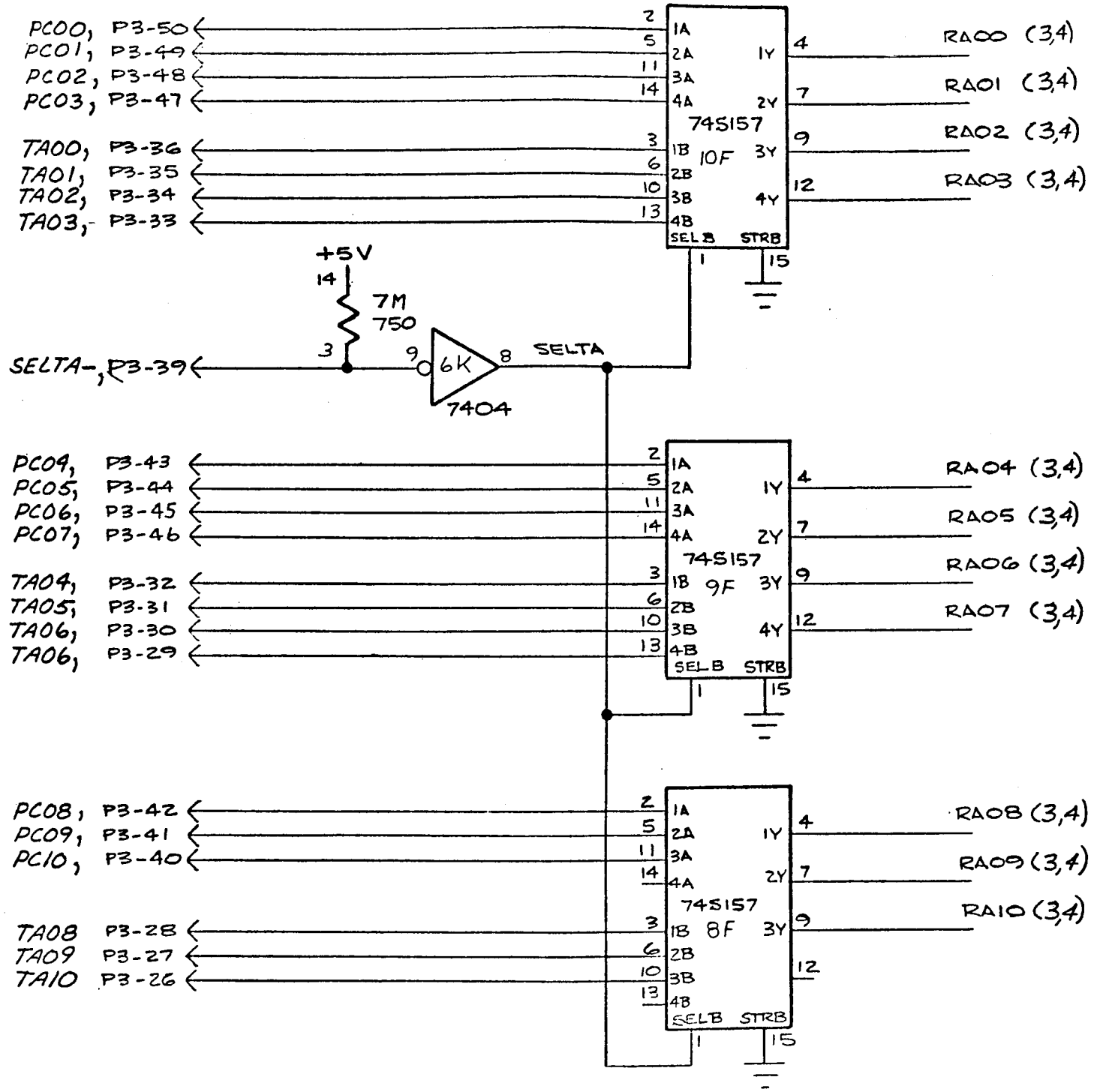
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	MACHINED SURFACES √	MFG	
				APP	

DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
X ± 1
XX ± .03
XXX ± .010
ANGLES ± 1.0°

basic/four corporation
1338 South Claudina Street Anaheim, California 92805

DRAWN	[illegible]	8-9-77
CHKD	[illegible]	8-10-77
ENG	[illegible]	8-10-77
MFG		
APP		

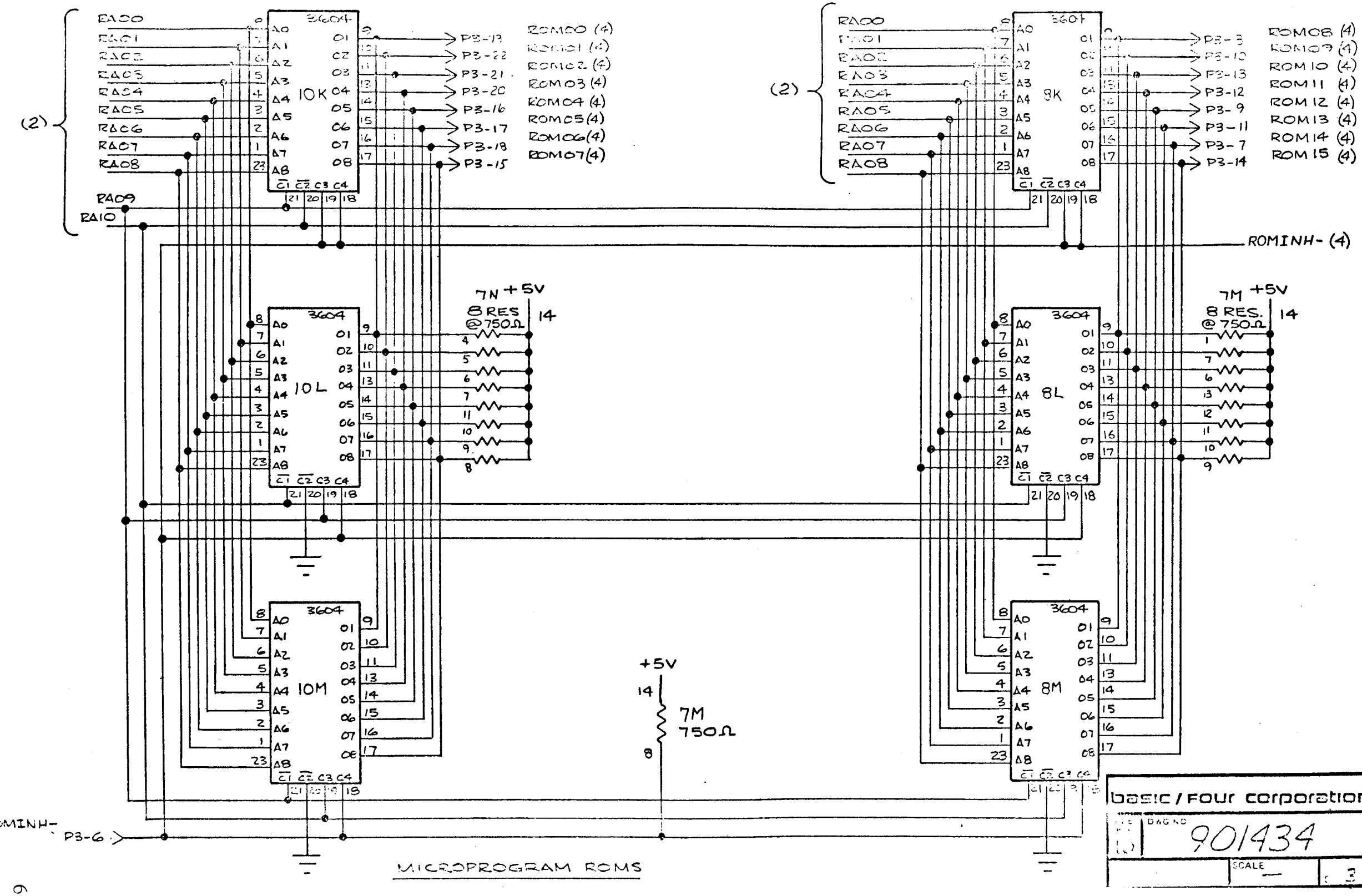
TITLE PCB ASSY, ACCESSORY BOARD, MODEL 1340 CPU
SIZE D DWG NO 903046 REV AX6
TABULATED SCALE — SH 1 OF 1



ROM ADDRESS MUX

basic / four corporation

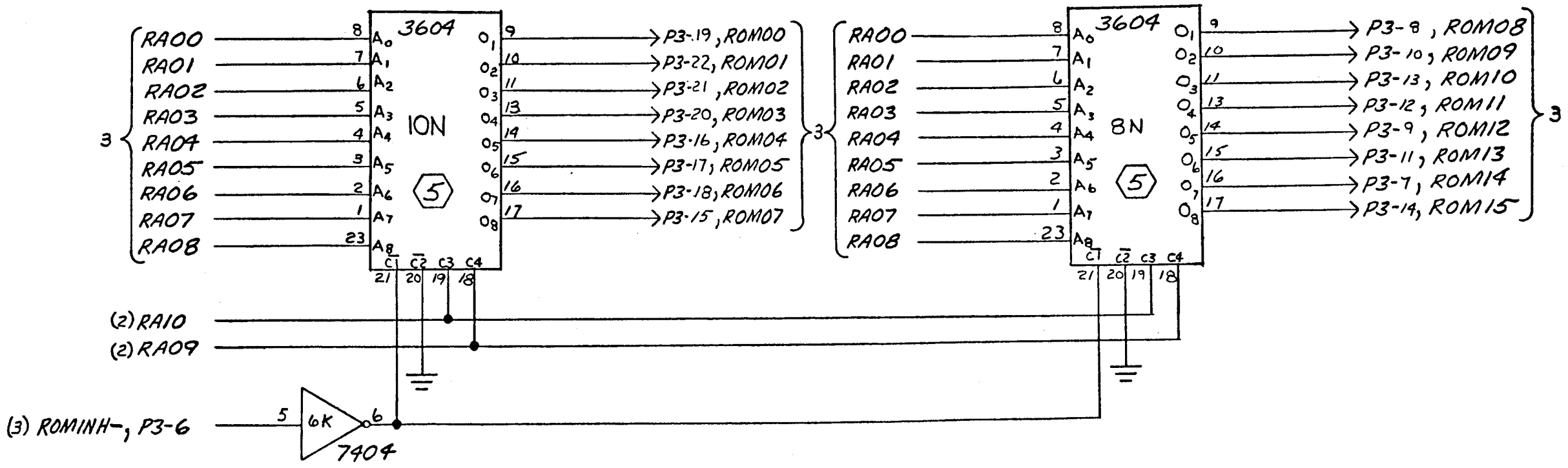
SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 2 OF 23



MICROPROGRAM ROMS

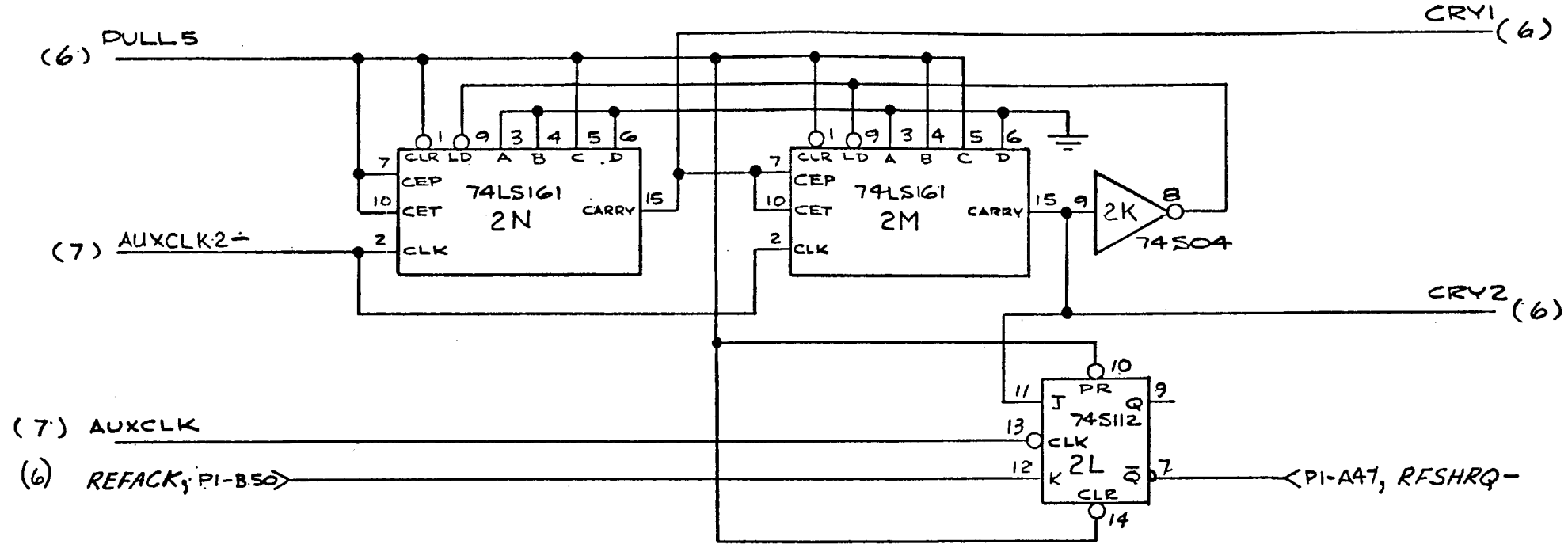
basic/four corporation

SIZE	DWG NO	REV
D	901434	H
	SCALE —	3 OF 23



basic / four corporation

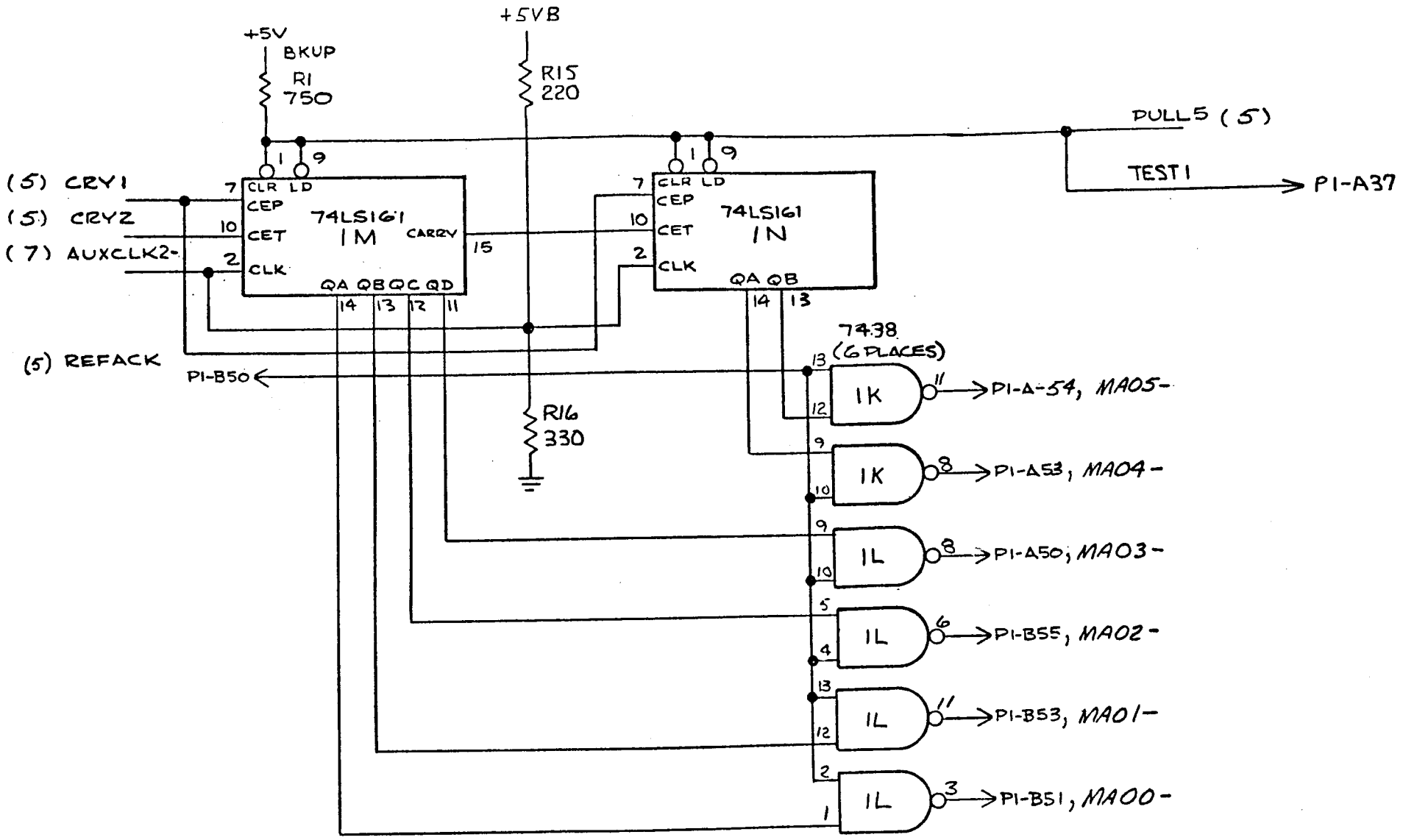
SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 4 OF 23



REFRESH LOGIC

basic / four corporation

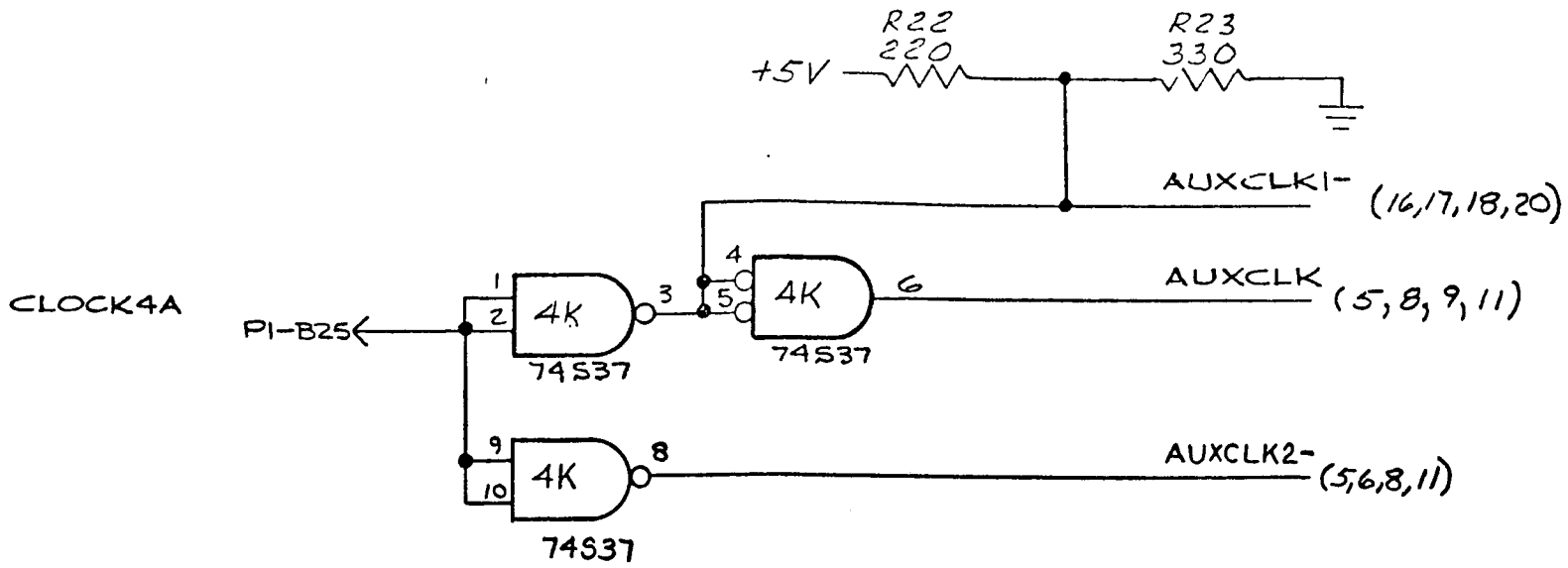
SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 5 OF 23

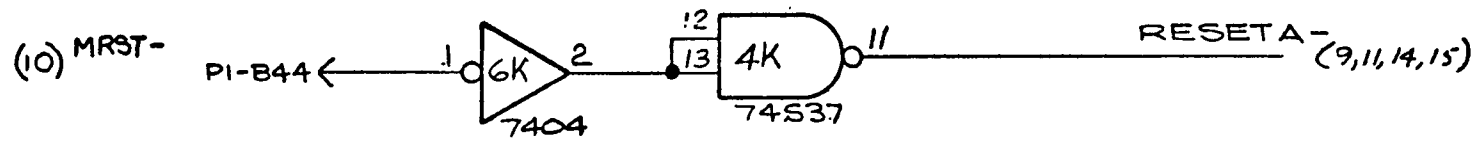


REFRESH LOGIC (Cont.)

basic / four corporation

SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 6 OF 29

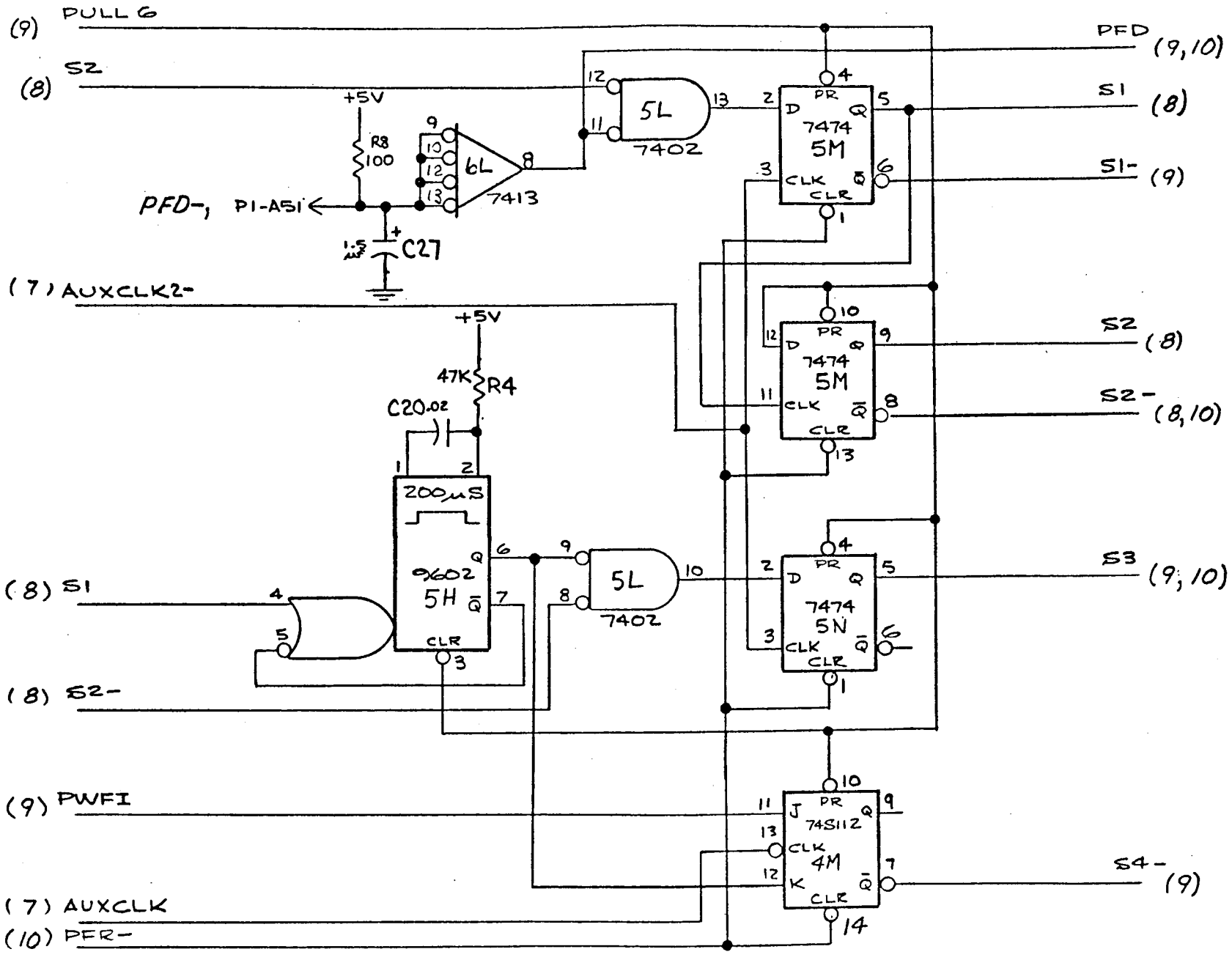




AUX. CLOCK AND RESET

basic / four corporation

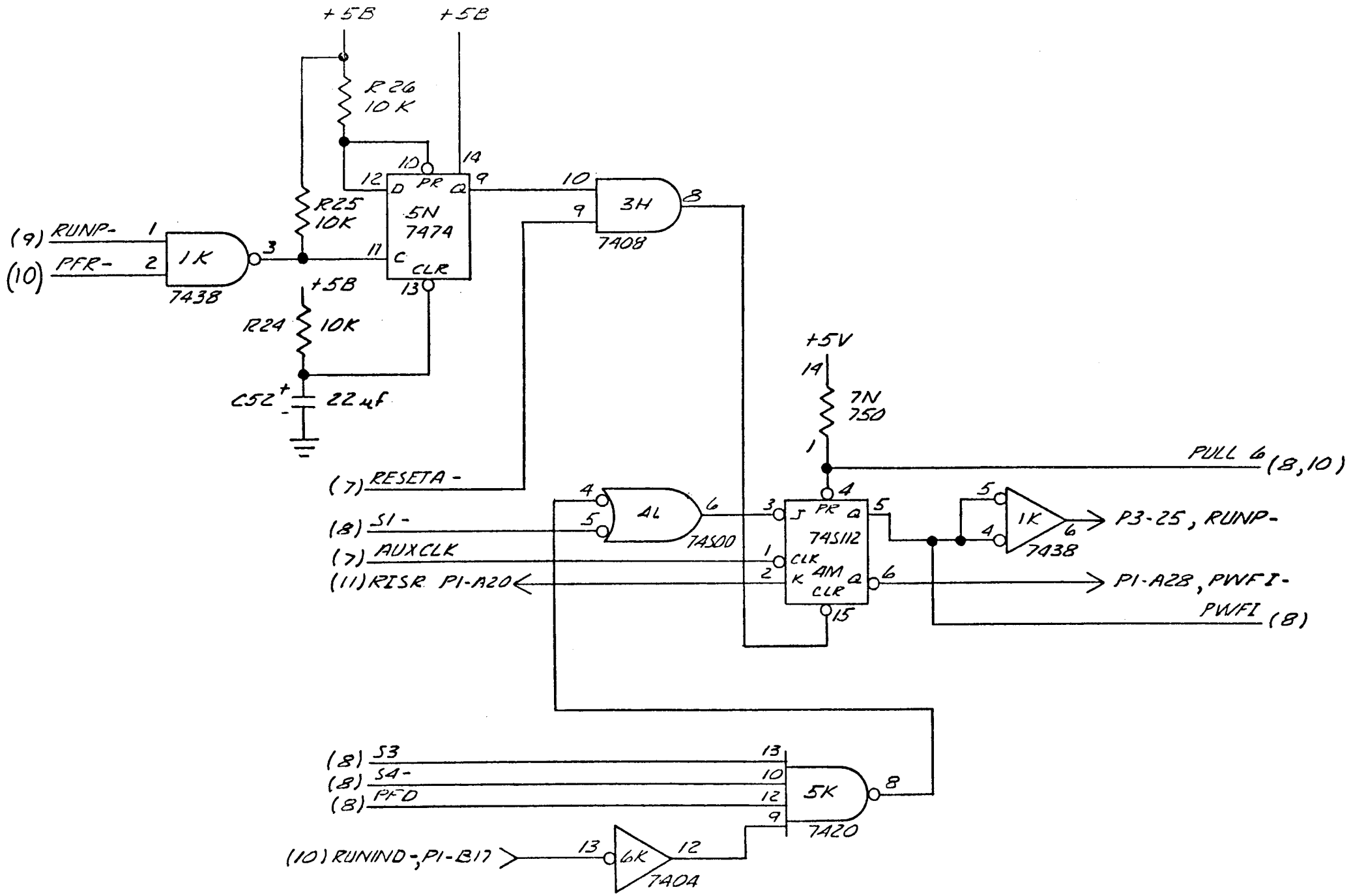
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 7 OF 23



POWER FAIL INTERRUPT

basic / four corporation

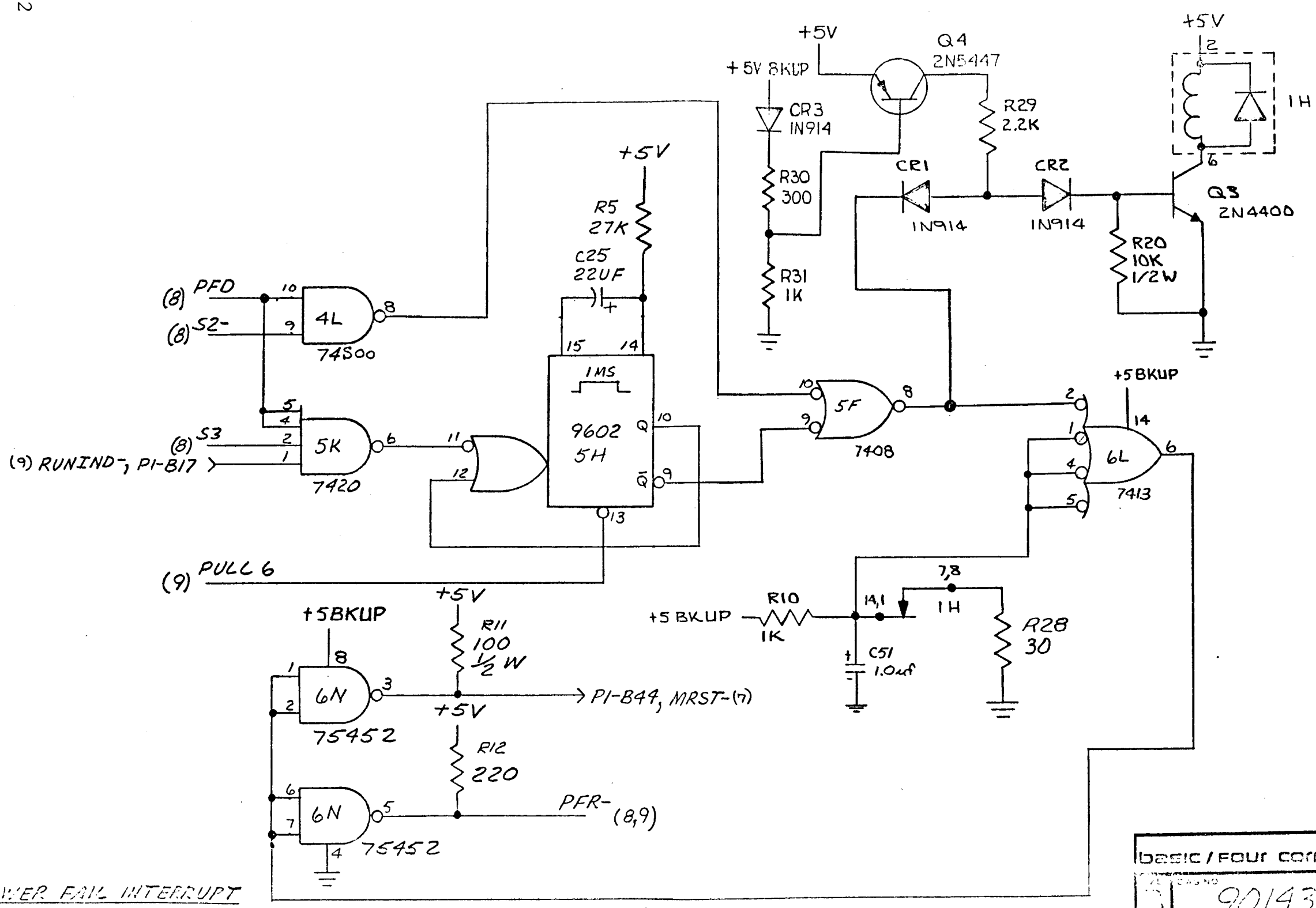
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 8 OF 23



POWER FAIL INTERRUPT (CONTINUED)

basic/four corporation

SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 9 OF 23

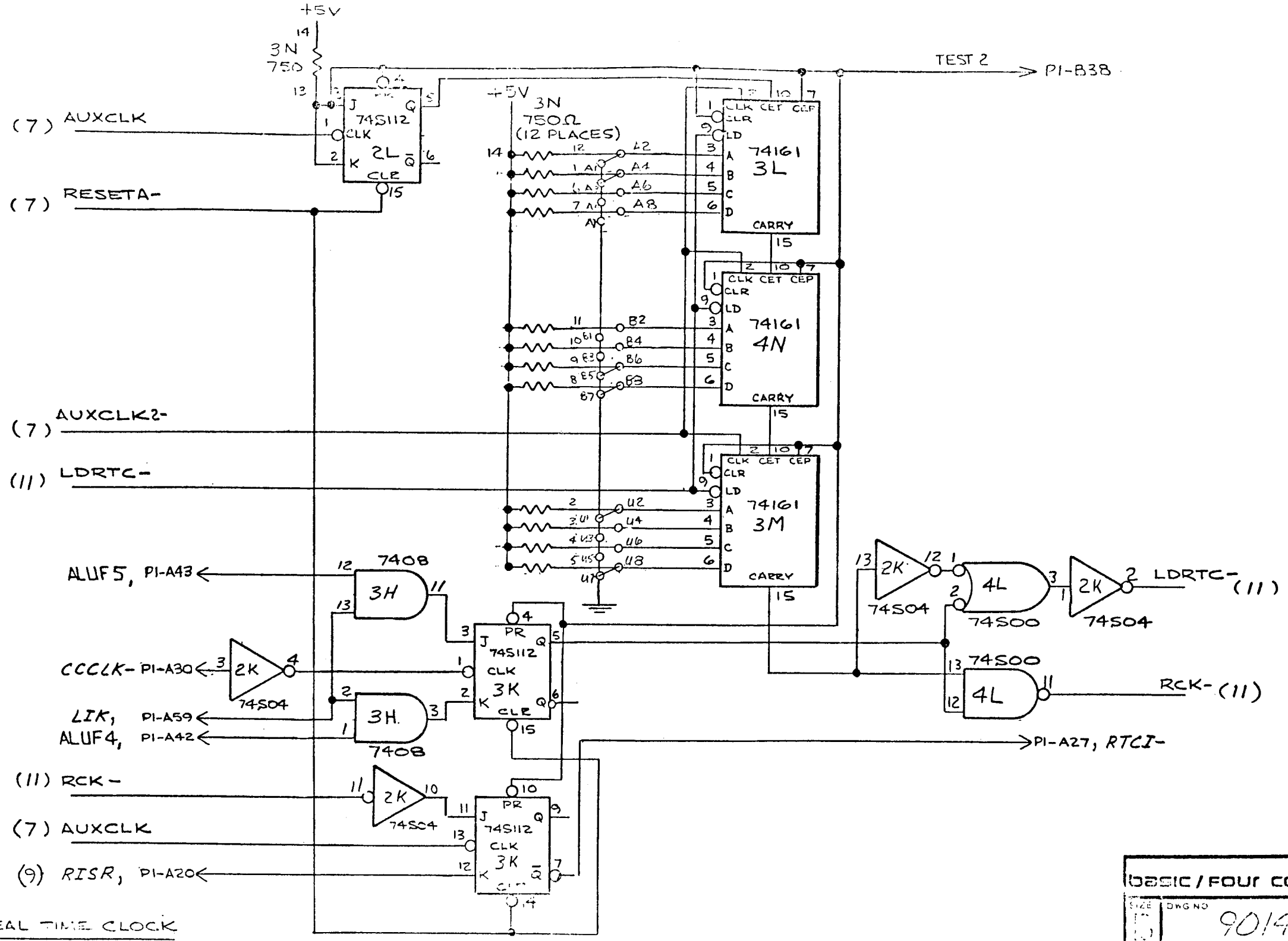


POWER FAIL INTERRUPT
(CONTINUED)

basic / four corporation

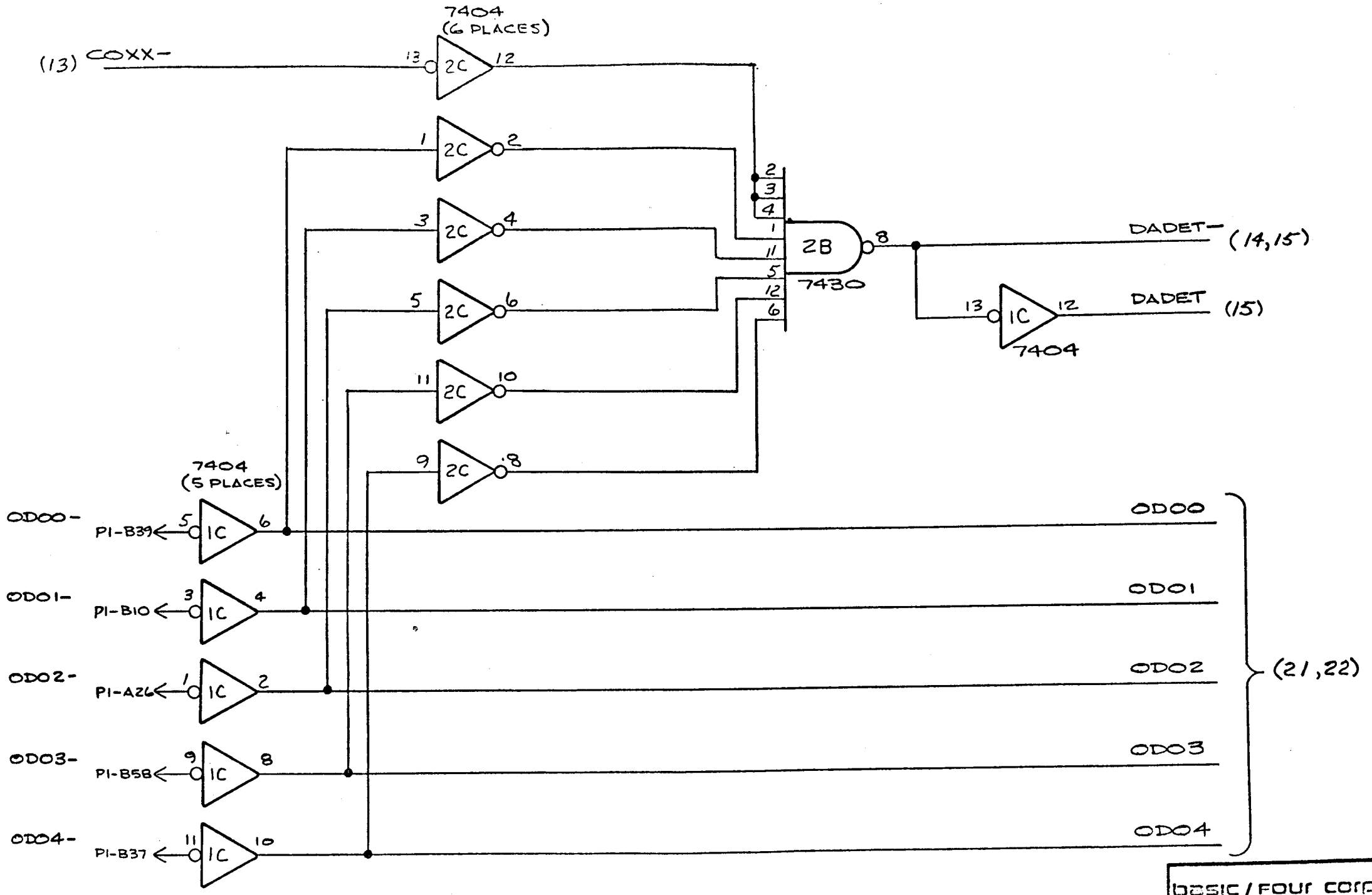
DWG NO	REV
901434	H

SCALE — SH 16 OF 23



basic / four corporation

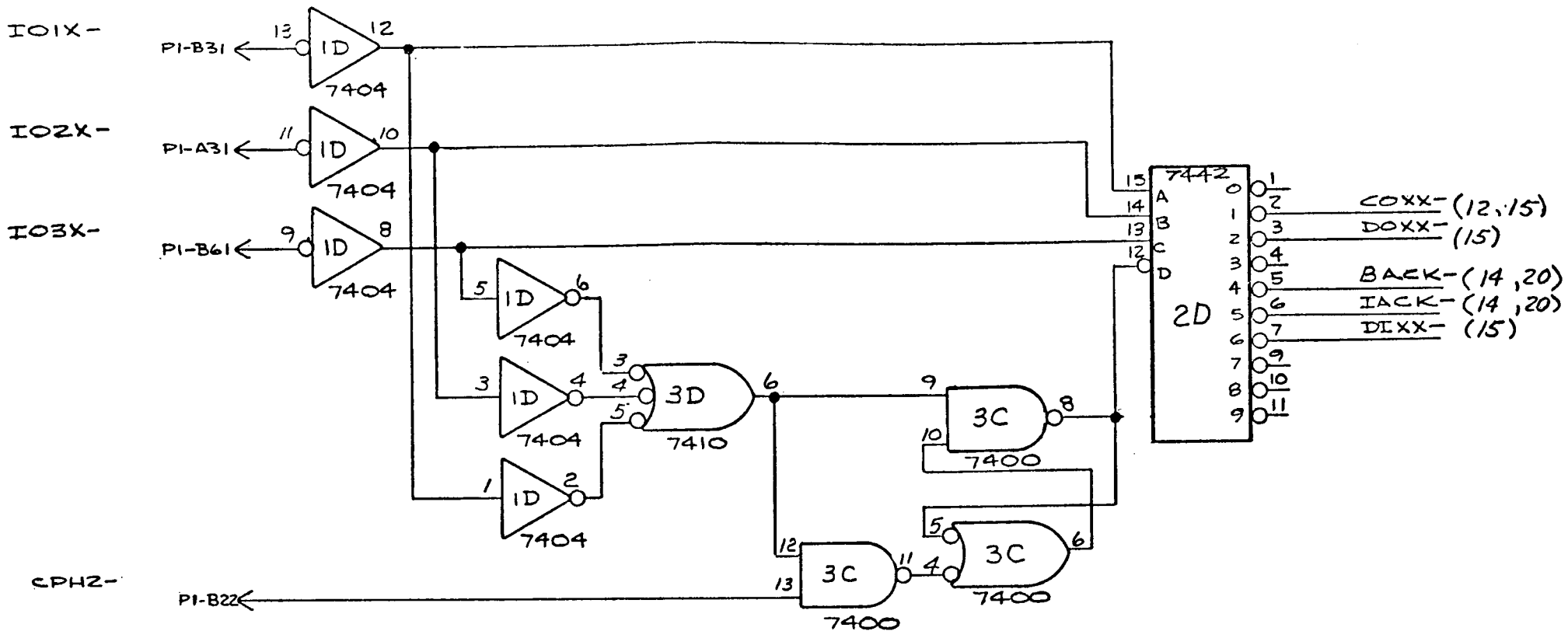
SIZE	DWG NO	REV
D	90134	H
	SCALE —	SH 11 OF 23



DUAL CHANNEL CONTROLLER - ADDRESS DETECT

basic / four corporation

SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 12 OF 23

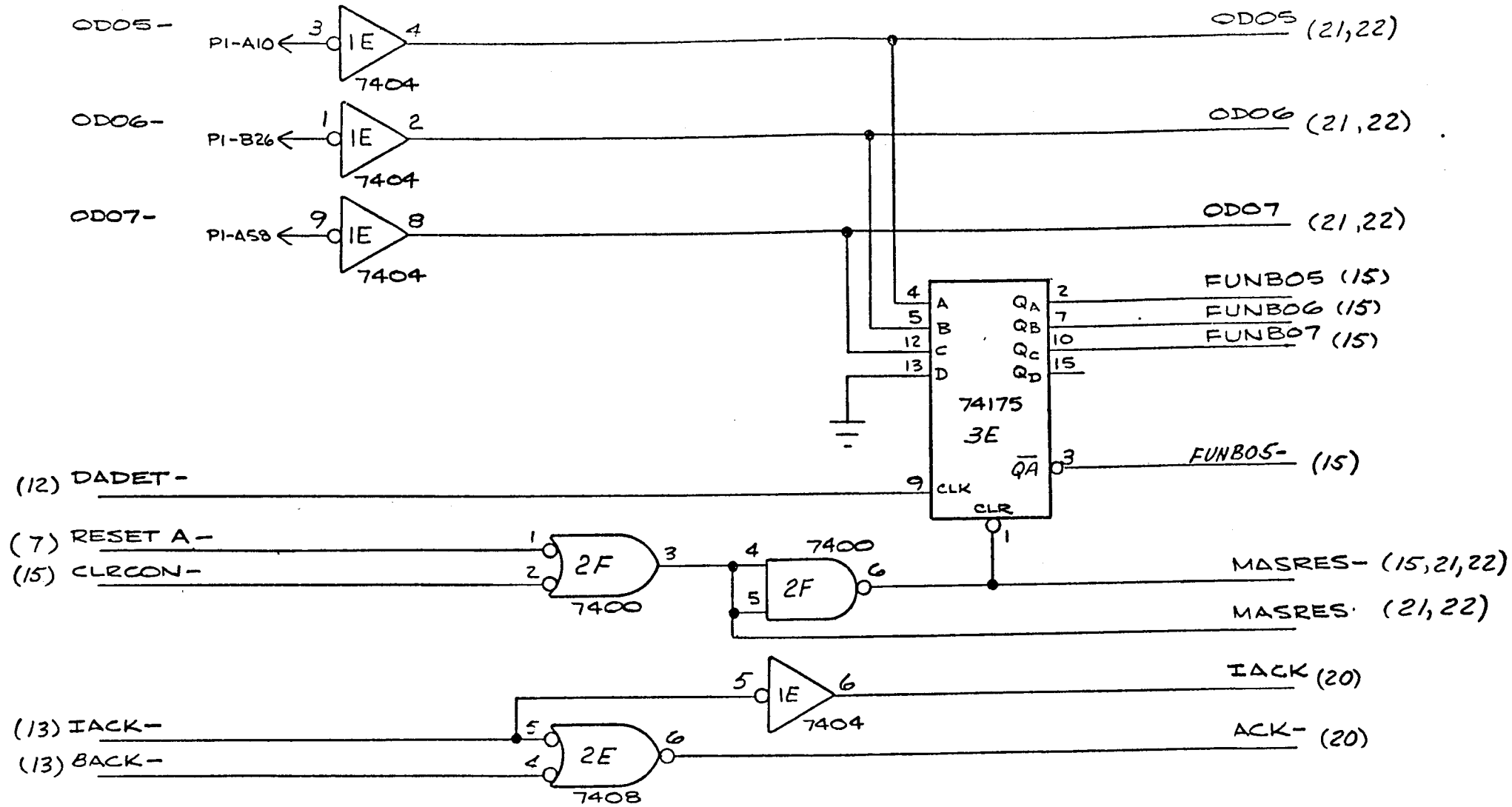


DUAL CHANNEL CONTROLLER - FUNCTION CONTROL

basic / four corporation

SIZE B | DWG NO 90/434 | REV H

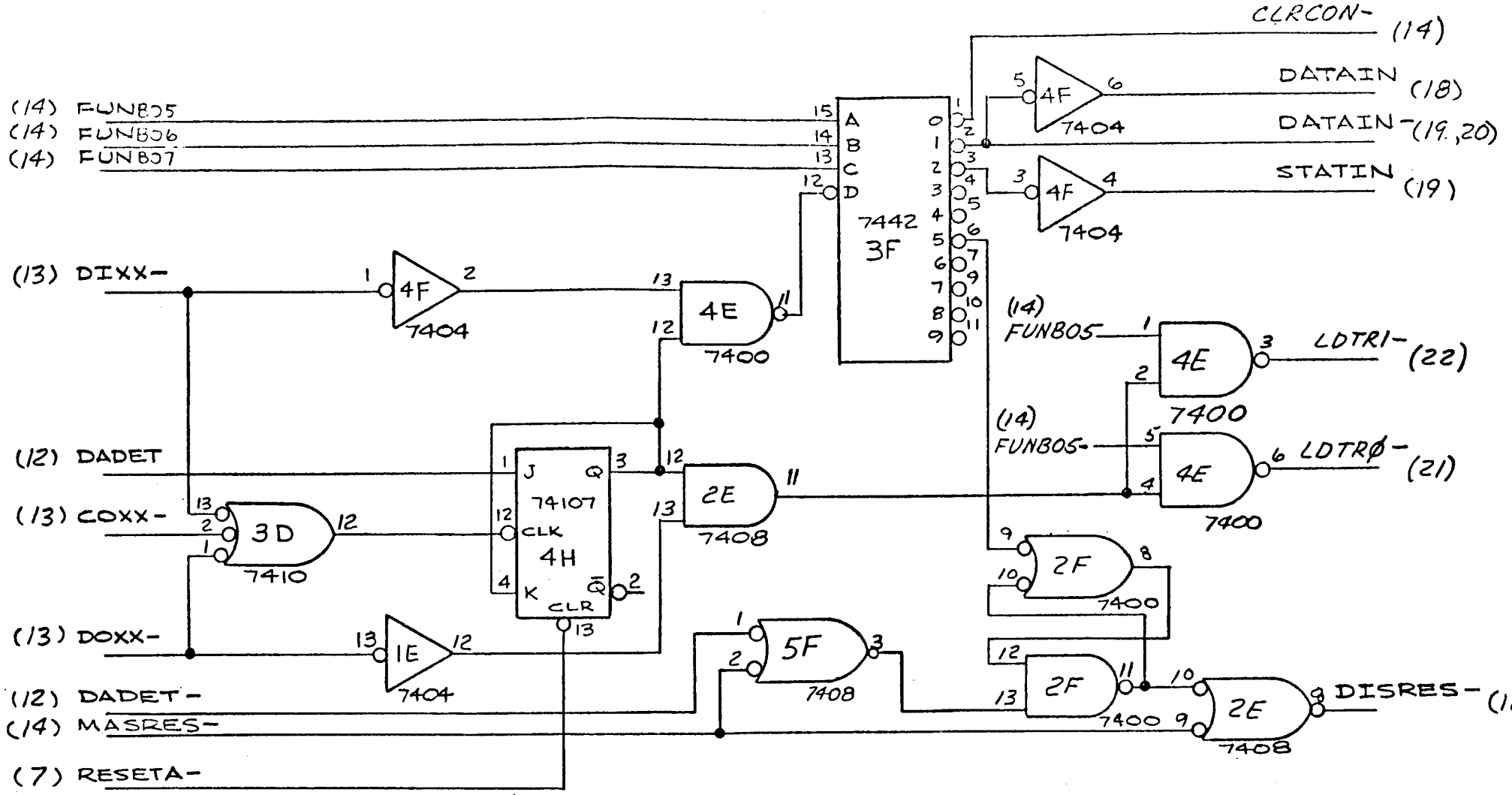
SCALE — | SH 13 OF 23



DUAL CHANNEL CONTROLLER - FUNCTION BIT REGISTER AND CONTROL

basic / four corporation

DWG NO	REV
901434	H
SCALE —	SH 14 OF 23

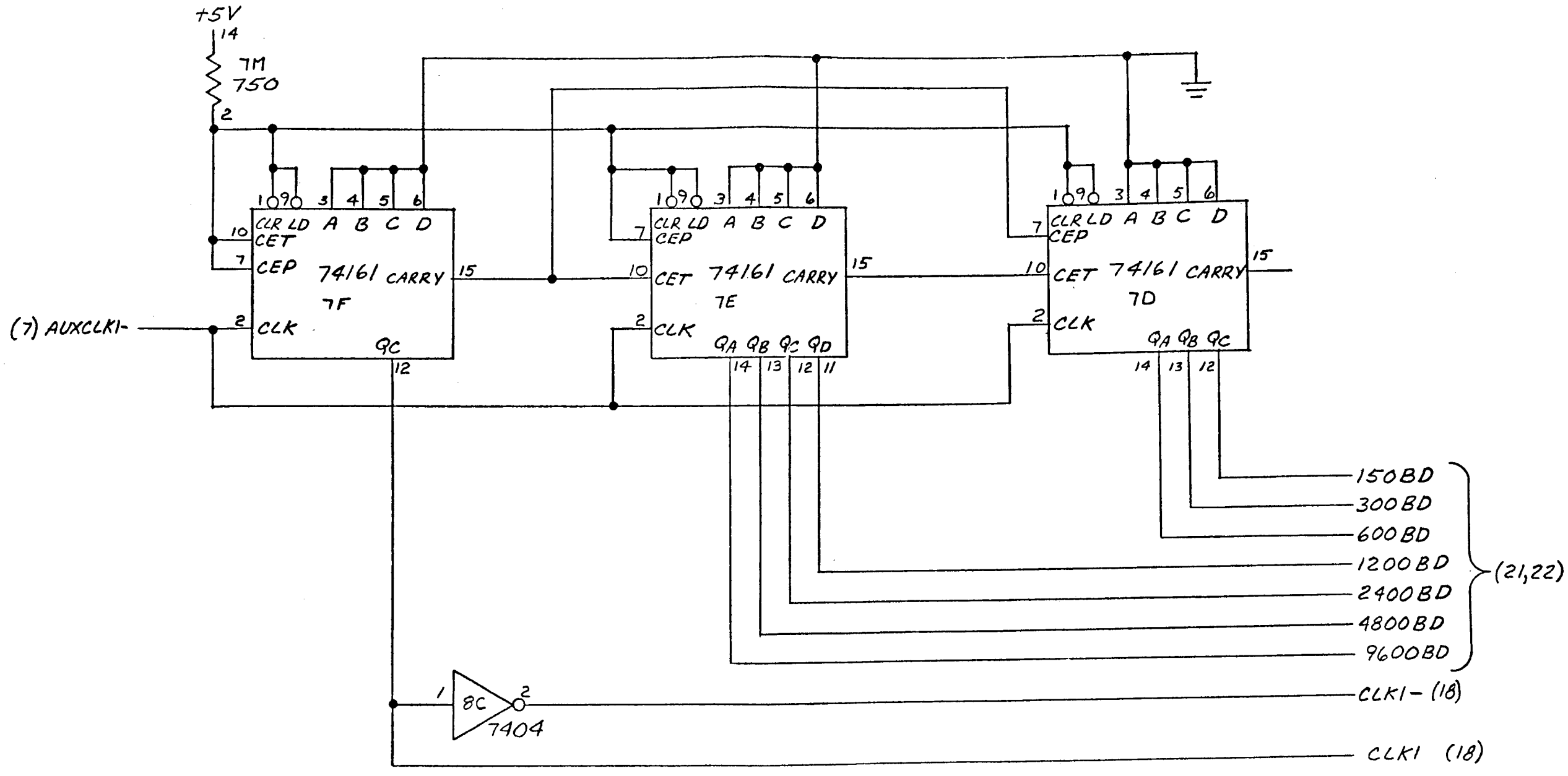


DUAL CHANNEL CONTROLLER - FUNCTION DECODE

basic/four corporation

DWG NO 901434 REV H

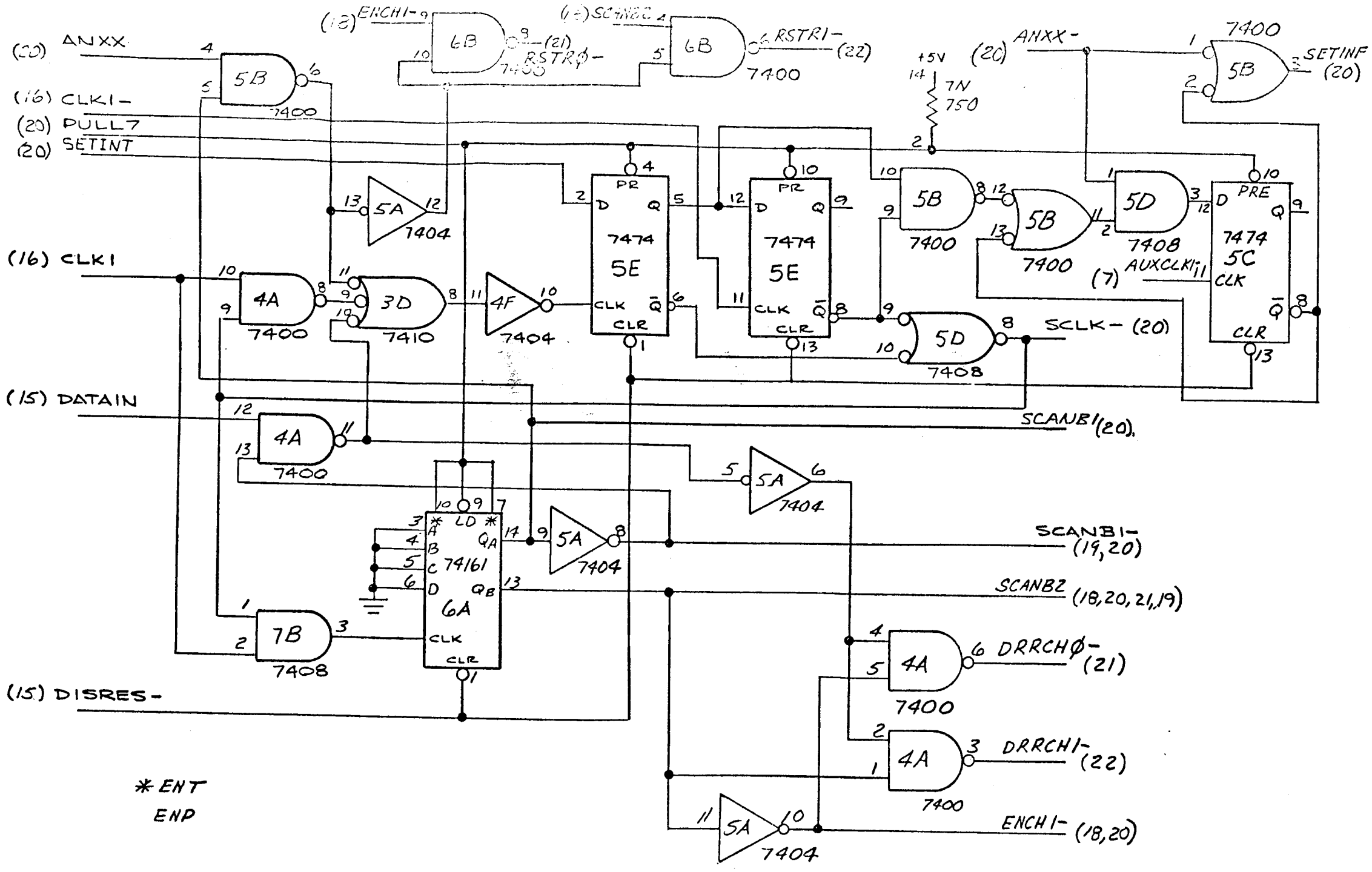
SCALE — SH 15 OF 23



DUAL CHANNEL CONTROLLER - BAUD RATE GENERATOR

basic / four corporation

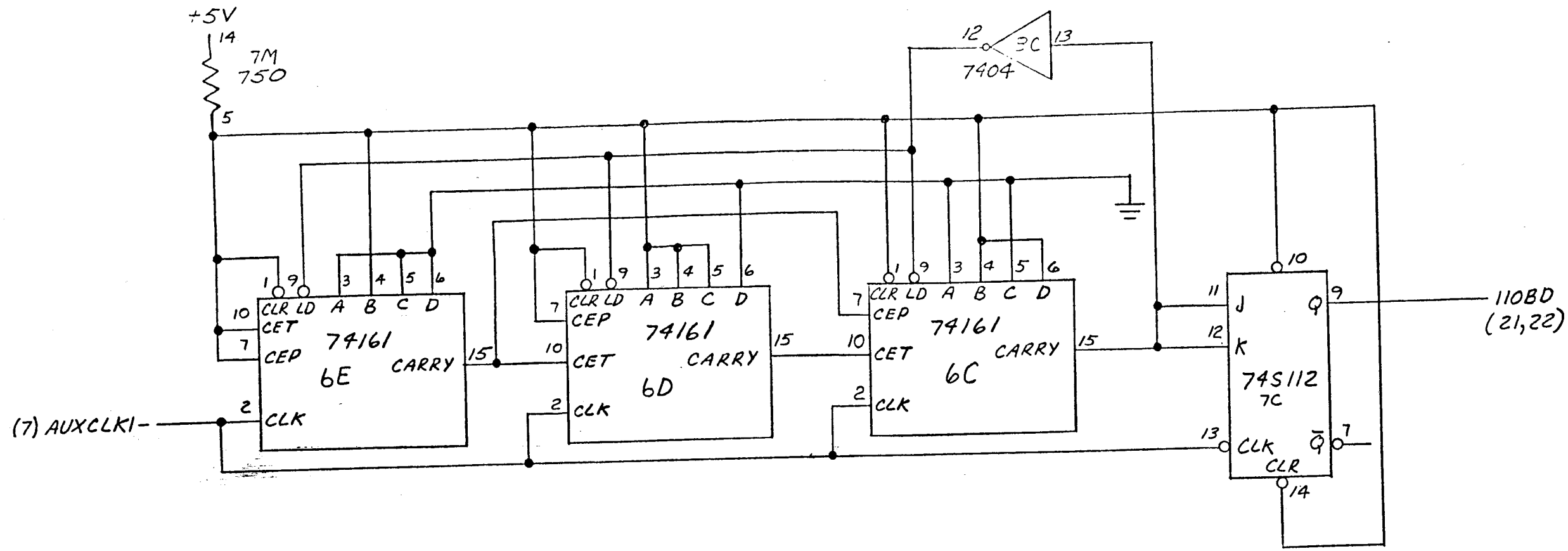
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 16 OF 23



DUAL CHANNEL CONTROLLER - SCAN CONTROL LOGIC

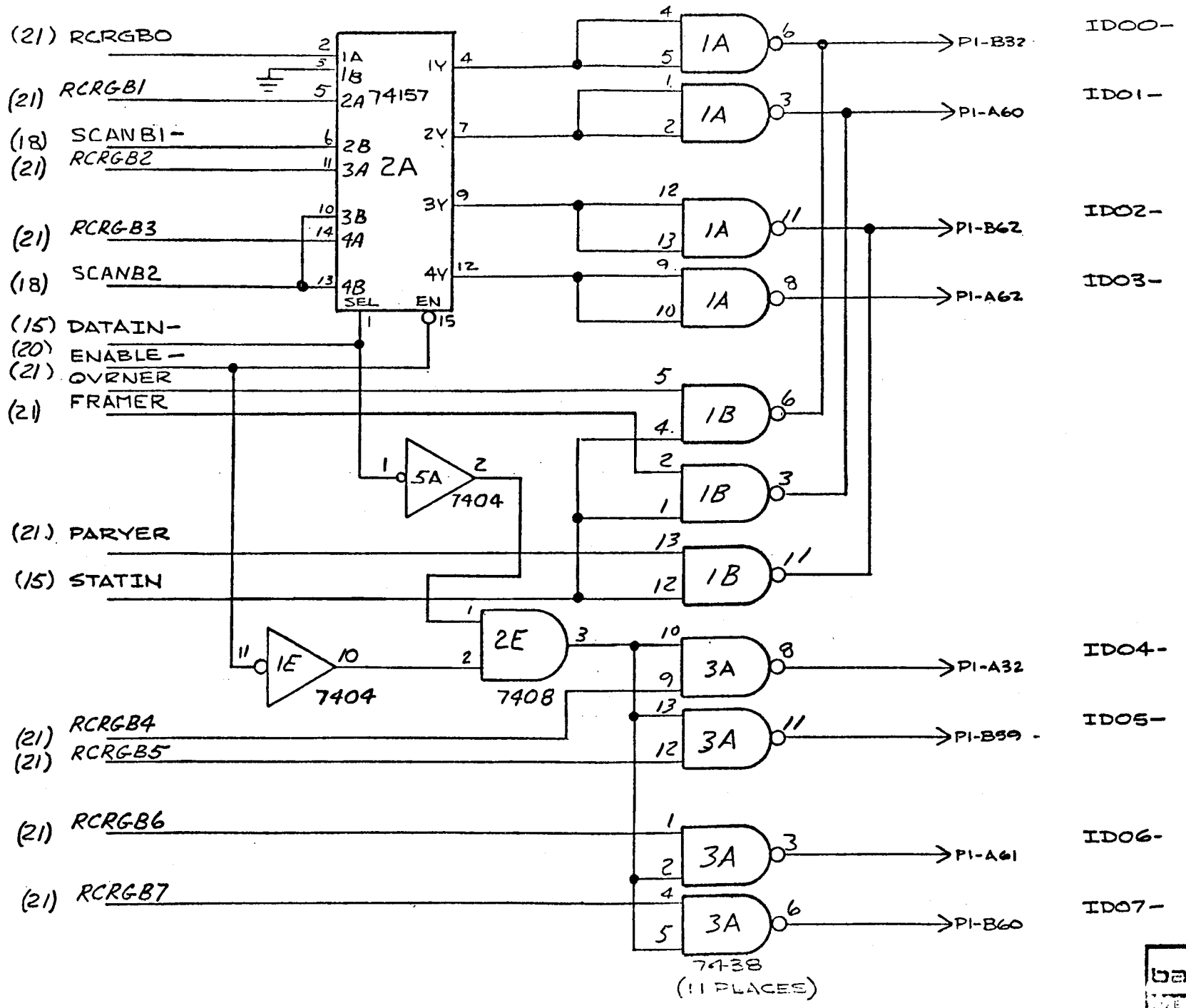
basic/four corporation

SIZE	DWG NO	REV
D	901434	H
	SCALE —	SH 16 OF 23



basic / four corporation

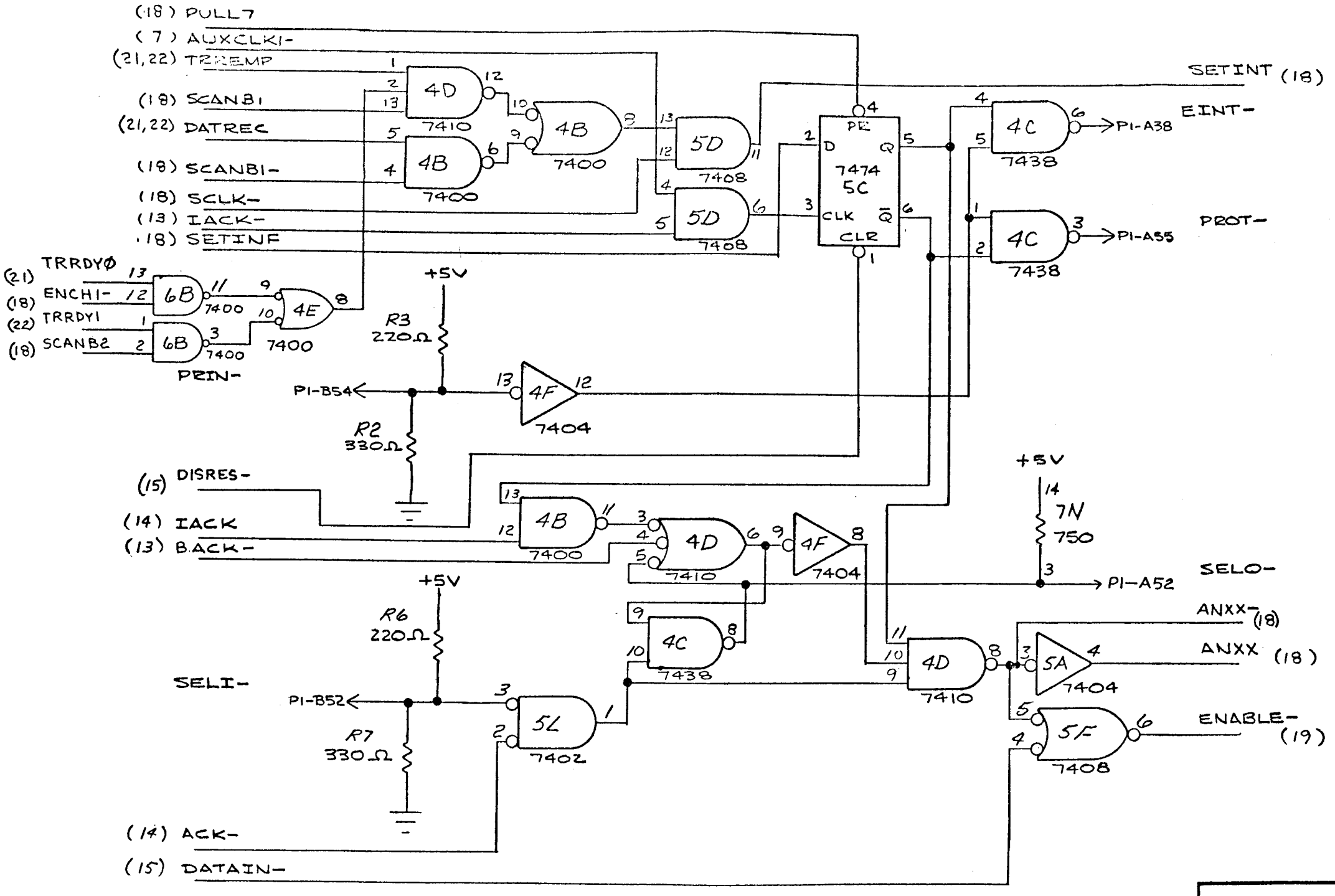
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 17 OF 23



DUAL CHANNEL CONTROLLER - INPUT DATA MULTIPLEXER

basic/four corporation

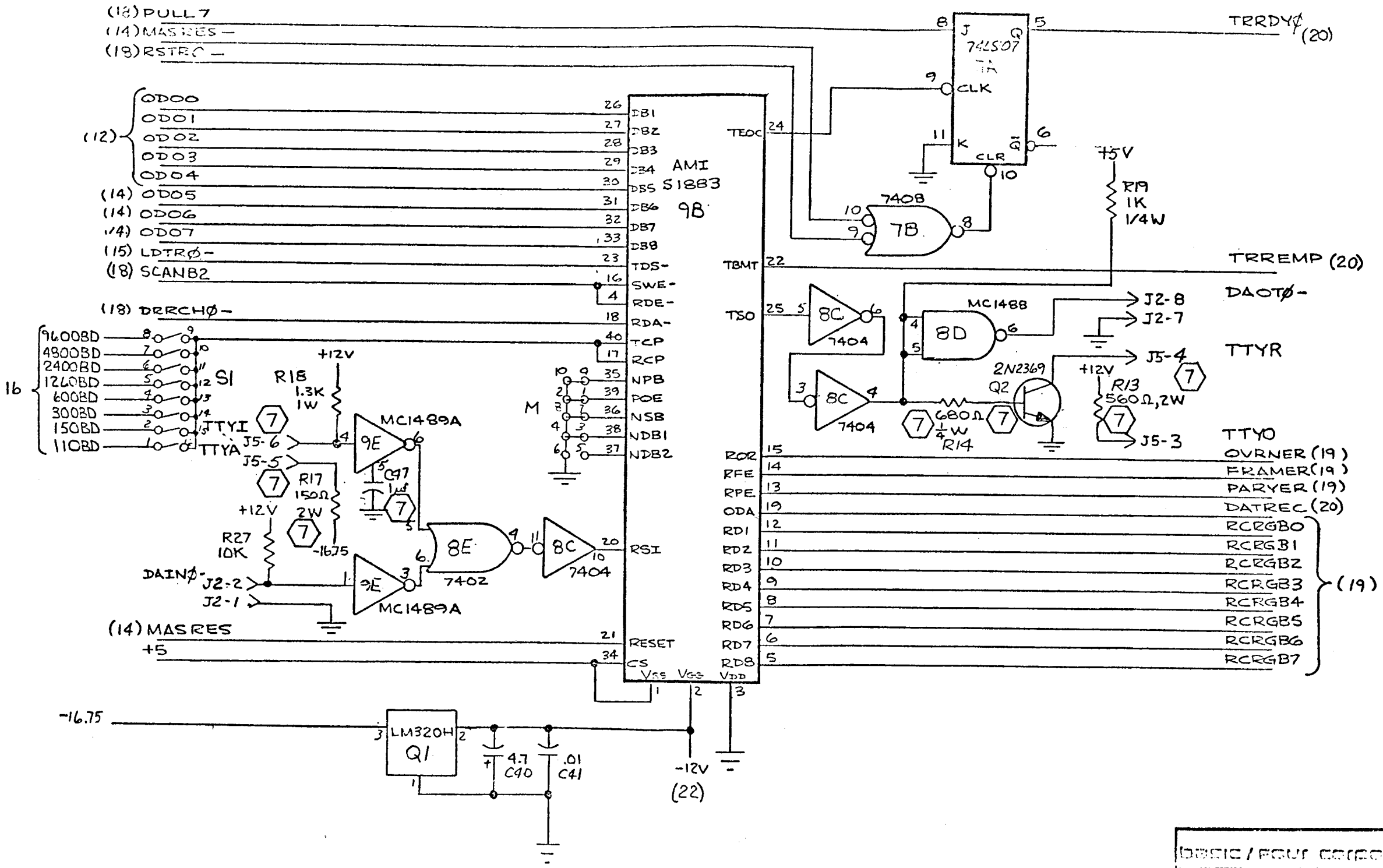
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 19 OF 23



DUAL CHANNEL CONTROLLER — INTERRUPT LOGIC

basic / four corporation

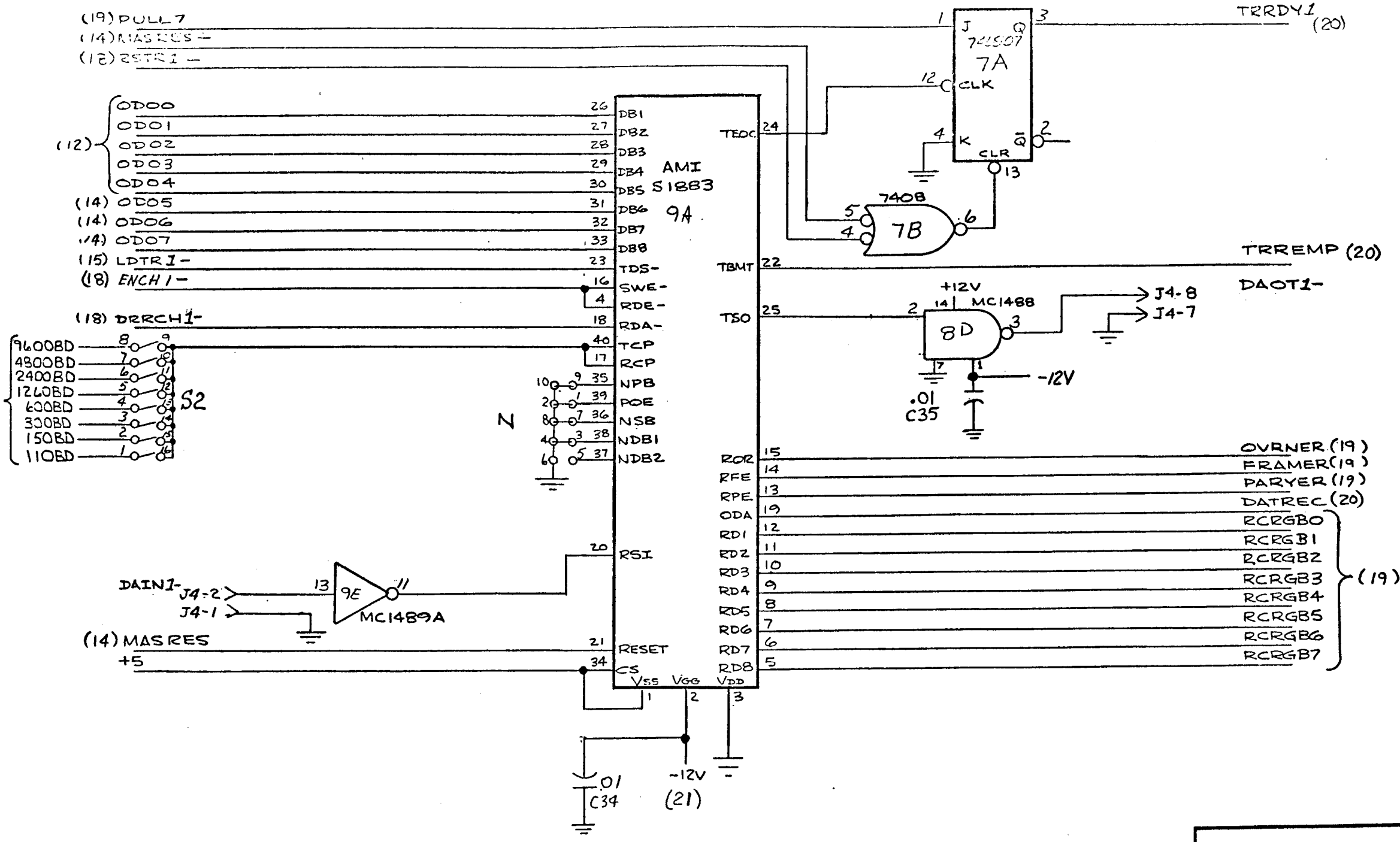
SIZE	DWG NO	REV
B	901434	H
	SCALE —	SH 20 OF 23



DUAL CHANNEL CONTROLLER – I/O INTERFACE CHANNEL Ø

basic / four corporation

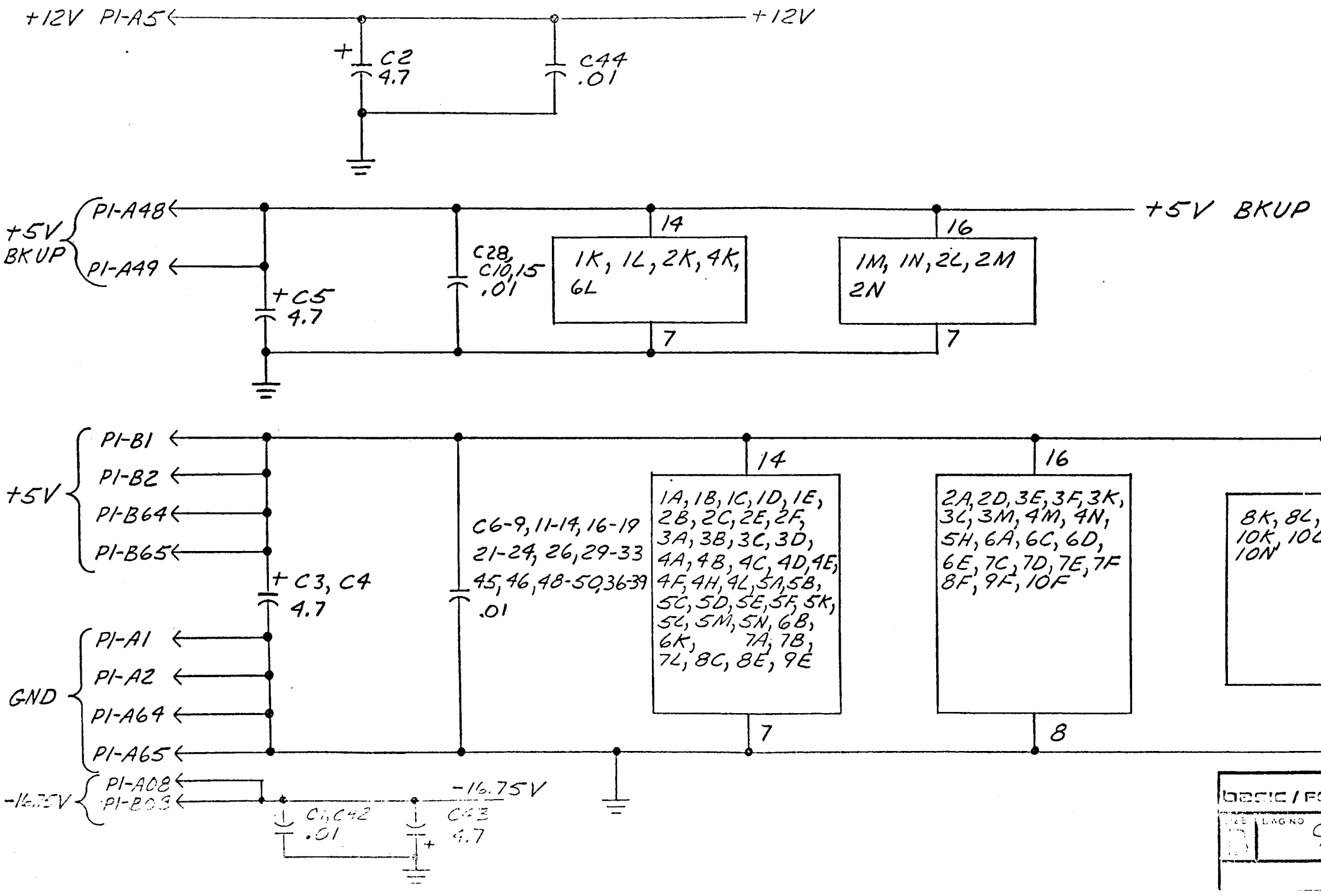
SIZE	DWG NO	REV
B	901434	H
	SCALE –	SH 21 OF 22



DUAL CHANNEL CONTROLLER – I/O INTERFACE CHANNEL 1

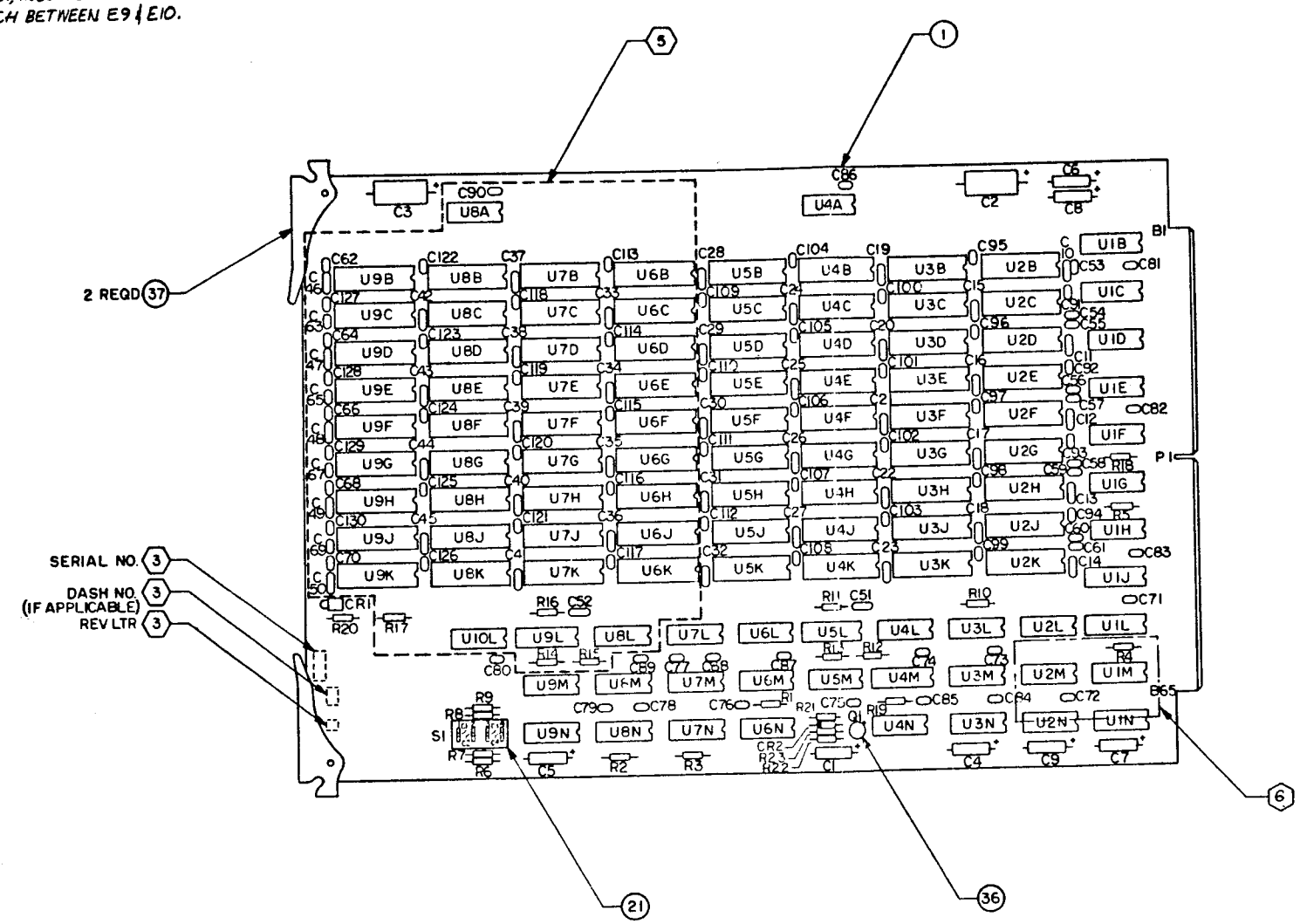
basic / four corporation

SIZE	DWG NO	REV
B	90454	H
	SCALE —	Sh 22 OF 23


+12V P1-A5
+12V
C2
4.7
C44
.01
+5V BKUP
P1-A48
P1-A49
+5V BKUP
+C5
4.7
C28, C10, 15
.01
14
1K, 1L, 2K, 4K, 6L
7
16
1M, 1N, 2L, 2M 2N
7
P1-B1
P1-B2
P1-B64
P1-B65
+5V
+C3, C4
4.7
C6-9, 11-14, 16-19 21-24, 26, 29-33 45, 46, 48-50, 36-39
.01
14
1A, 1B, 1C, 1D, 1E, 2B, 2C, 2E, 2F, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 4E, 4F, 4H, 4L, 5A, 5B, 5C, 5D, 5E, 5F, 5K, 5L, 5M, 5N, 6B, 6K, 7A, 7B, 7L, 8C, 8E, 9E
7
16
2A, 2D, 3E, 3F, 3K, 3L, 3M, 4M, 4N, 5H, 6A, 6C, 6D, 6E, 7C, 7D, 7E, 7F 8F, 9F, 10F
8
+5V
24
8K, 8L, 8M, 8N, 10K, 10L, 10M, 10N
12
P1-A1
P1-A2
P1-A64
P1-A65
GND
P1-A08
P1-B03
-16.75V
-16.75V
C1, C42
.01
C43
4.7
basic four corporation
SIZE
DWG NO 501434
REV H
SCALE —
SH 23 OF 23

NOTES: UNLESS OTHERWISE SPECIFIED

1. REF LOGIC DIAGRAM 903021
2. REF BD DETAIL 904028
3. MARK DESIGNATION APPROXIMATELY WHERE SHOWN PER BFC SPECIFICATION NO. 800000.
4. REF PRODUCT SPECIFICATION NO. 500123
5. THESE COMPONENTS NOT USED ON 903020-001 ASSY.
6. FOR 32K ASSY 903020 , INCORPORATE JUMPER E5-E6. FOR 16K ASSY 903020-001, INCORPORATE JUMPERS E3-E4; E6-E7 & E8-E9. CUT ETCH BETWEEN E9 & E10.



REVISION BLOCK

REV LTR	ENTECH	DESCRIPTION	INITIAL	DATE
X3		PROTOTYPE RELEASE		
AX1	1780	PRE-PRODUCTION REL	MFL	8-11-77
AX2	2313	SEE ECN		12-23-77
A	2178	PRODUCTION RELEASE		3-3-78
A1	2353	SEE ECN		4-19-78

OUTSTANDING ECN'S

None

903020-001	A1	16K MEMORY MODULE
903020	A1	32K MEMORY MODULE
ASSY NO.	MIN ACCEPT REV LEVEL	DESCRIPTION
TABULATION CHART		

REWORK PER ECN

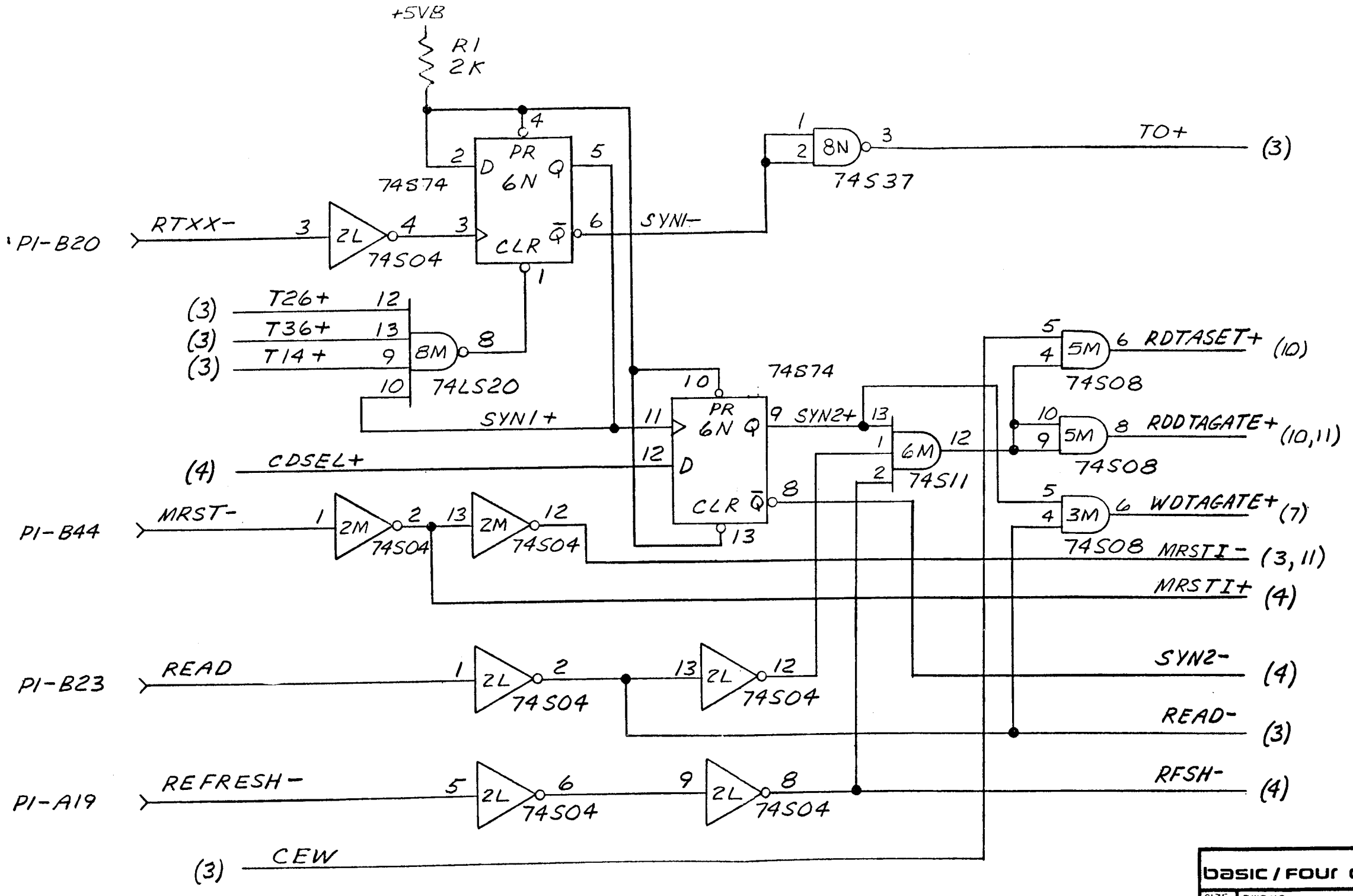
SEE P/L 903020

DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
.X ± .1
.XX ± .03
.XXX ± .010
ANGLES ± 1.0°
MACHINED SURFACES √
DO NOT SCALE DRAWING
NEXT ASSY | USED ON

basic/four corporation
1326 South Claudina Street Anaheim, California 92805

DRAWN | CHKD | ENG | MFG | APP

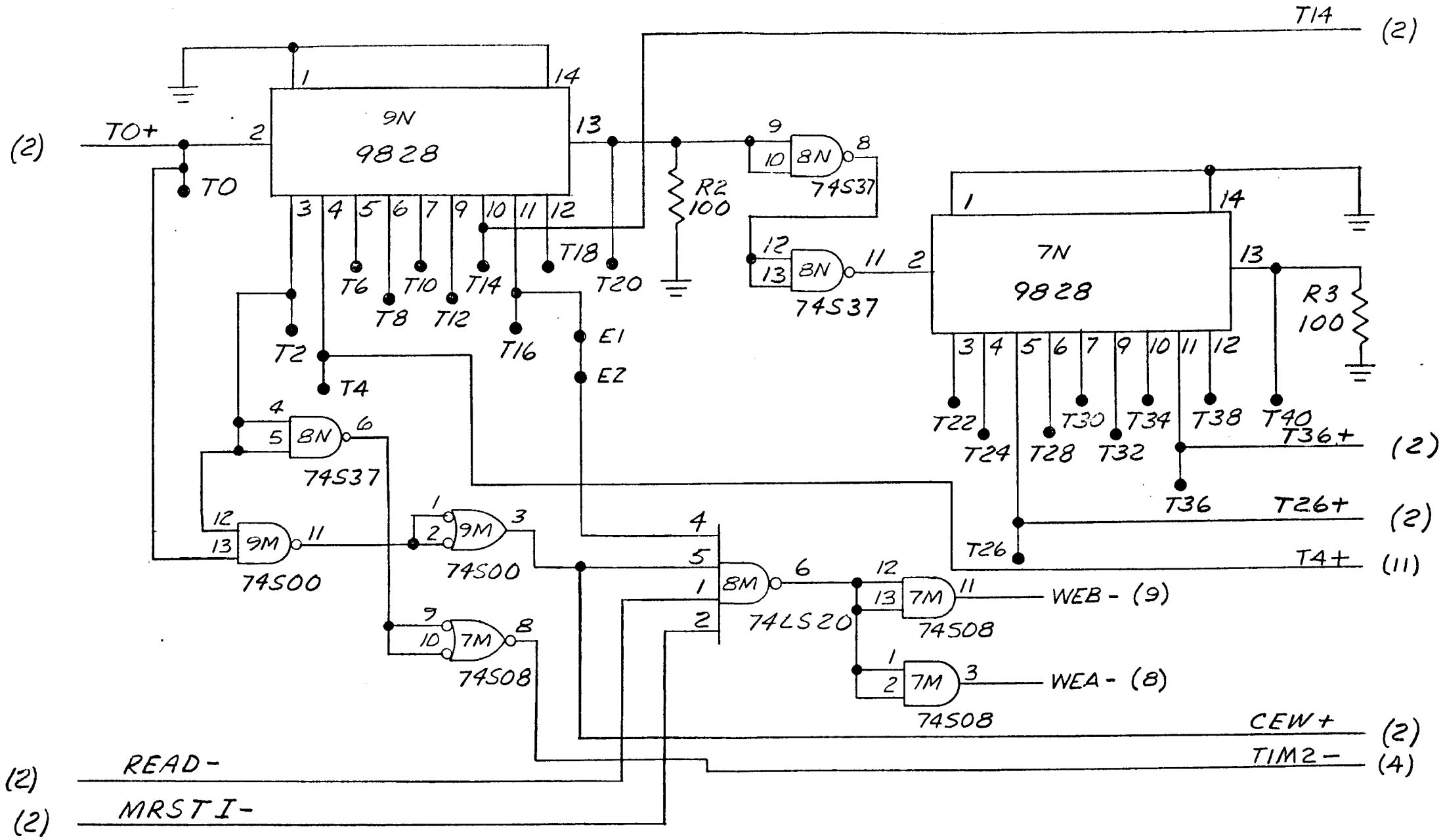
TITLE PCB ASSY, 32K/16K SEMICONDUCTOR MEMORY
SIZE D | DWG NO 903020 | REV A1
SCALE NOT | SH 1 OF 1



START CONTROL

basic / four corporation

SIZE	DWG NO	REV
B	903021	B
	SCALE NONE	SH 2 OF 12

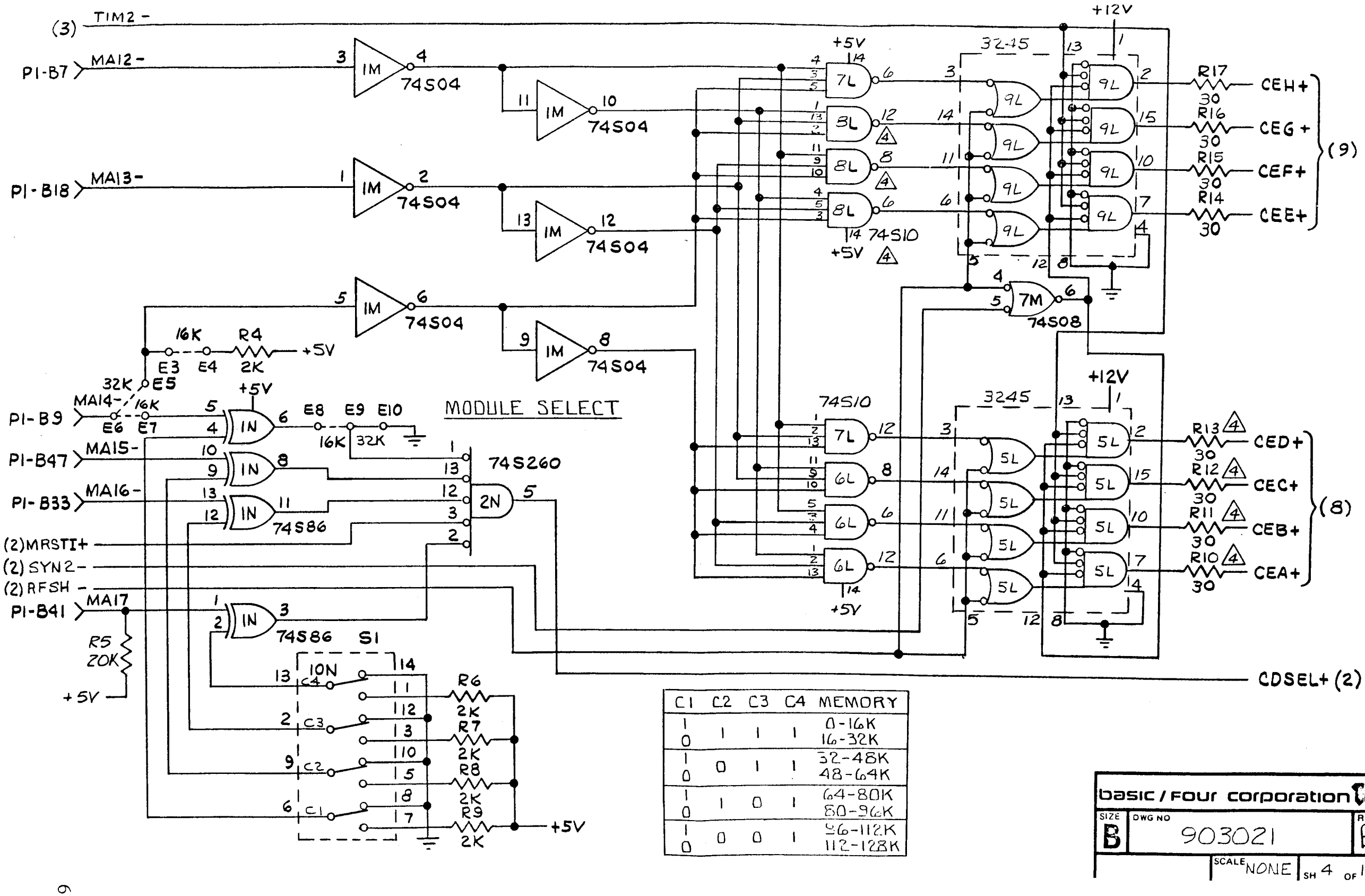


TIMING TRAIN

basic / four corporation

SIZE	DWG NO	REV
B	903021	B

SCALE NONE SH 3 OF 12

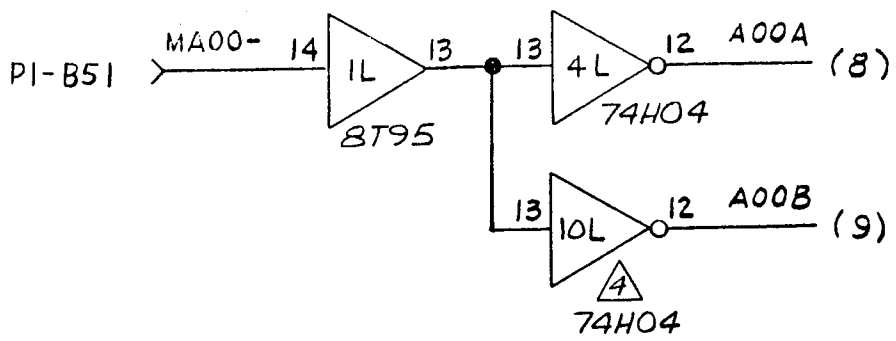


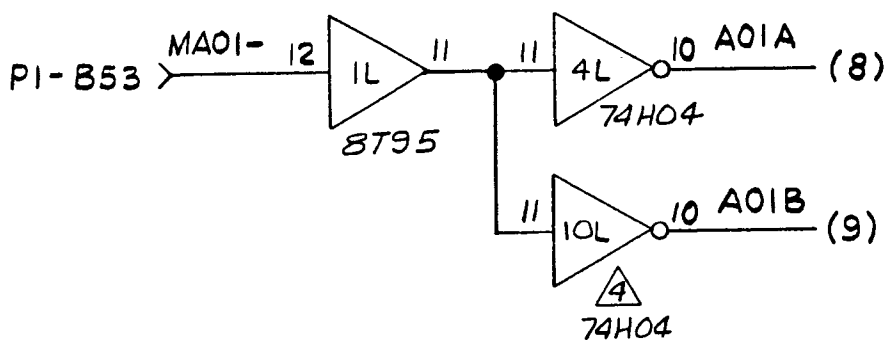
C1	C2	C3	C4	MEMORY
1 0	1	1	1	0-16K 16-32K
1 0	0	1	1	32-48K 48-64K
1 0	1	0	1	64-80K 80-96K
1 0	0	0	1	96-112K 112-128K

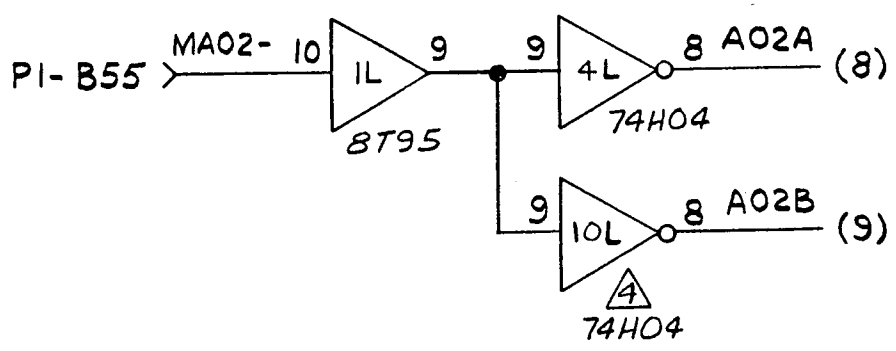
basic / four corporation

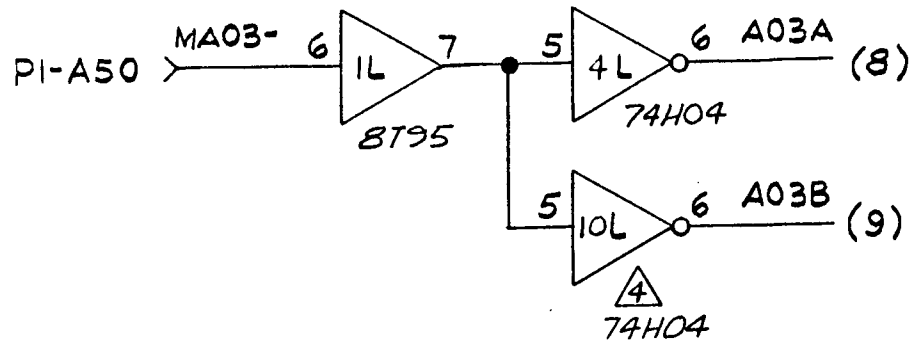
SIZE	DWG NO	REV
B	903021	B

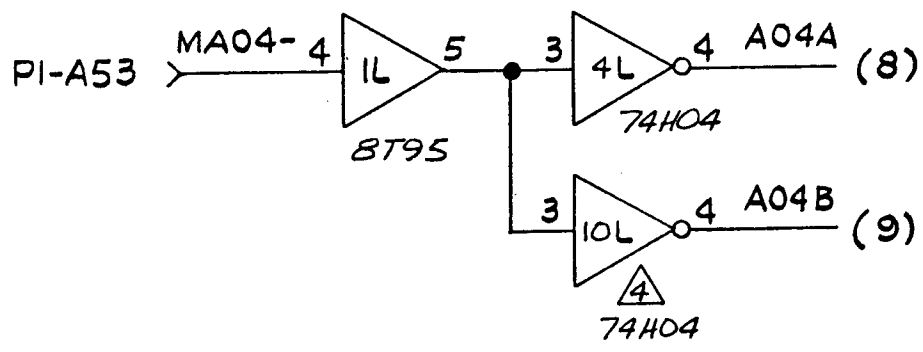
SCALE NONE SH 4 OF 12

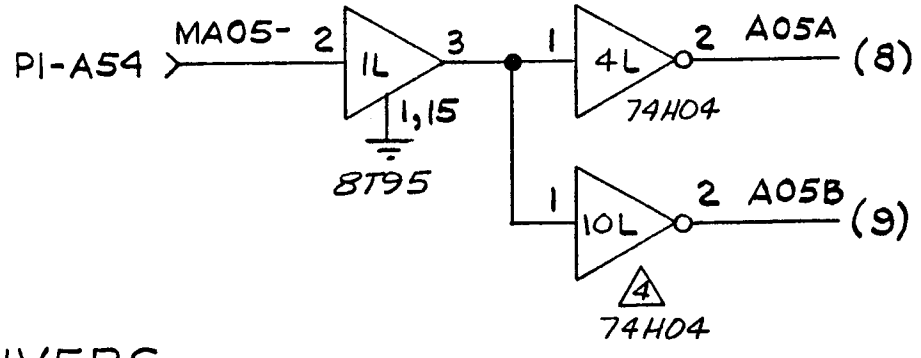










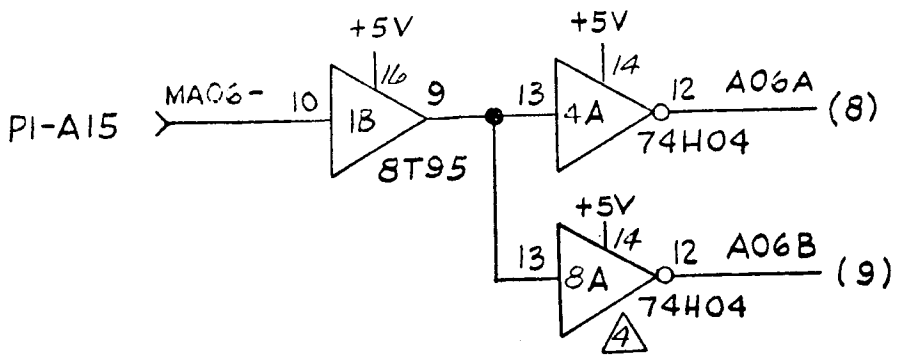


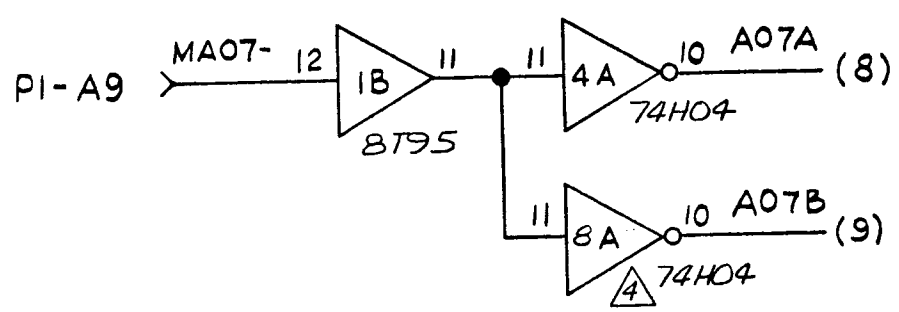
ADDRESS RECEIVERS

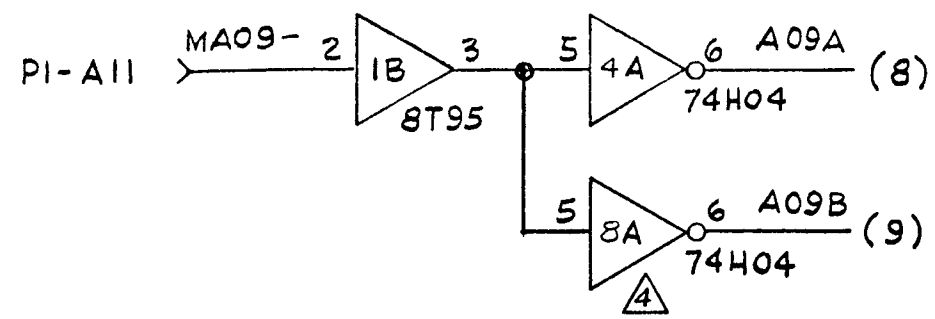
basic / four corporation

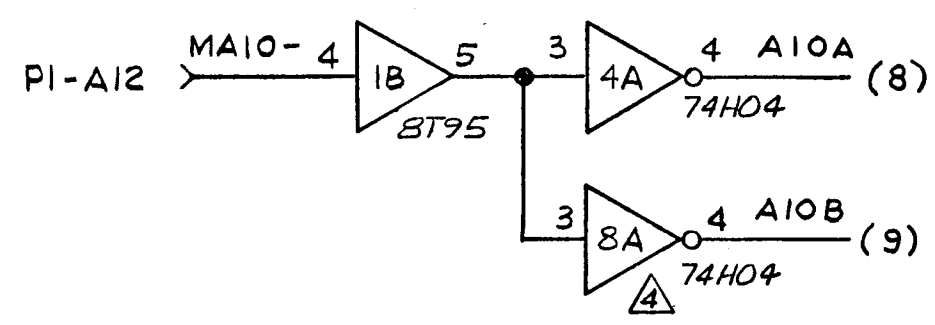
SIZE	DWG NO	REV
B	903021	B

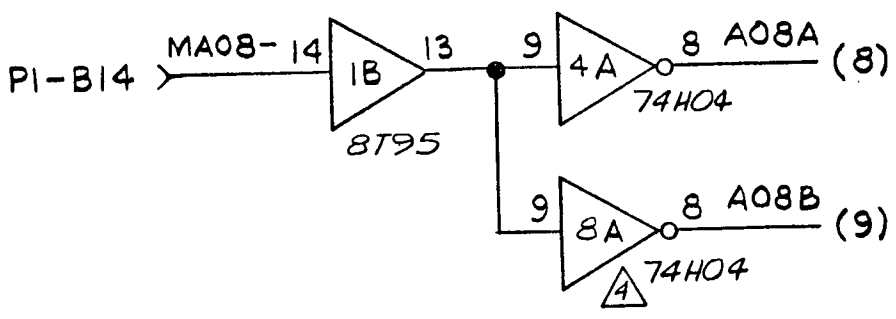
SCALE NONE SH 5 OF 12

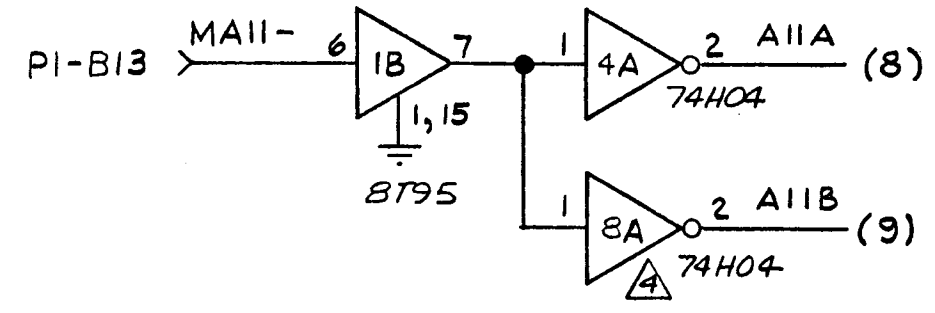










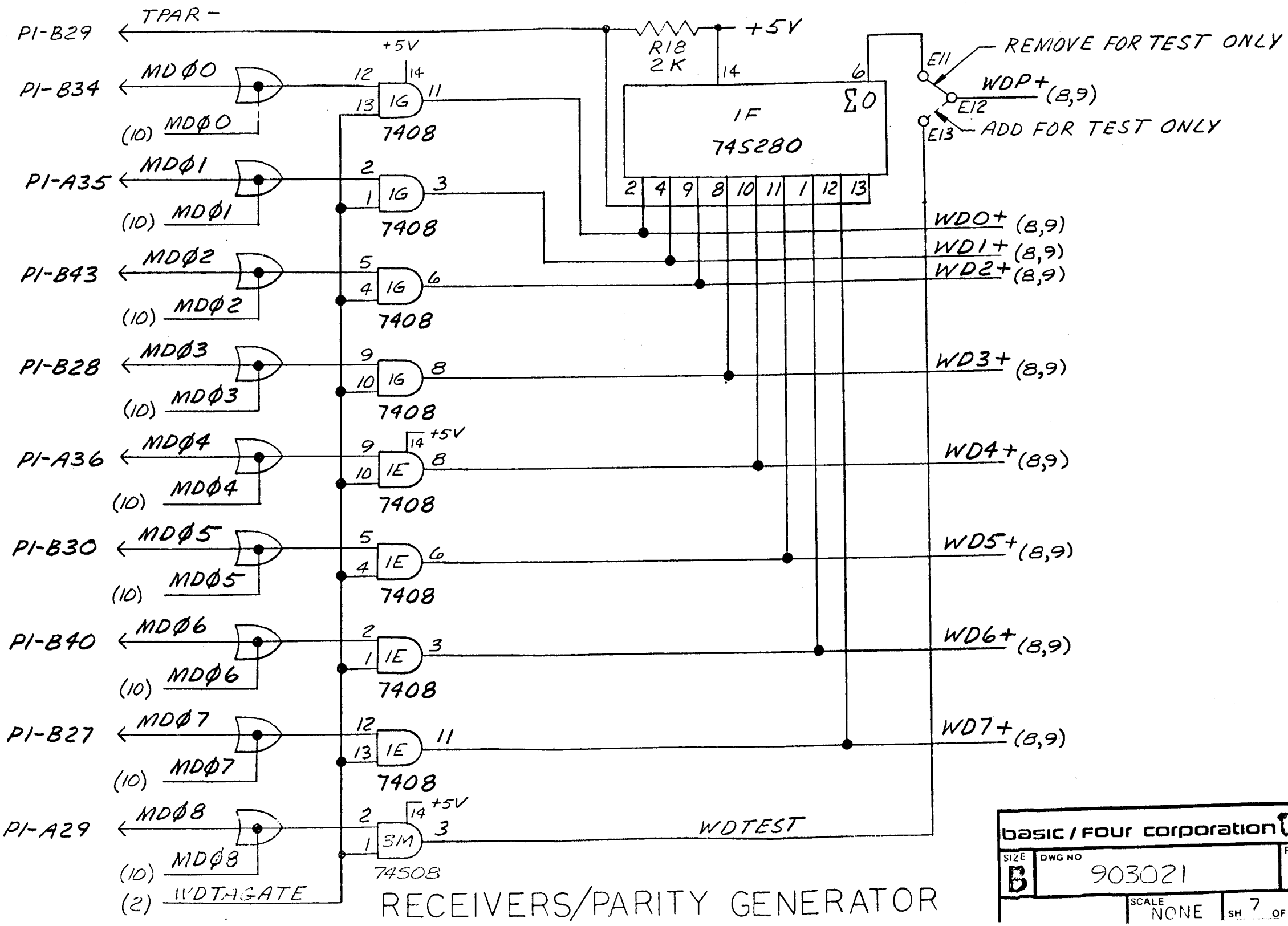


ADDRESS RECEIVERS

basic / four corporation

SIZE	DWG NO	REV
B	903021	B

SCALE NONE SH 6 OF 12

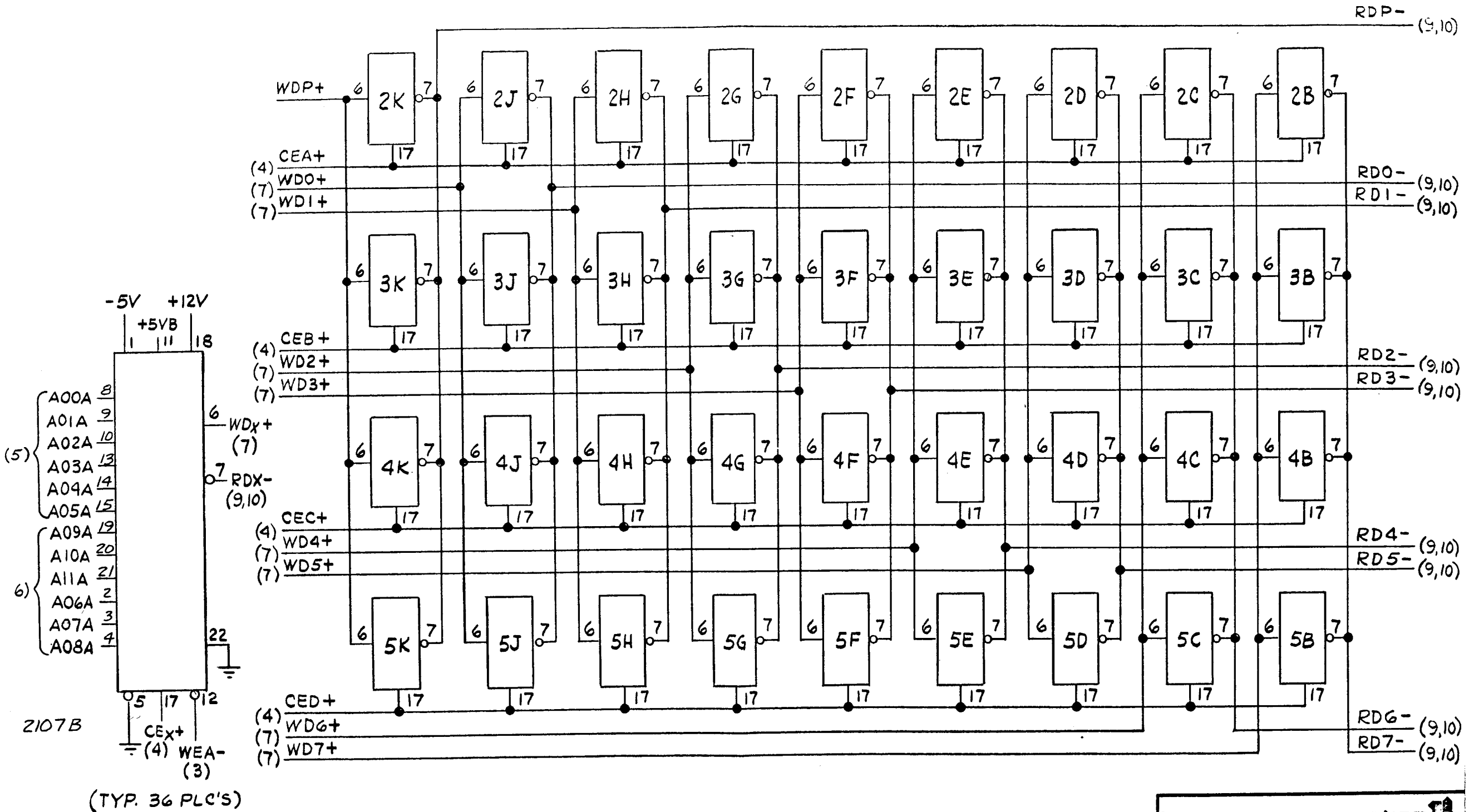


RECEIVERS/PARITY GENERATOR

basic / four corporation

SIZE	DWG NO	REV
B	903021	B

SCALE NONE SH. 7 OF 12

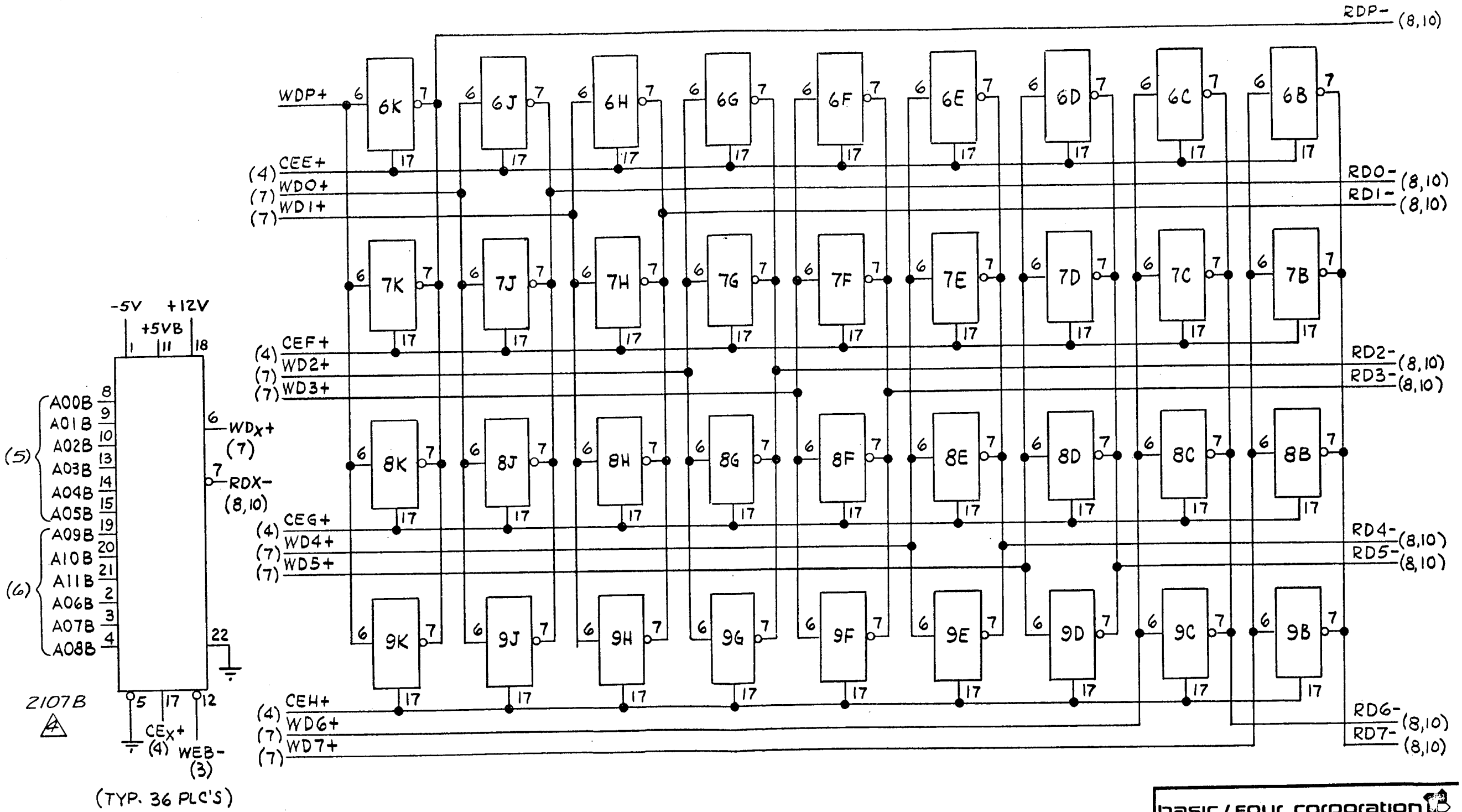


STORAGE ELEMENTS

basic / four corporation

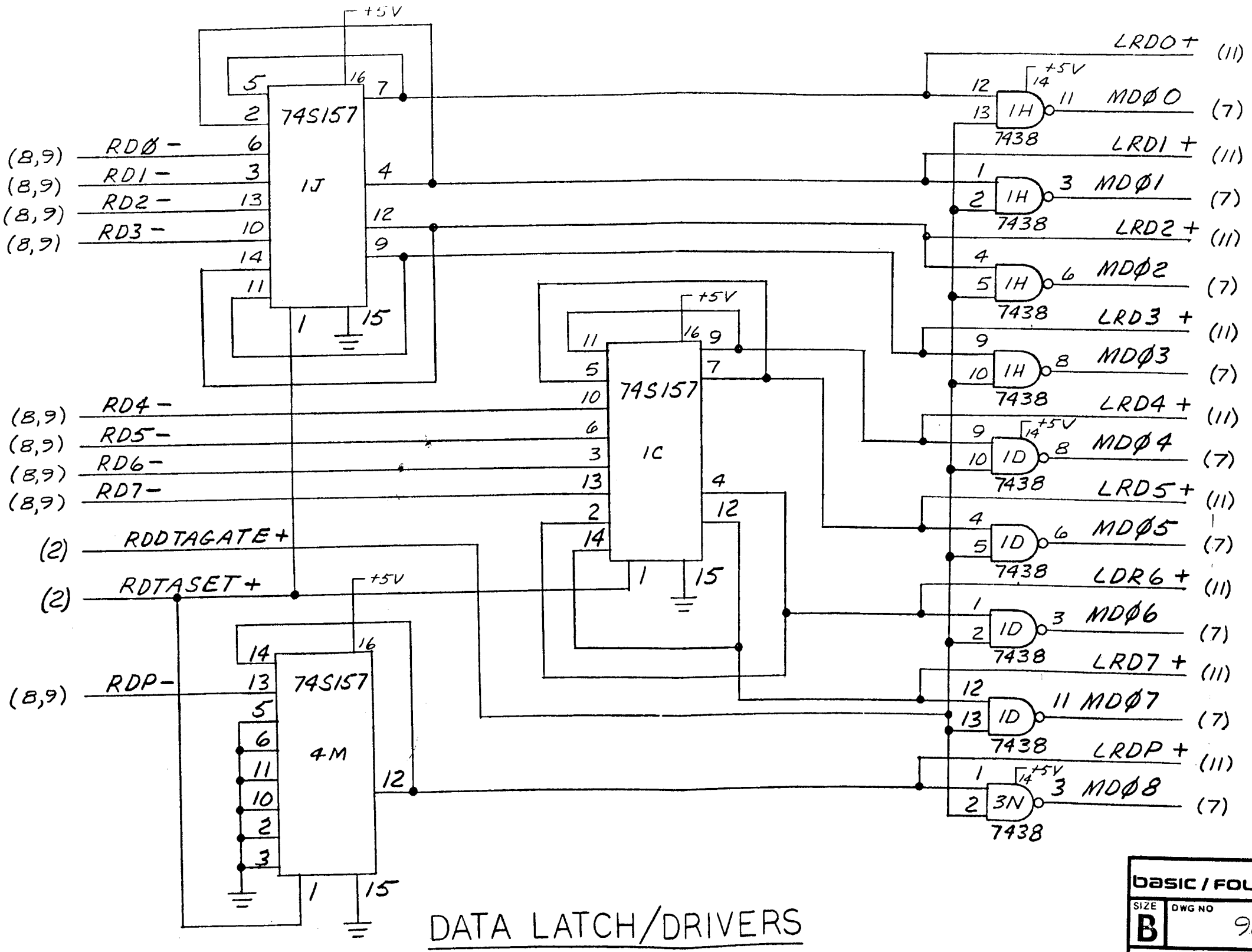
SIZE	DWG NO	REV
B	903021	B

SCALE NONE SH 8 OF 12



STORAGE ELEMENTS

basic / four corporation		
SIZE B	DWG NO 903021	REV B
	SCALE NONE	SH 9 OF 12

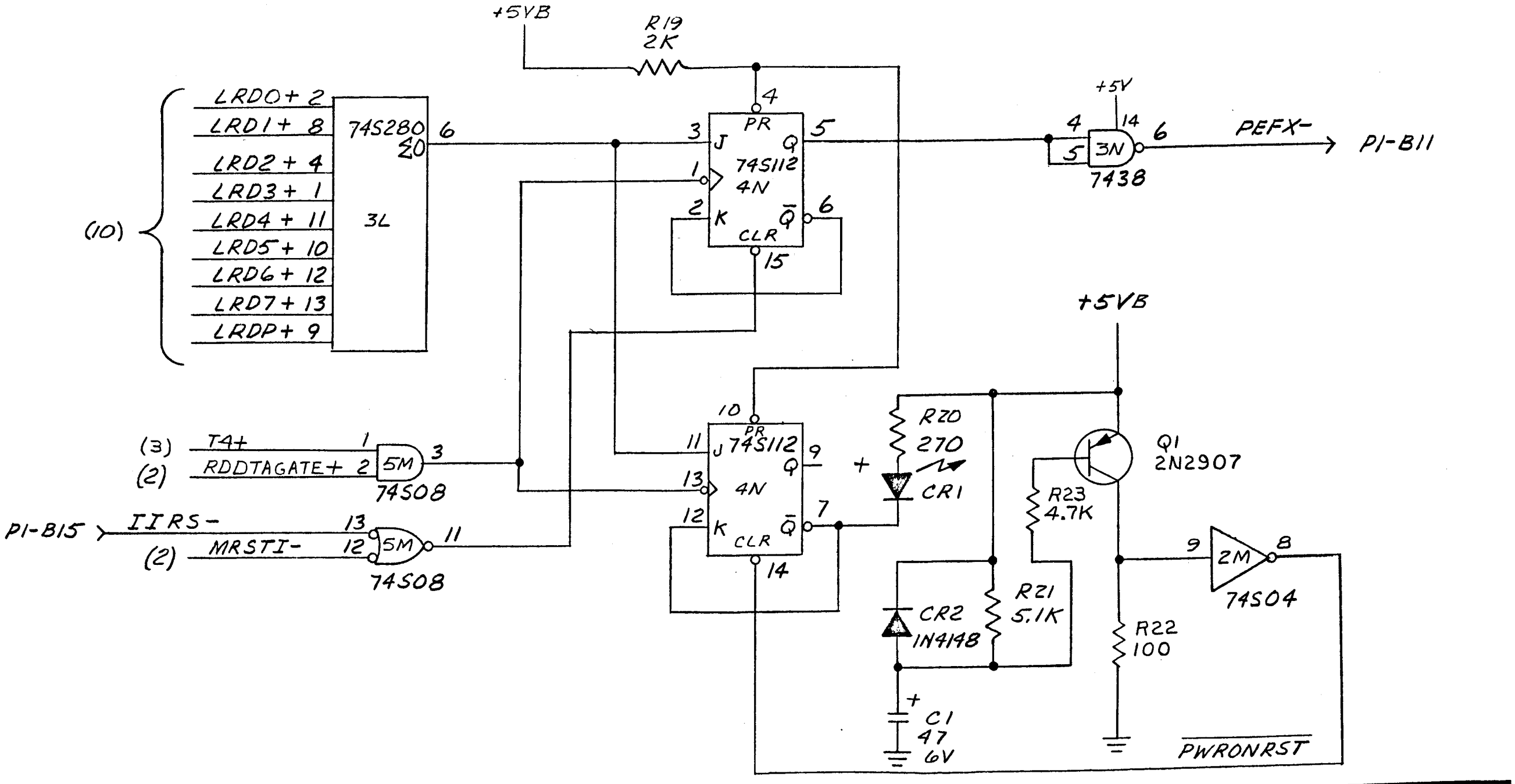


DATA LATCH/DRIVERS

basic / four corporation

SIZE	DWG NO	REV
B	903021	B

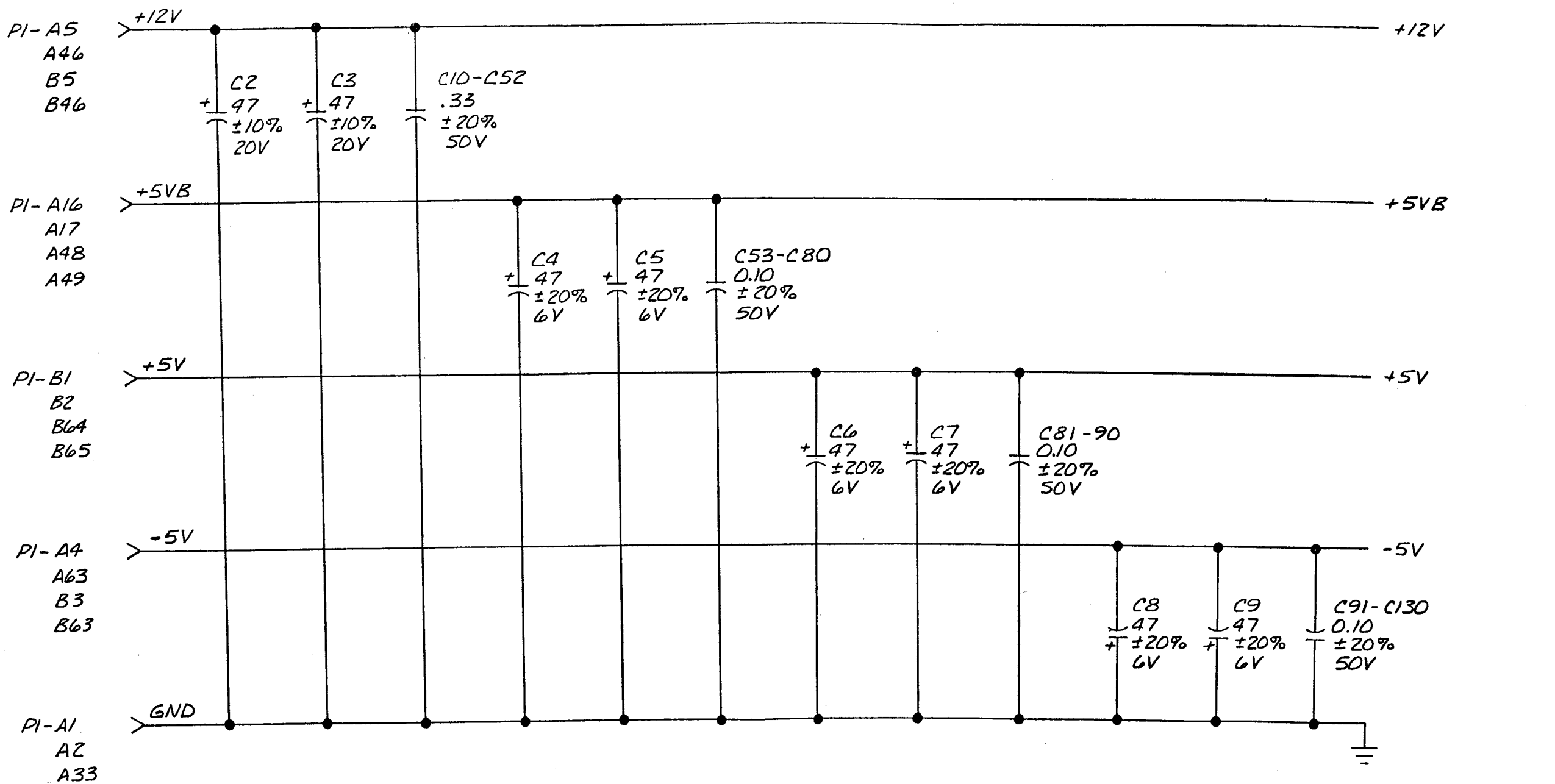
SCALE NONE SH 10 OF 12



PARITY CHECK/FLAGS

basic / four corporation

SIZE	DWG NO	REV
B	903021	B
	SCALE NONE	SH 11 OF 12

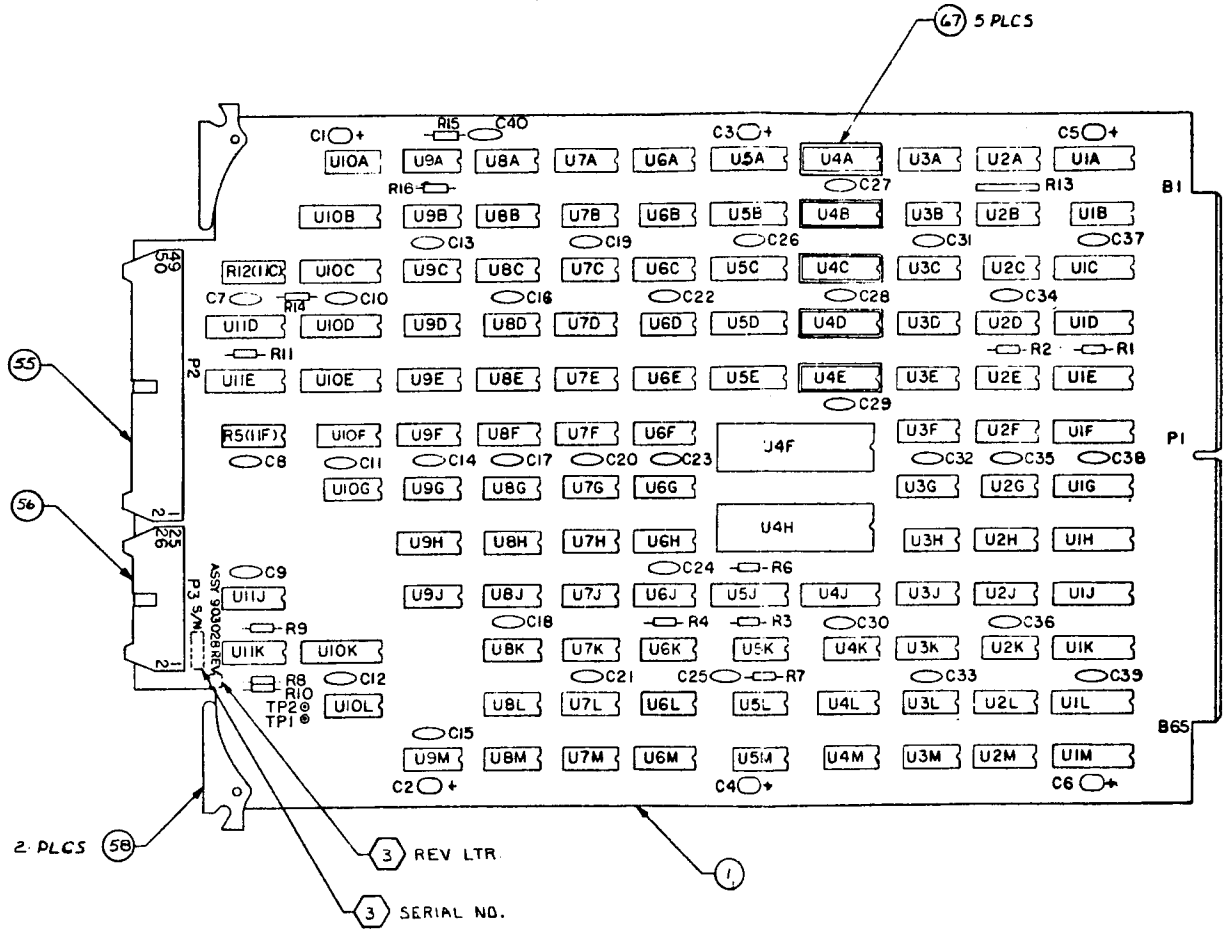


basic / four corporation

SIZE	DWG NO	REV
B	903021	B

SCALE NONE SH 12 OF 12

REV LTR	ECN #	DESCRIPTION	INITIAL	DATE
X3	1096	RELEASE	PAL	1--
X4	1248	SEE ECN	[illegible]	1-1-81
AX1	1469	PRE PRODUCTION RELEASE	[illegible]	10-1-81
AX2	1995	SEE ECN	[illegible]	3-12-82
AX3	2227	SEE ECN	[illegible]	5-20-82
A	2334	PRODUCTION RELEASE FCB WAS 904033	[illegible]	9-17-82
B	2841	REVISED PER ECN	[illegible]	1-9-84
C	3947	REVISED PER ECN	[illegible]	1-9-87



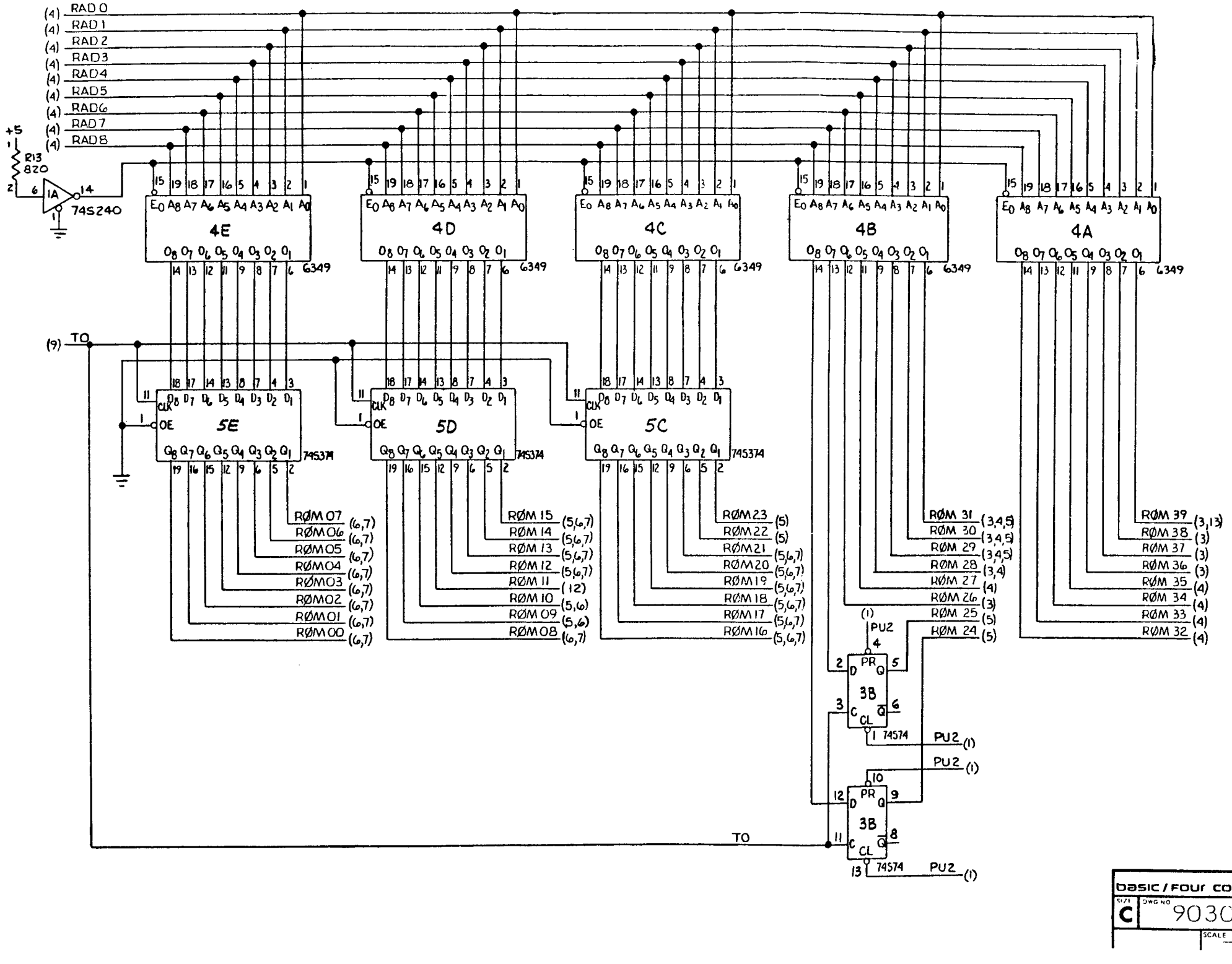
OUTSTANDING ECN'S

3029A
3148
3207

4. REFERENCE BOARD DETAIL PART NO. 904072.
(3) MARK PER BFC SPECIFICATION 300000 APPROX WHERE SHOWN.
2. FOR SEPARATE PARTS LIST SEE H/L 903028
1. REF LOGIC DIAGRAM 903029.
NOTES: UNLESS OTHERWISE SPECIFIED

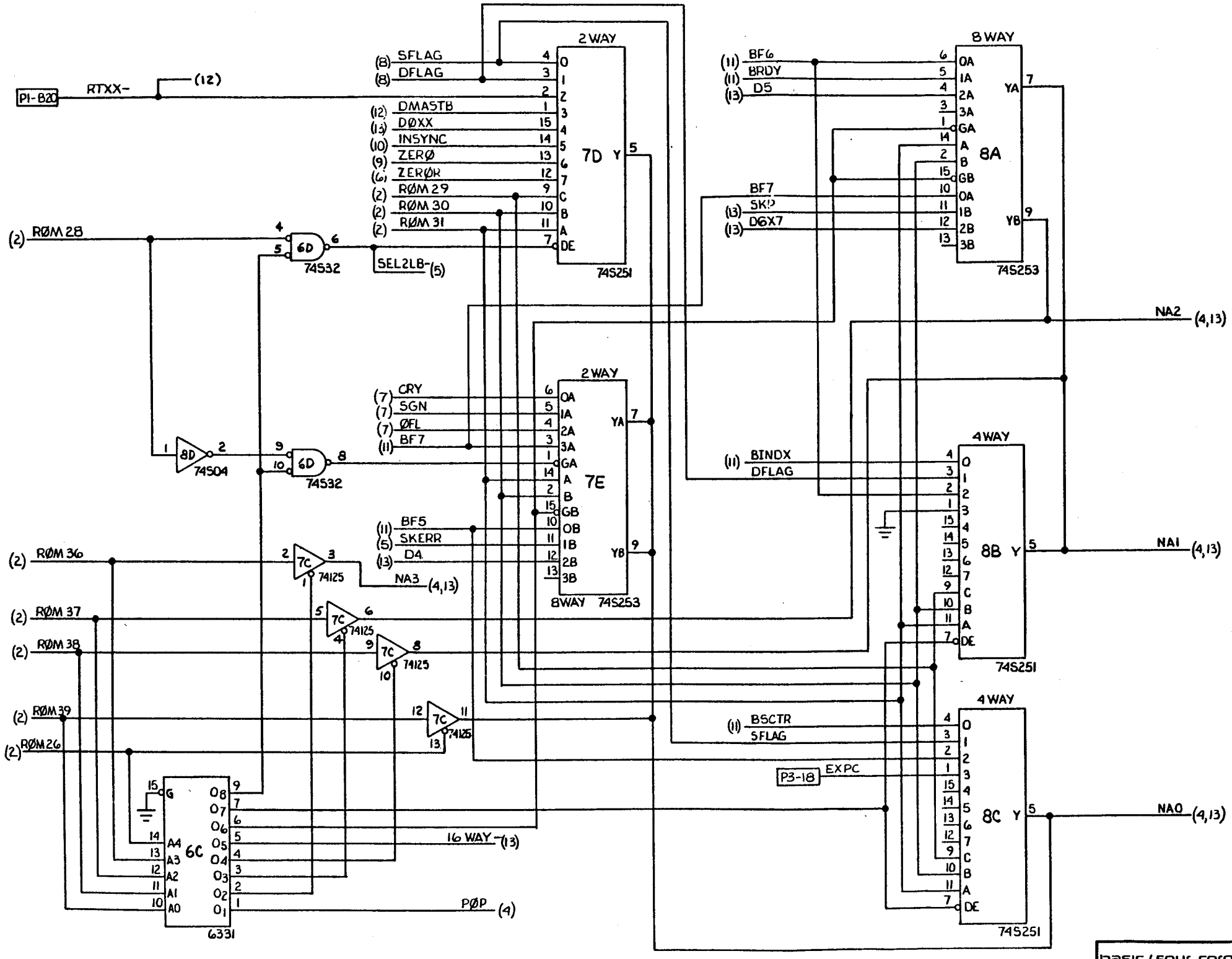
REWORK PER ECN 2841.

		DIMENSIONS ARE IN INCHES TOLERANCES UNLESS OTHERWISE SPECIFIED X ± 1 XX ± 03 XXX ± 010 ANGLES ± 1.0° MACHINED SURFACES √	basic/four corporation 1338 South Claudina Street Anaheim, California 92805
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	DRAWN [illegible] 1-9-84 CHKD [illegible] 1-9-84 ENG MFG APP TITLE PCBA FIXED DISC CONT SIZE C DWG NO 903028 REV C SCALE 1/1 SH 1 OF 1



basic / four corporation

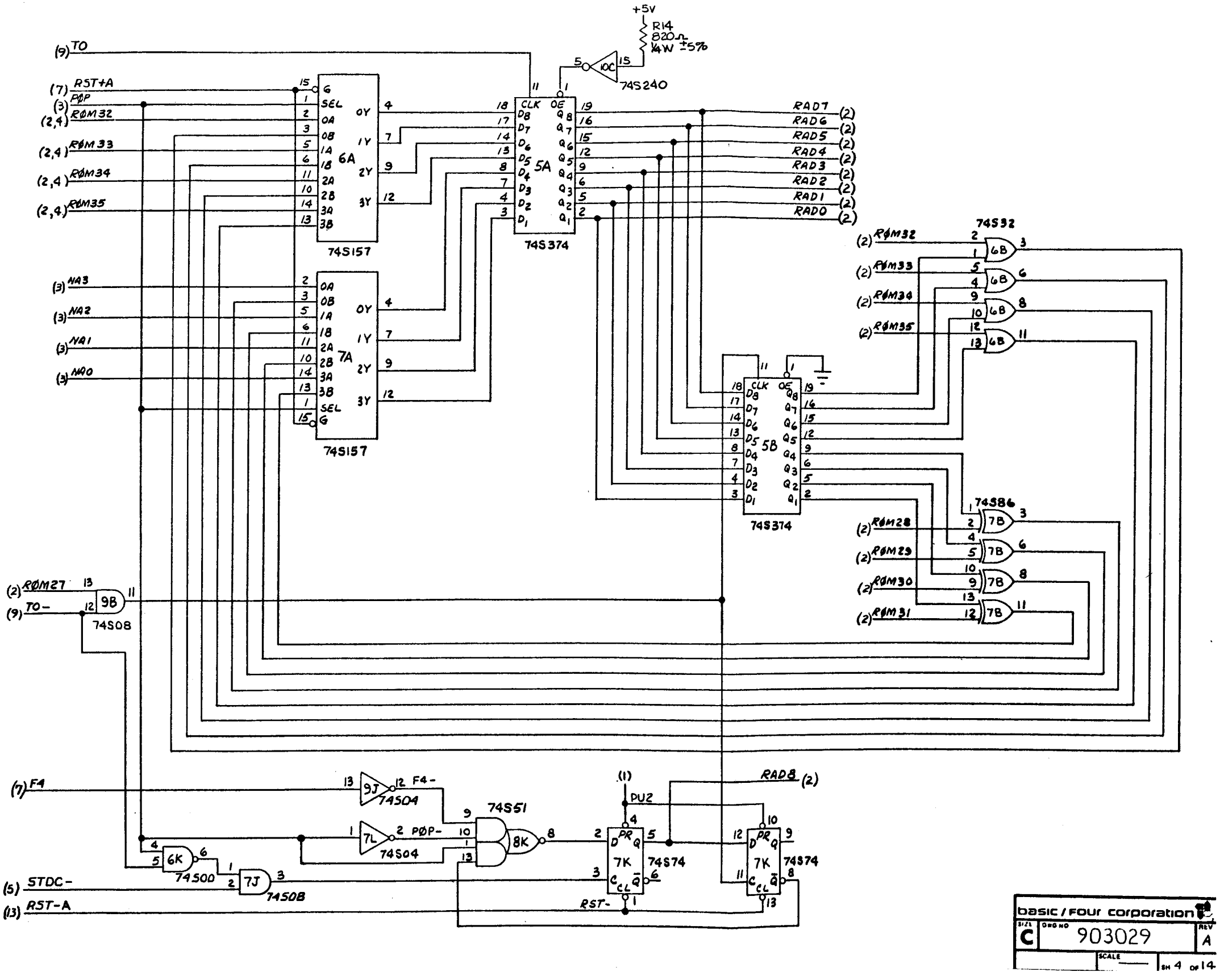
SIZE	DWG NO	REV
C	903029	A
SCALE		SH 2 OF 14



basic / four corporation

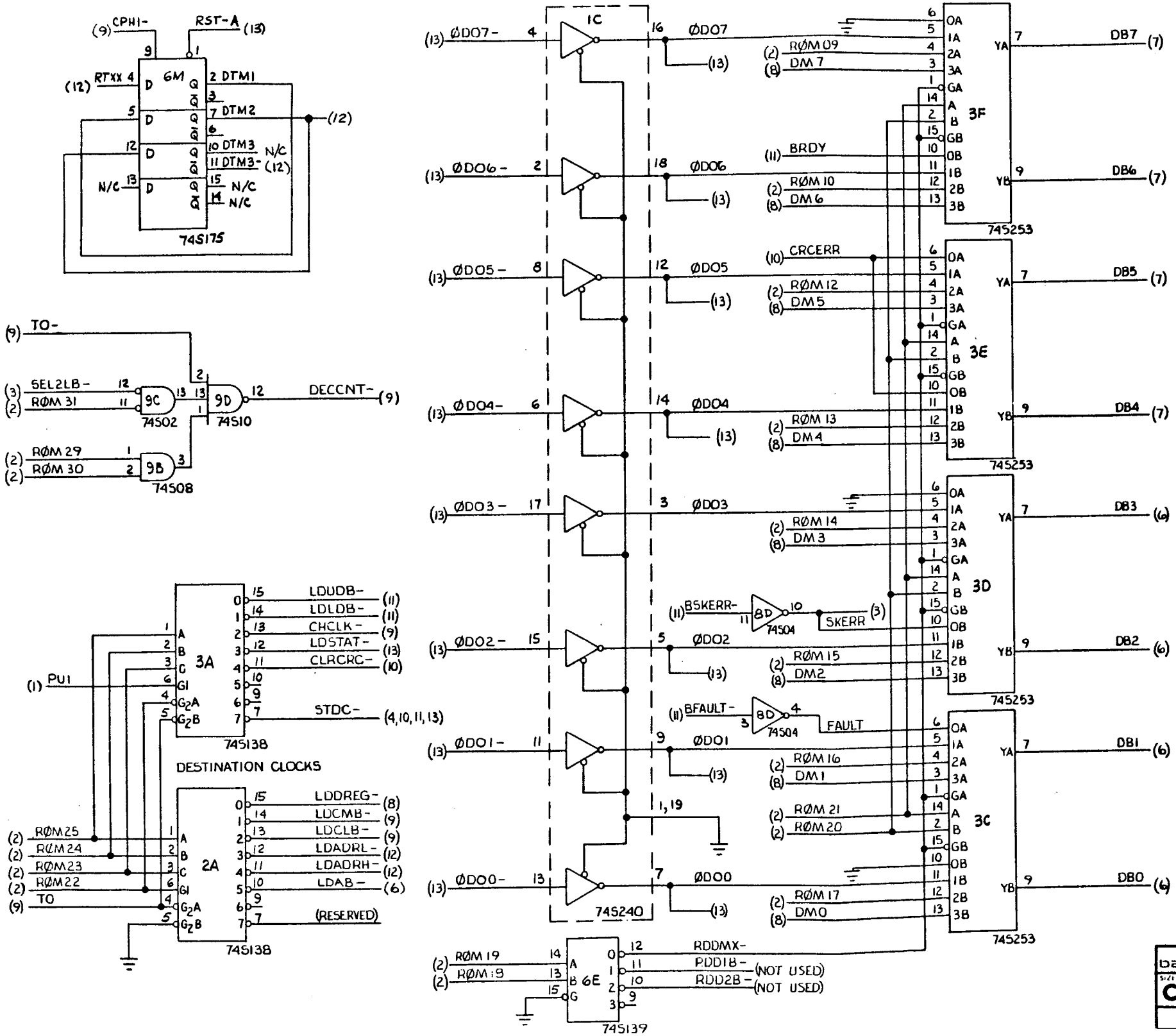
SIZE	DWG NO	REV
C	903029	A

SCALE — SH 3 OF 14



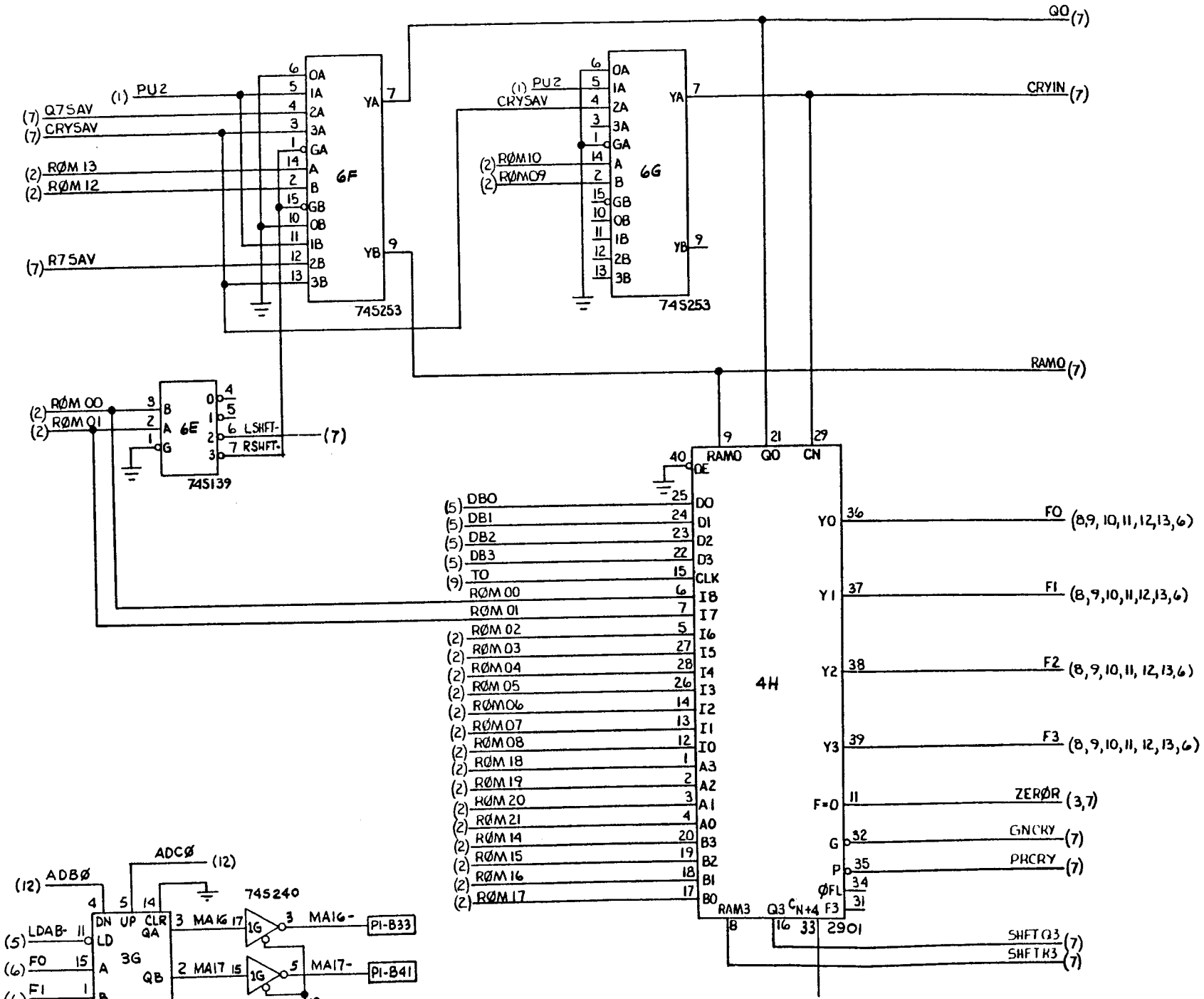
basic / four corporation

SIZE	DWG NO	REV
C	903029	A
	SCALE —	SH 4 OF 14



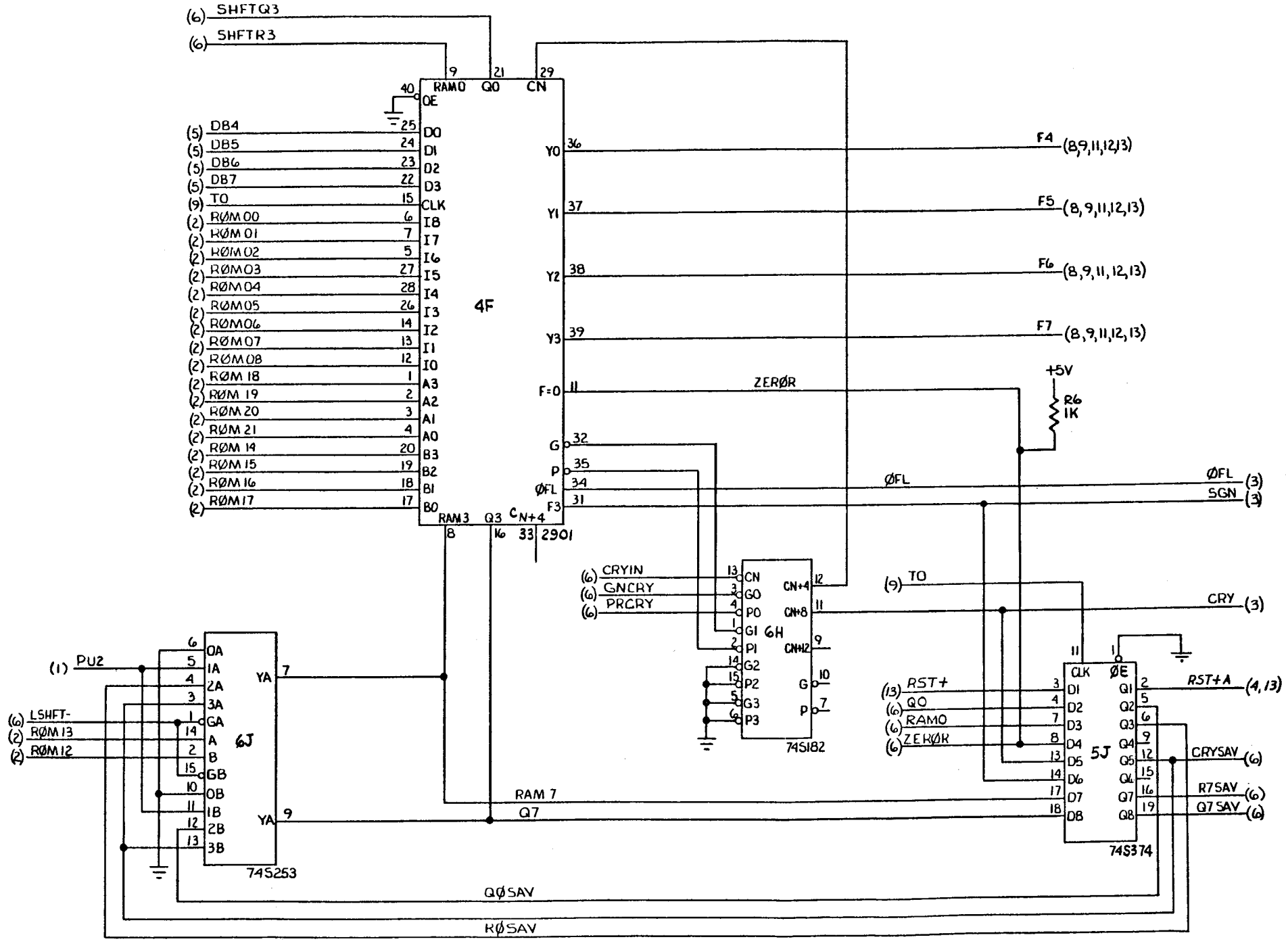
basic / four corporation

SIZE	DWG NO	REV
C	903029	A
	SCALE	SH 5 OF 14



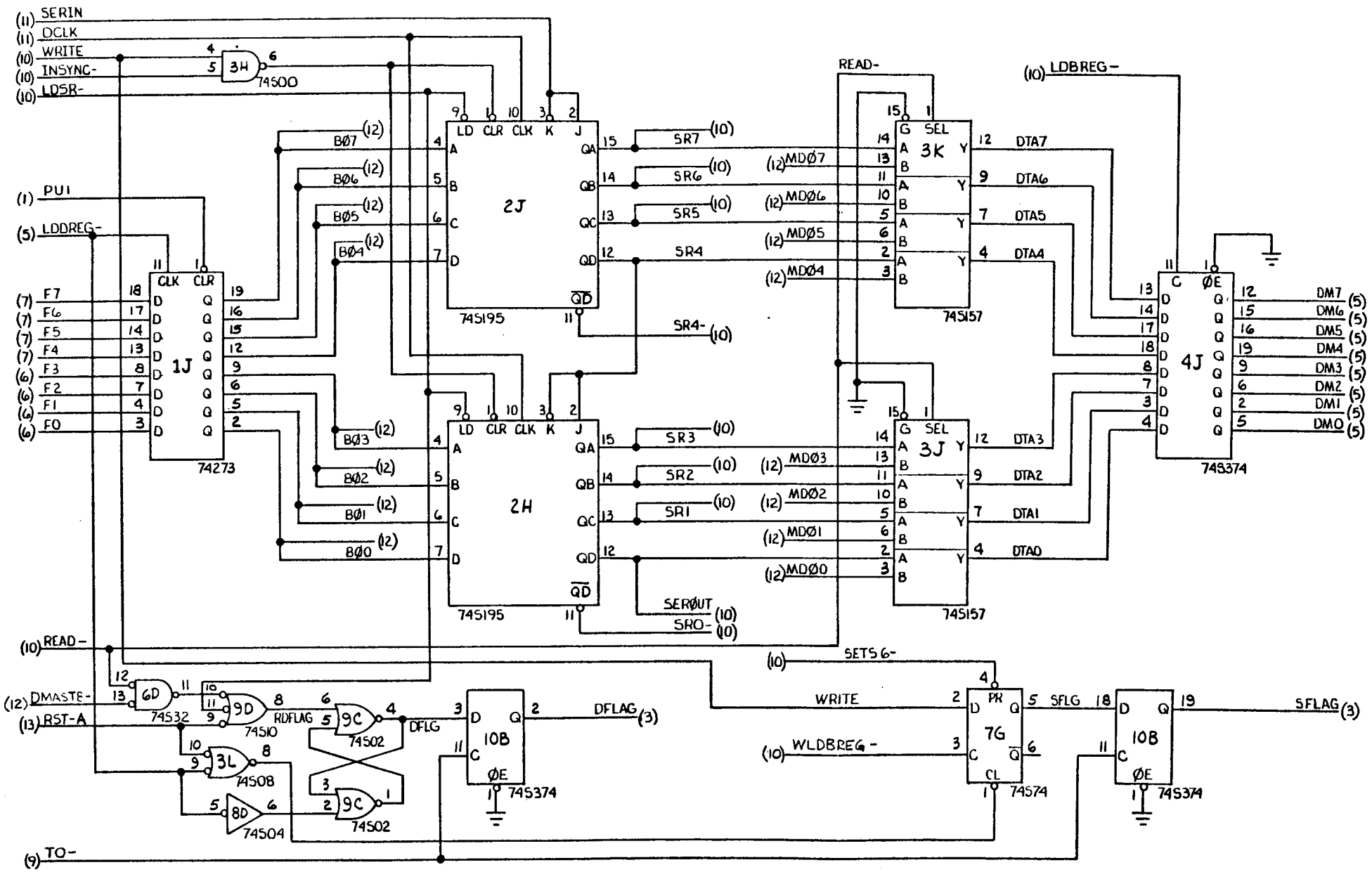
basic / four corporation

SIZE	DWG NO	REV
C	903029	A
	SCALE —	SH 6 OF 14



basic / four corporation

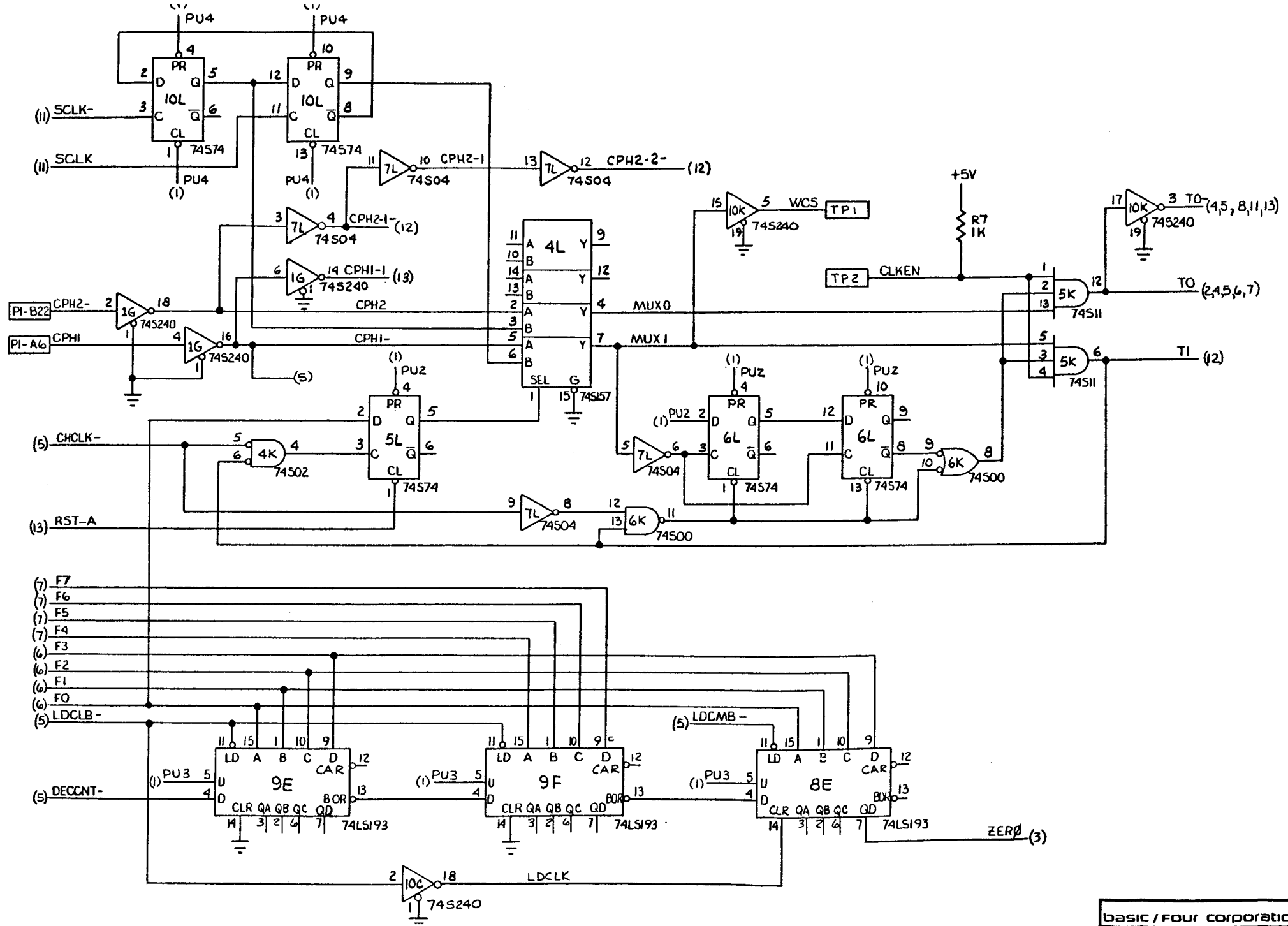
SIZE	DWG NO	REV
C	903029	A
	SCALE ——	SH 7 OF 14



basic / four corporation

SIZE	DWG NO	REV
C	903029	A

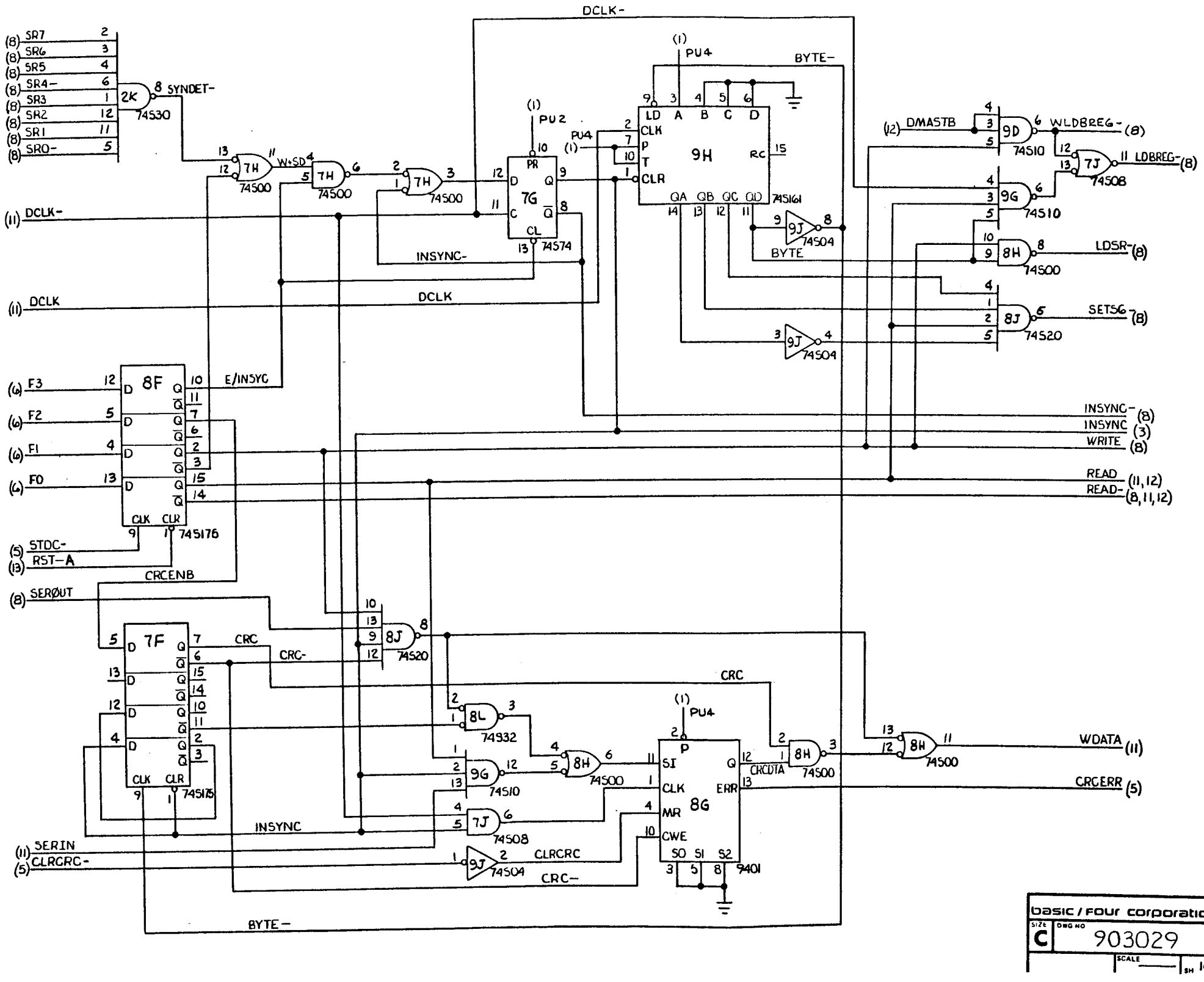
SCALE — SH 8 OF 14



basic / four corporation

SIZE	DWG NO	REV
C	903029	A

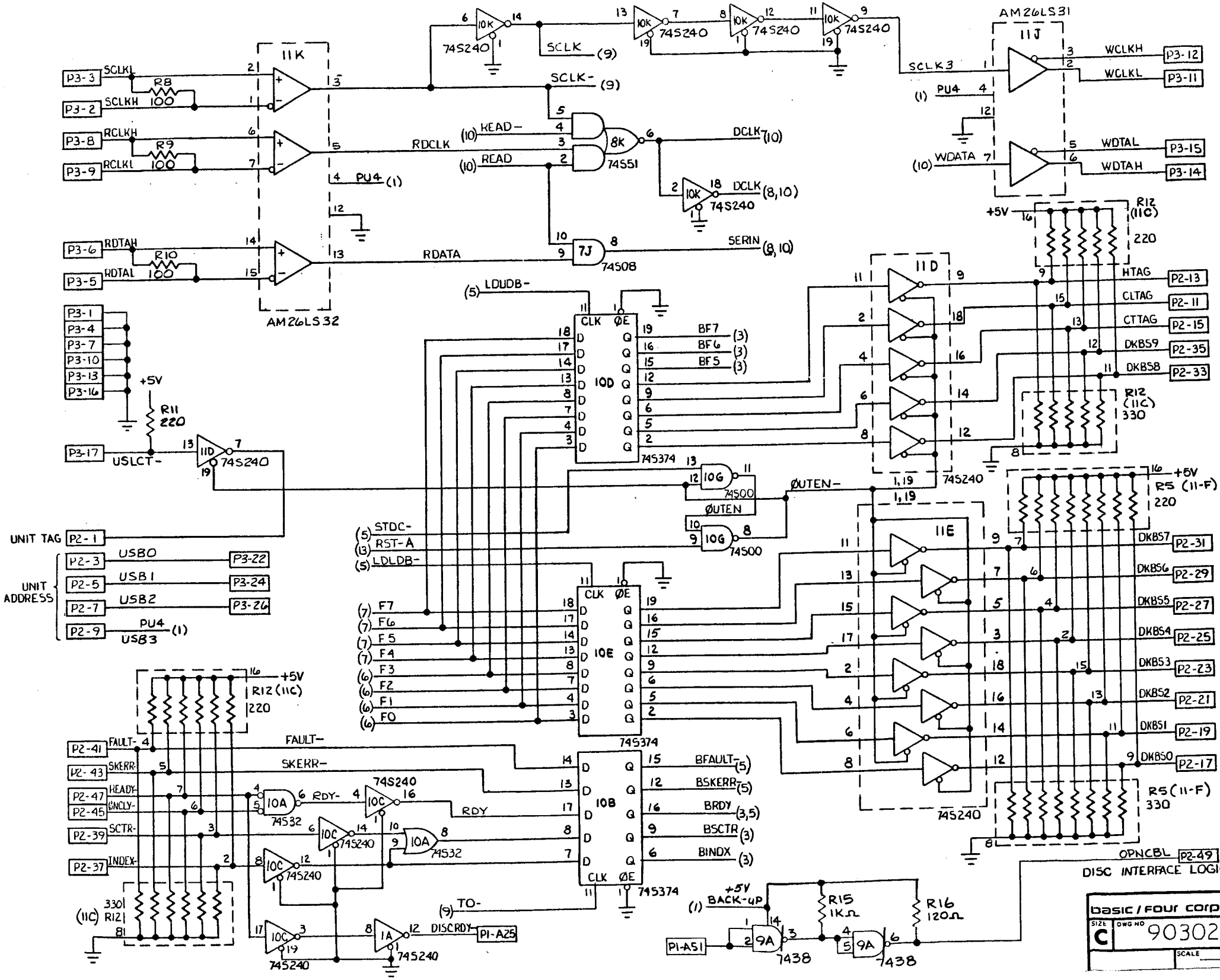
SCALE —— SH 9 OF 14



basic / four corporation

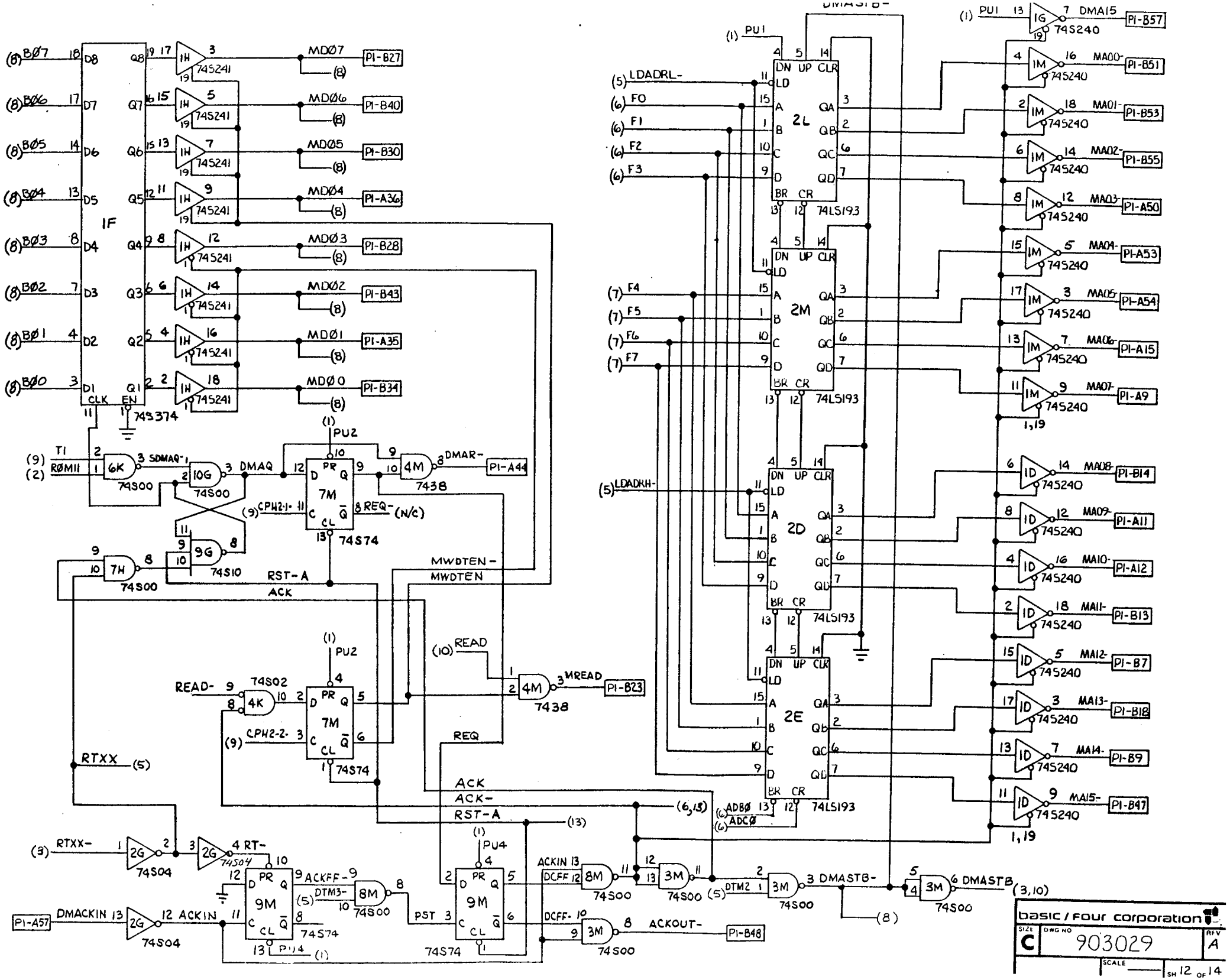
SIZE	DWG NO	REV
C	903029	A

SCALE —— SH 10 OF 14



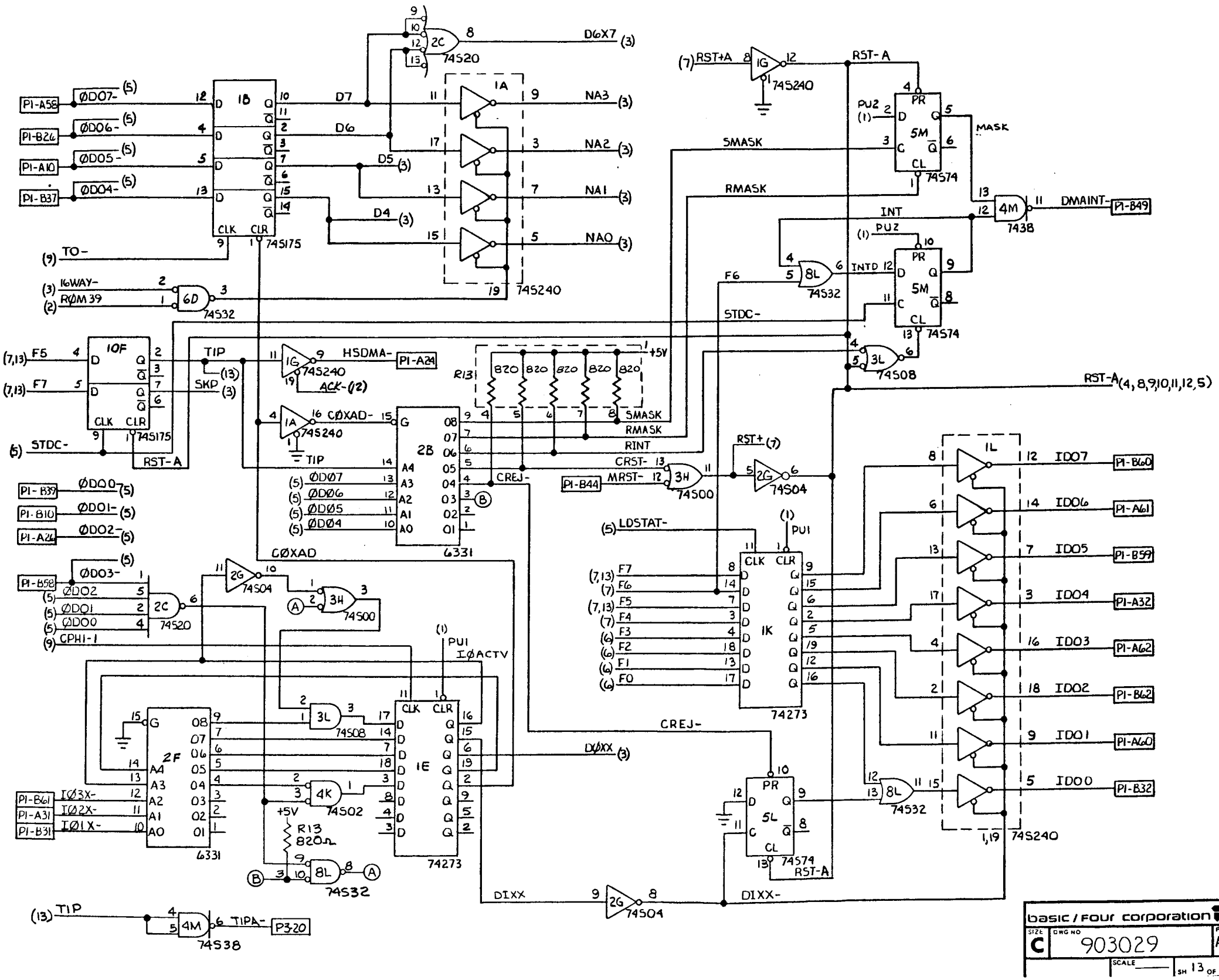
basic / four corporation

SIZE	DWG NO	REV
C	903029	A
	SCALE	SH 11 OF 14



basic / four corporation

SIZE C | DWG NO 903029 | REV A | SCALE — | SH 12 OF 14

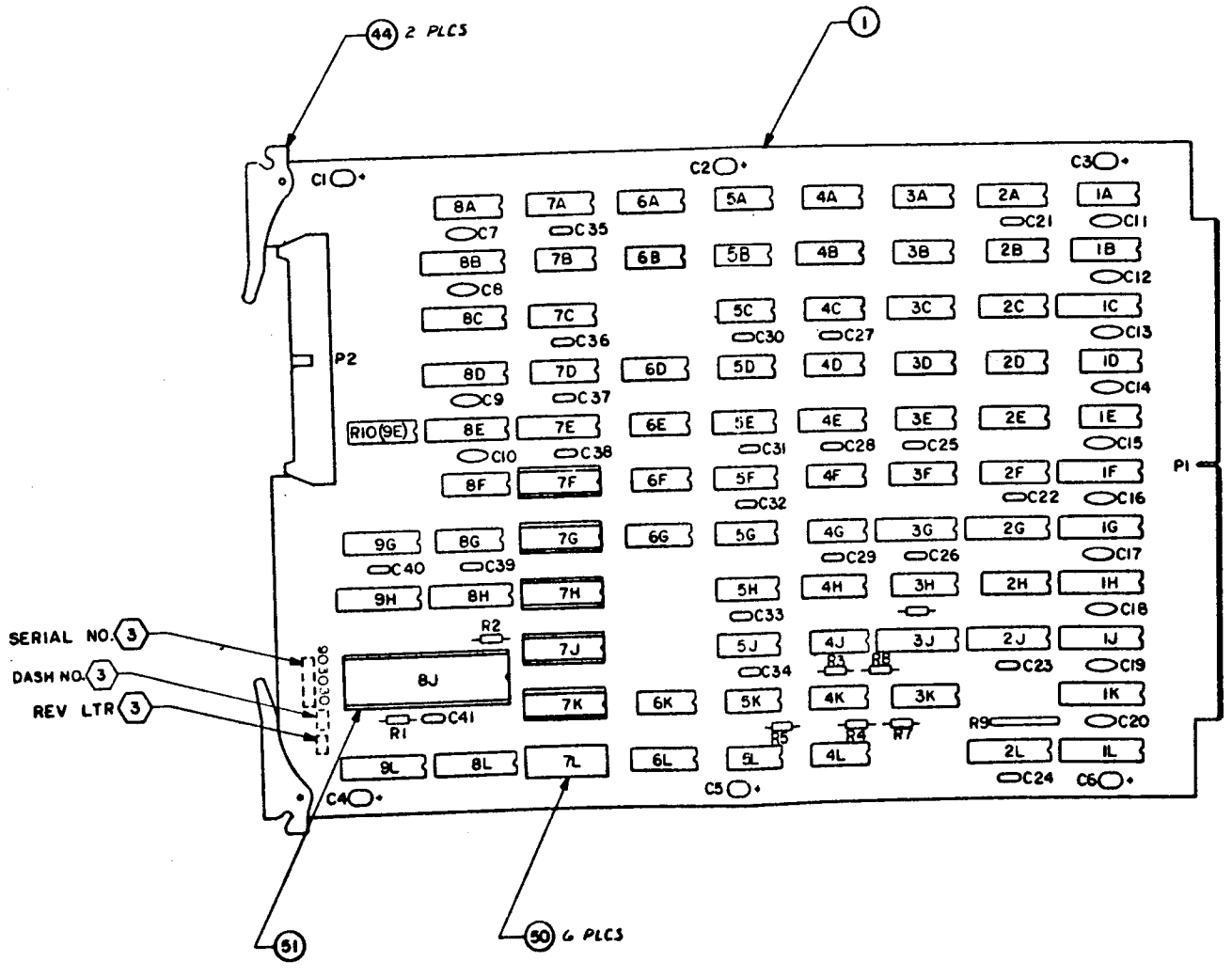


basic / four corporation

SIZE	DWG NO	REV
C	903029	AX3

SCALE —— SH 13 OF 14

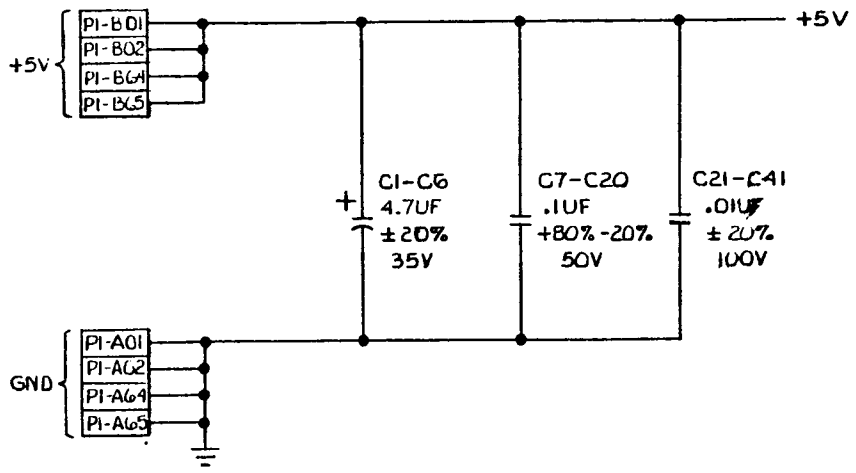
AX1	[illegible]	PRE PRODUCTION RELEASE	[illegible]	[illegible]
AX2	[illegible]	[illegible]	[illegible]	[illegible]
AX3	[illegible]	SEE ECN	[illegible]	[illegible]
AX4	2515	SEE ECN	[illegible]	[illegible]
AX5	2562	SEE ECN	[illegible]	[illegible]
AX6	[illegible]	SEE ECN	[illegible]	[illegible]
AX7	2743	SEE ECN	[illegible]	[illegible]
A	2393	PRODUCTION RELEASE	[illegible]	[illegible]
B	2501	IC AT LOC 7G REVISED WAS 165006-047	[illegible]	[illegible]
B1	2519	CHANGED P/N FOR R2 WAS 10104. REWORK ON BD.— 904059	[illegible]	[illegible]
B2	2599	ADDED IC AT 5B CHANGED IC'S AT 2D, 4E, 6F & 1E REWORK TO BDS. 904031 & 904059	[illegible]	[illegible]
C	2623	SEE ECN (ARTS UPDATE)	[illegible]	[illegible]
D	2711	REV P/L ITEM 50	[illegible]	[illegible]



OUTSTANDING ECN'S
2982

(3) MARK PER BFC SPECIFICATION 800000 APPROX WHERE SHOWN.
2. FOR SEPARATE PARTS LIST SEE P/L 903030.
1. REF LOGIC DIAGRAM 903031.
NOTES: UNLESS OTHERWISE SPECIFIED

		DIMENSIONS ARE IN INCHES TOLERANCES UNLESS OTHERWISE SPECIFIED X ± 1 XX ± .03 .XXX ± .010 ANGLES ± 1.0° MACHINED SURFACES √	basic / four corporation 1328 South Cloudina Street Anaheim, California 92805		
			DRAWN	[illegible]	TITLE PCB A CARTRIDGE TAPE CONT
			CHKD	[illegible]	
			ENG	[illegible]	SIZE D DWG NO 903030 REV D
			MFG		
			APP	[illegible]	SCALE 1:1 SH 1 OF 1
NEXT ASSY	USED ON	DO NOT SCALE DRAWING			



		DESCRIPTION	INITIAL	DATE
AX1	[illegible]	[illegible]	[illegible]	[illegible]
AX2	1958	SEE ECN	[illegible]	[illegible]
AX3	[illegible]	SEE ECN	[illegible]	[illegible]
A	2343	RELEASED	[illegible]	[illegible]
B	2519	CHANGED LOGIC SHTS. 2, 13 & 14	[illegible]	[illegible]
C	2544	CHANGED LOGIC SHTS. 1, 2, 8 & 10	[illegible]	8-3-78

UNUSED GATES		
LOC	COML. NO.	NO.
6B	74LS08	1
5L	74LS00	1
6E	74LS04	1
4L	74LS20	1
1E	7438	1
5K	7438	1
1F	74S240 *	3
8C	74S240 *	2

* CONTROL LINES TIED TO GND

OUTSTANDING ECN'S

None

3. FOR P1 AND P2 CONNECTOR FUNCTIONS SEE SHT 15

2. I.C. DESIGNATIONS ON F/D INDICATE BOARD LOCATION. FOR COMPLETE REFERENCE DESIGNATION PREFIX WITH "U". EXAMPLE: "U6A".

1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4 WATT.

NOTES UNLESS OTHERWISE SPECIFIED

		DIMENSIONS ARE IN INCHES	basic/four corporation			
		TOLERANCES UNLESS OTHERWISE SPECIFIED	1335 South Claudina Street Anaheim, California 92806			
		x ± 1 xx ± 03 xxx ± 010 ANGLES ± 1.0°	DRAWN	R.G. HANSON	6-29-77	TITLE LD CARTRIDGE TAPE CONT
			CHKD	[illegible]	9-28-77	
			ENG	[illegible]	9-29-77	
			MFG			SIZE C DWG NO 903031 REV C
903030	REF	MACHINED SURFACES √	APP	[illegible]	9-29-77	
NEXT ASSY	USED ON	DO NOT SCALE DRAWING				SCALE NONE SH 1 OF 15

MICROPROCESSOR ADDRESS & CONTROL BUFFERS

MEMORY BANK & I/O DECODE

CPU 8J

Z80

74LS241 8L

74LS241 9L

74LS138 6L

74LS138 6D

74LS138 8F

74LS109 4H

74S37 4J

74S37 4J

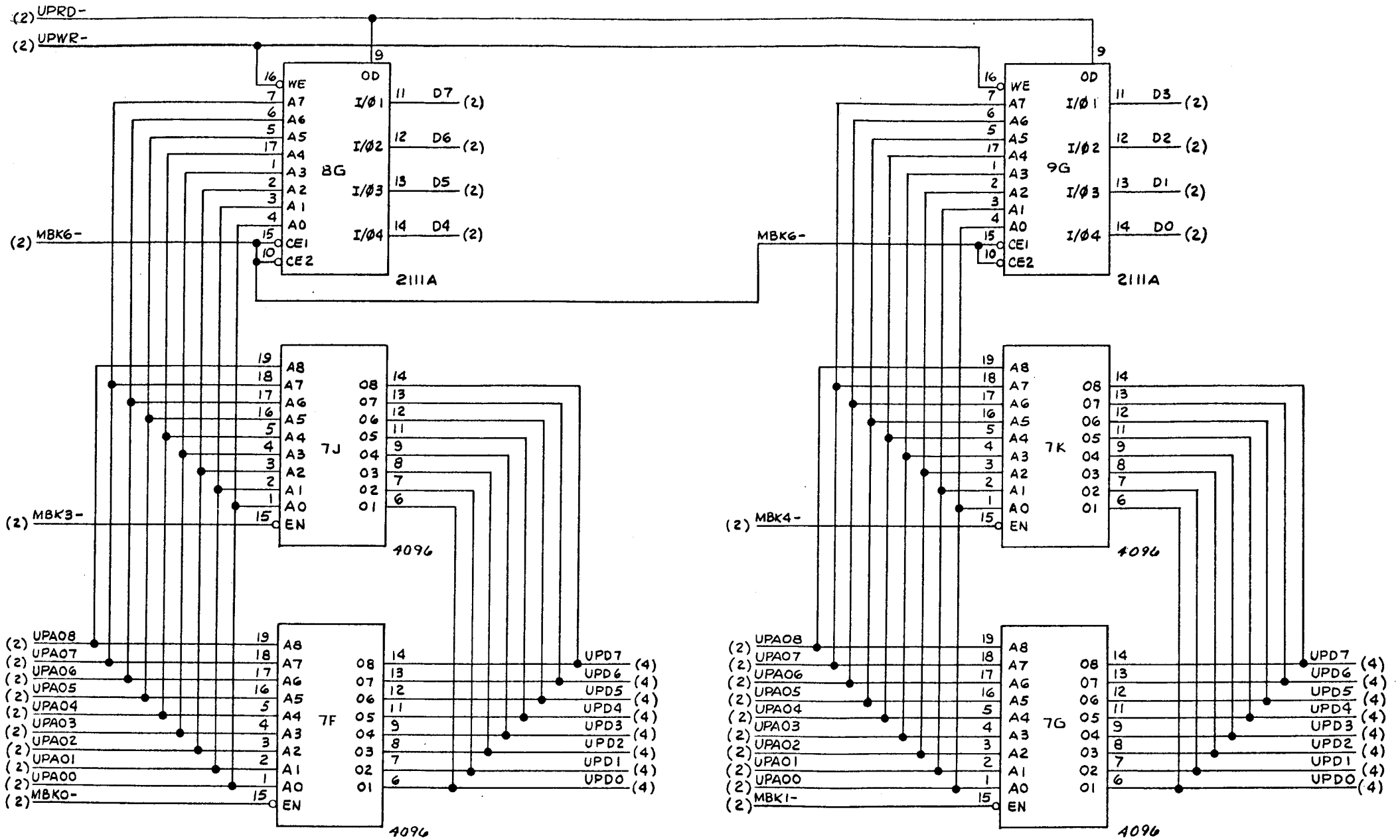
74LS240 1F

MICROPROCESSOR, BUFFERS & DECODERS

basic/four corporation

SIZE C | DWG NO 903031 | REV C

SCALE NONE | SH 2 OF 15

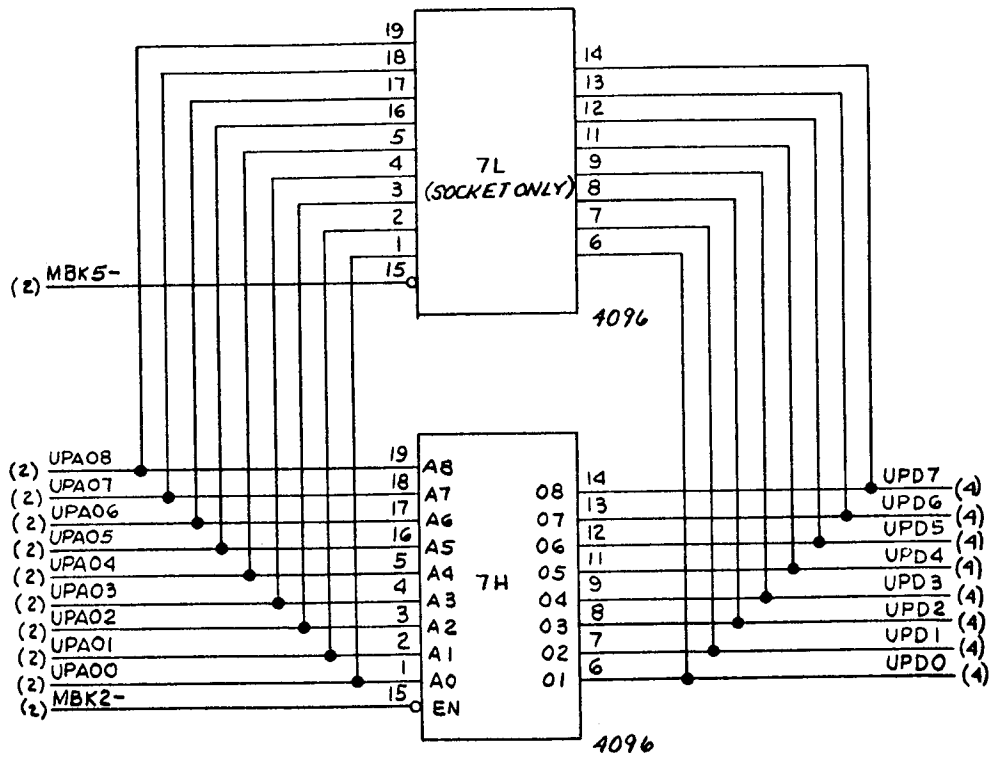


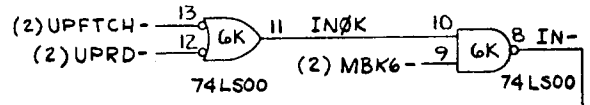
RAMS & PROMS

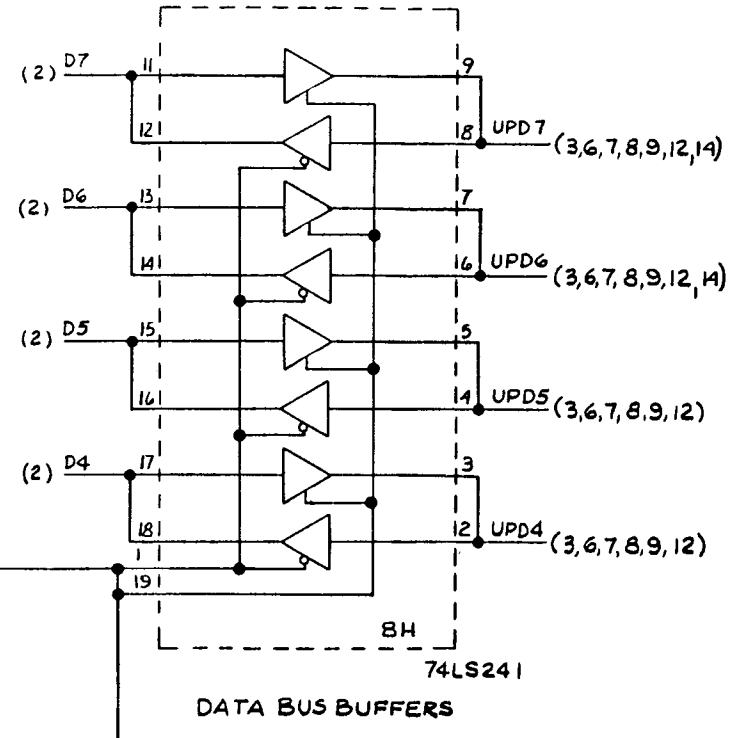
basic/four corporation

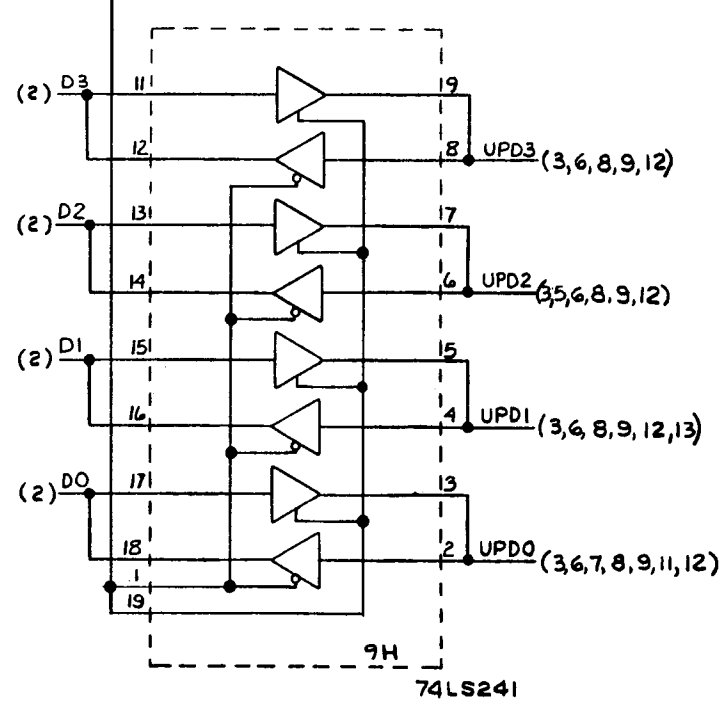
SIZE	DWG NO	REV
C	903031	C

SCALE NONE SH 3 OF 15



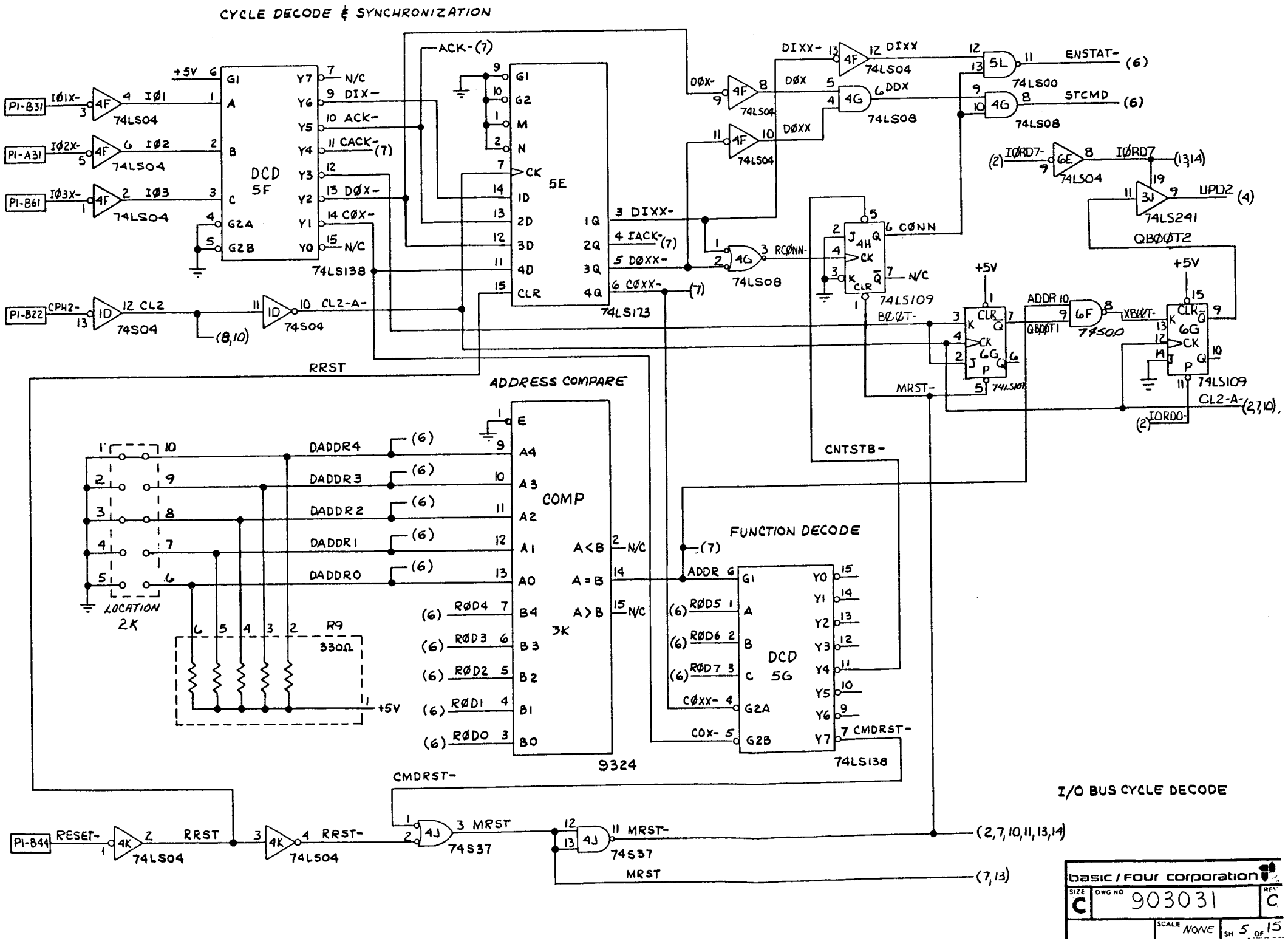






basic/four corporation

SIZE	DWG NO	REV
C	903031	C
	SCALE NONE	SH 4 OF 15

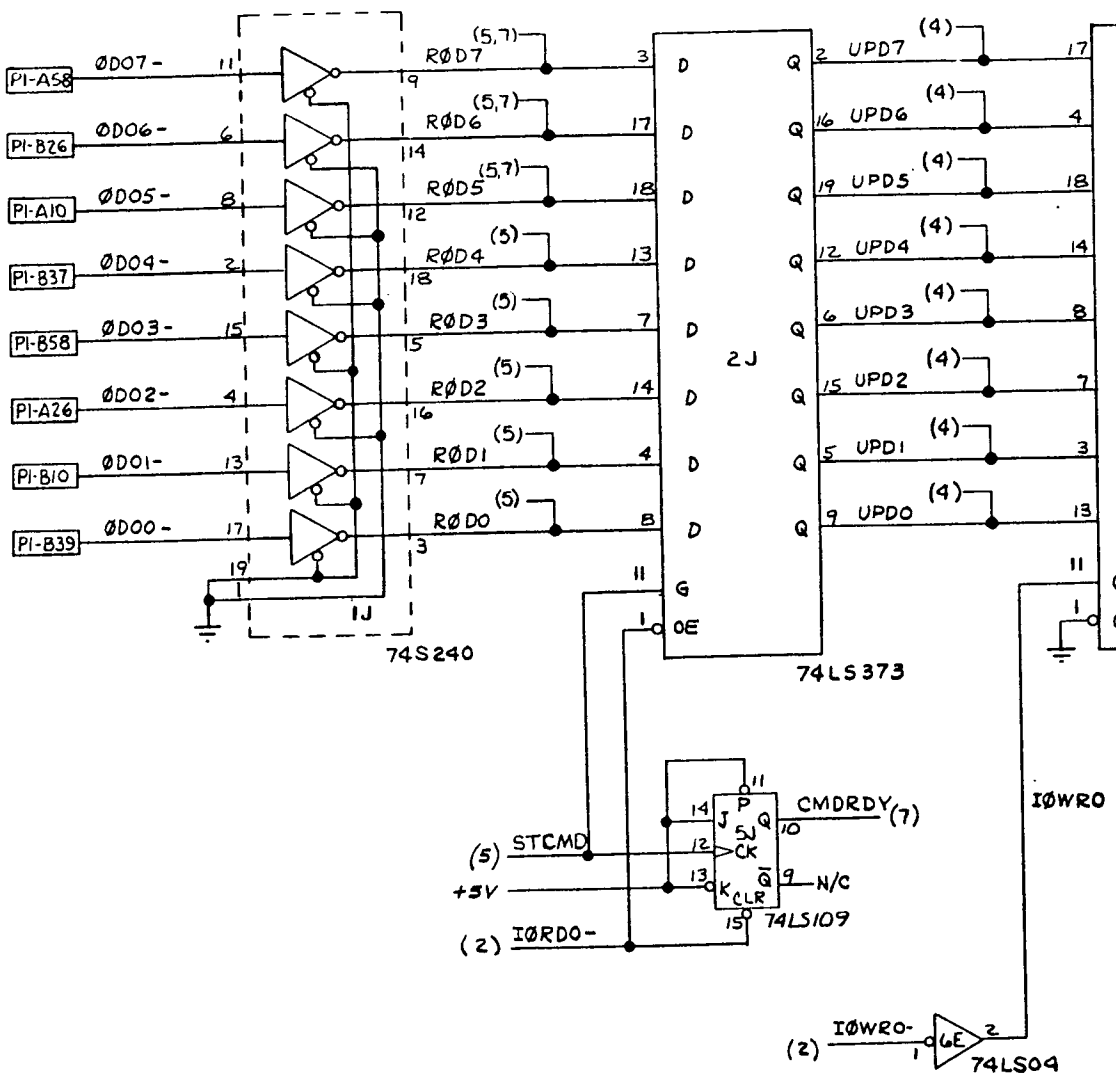


basic / four corporation

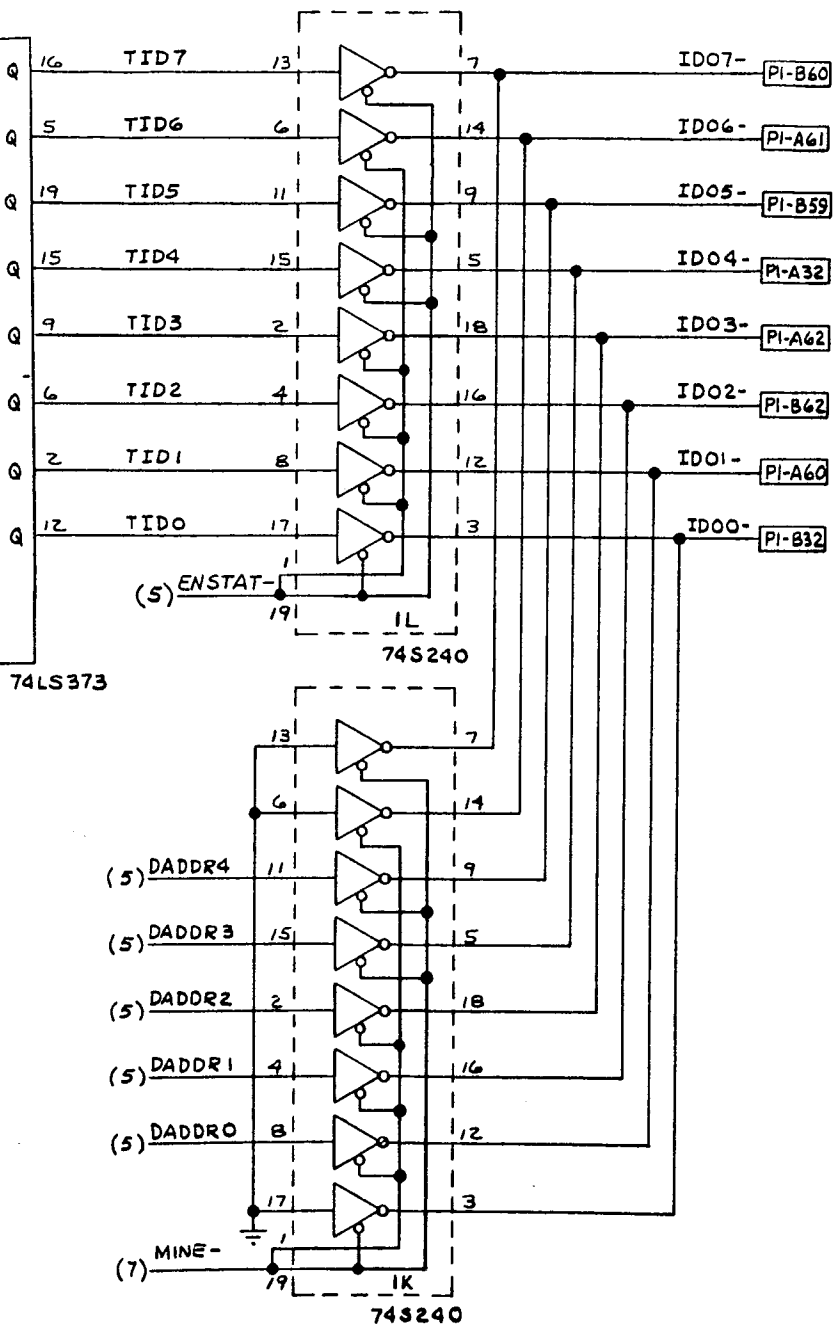
SIZE	DWG NO	REV
C	903031	C

SCALE NONE SH 5 OF 15

I/O DATA RECEIVERS & COMMAND LATCH



MAIN STATUS LATCH & I/O DATA DRIVERS



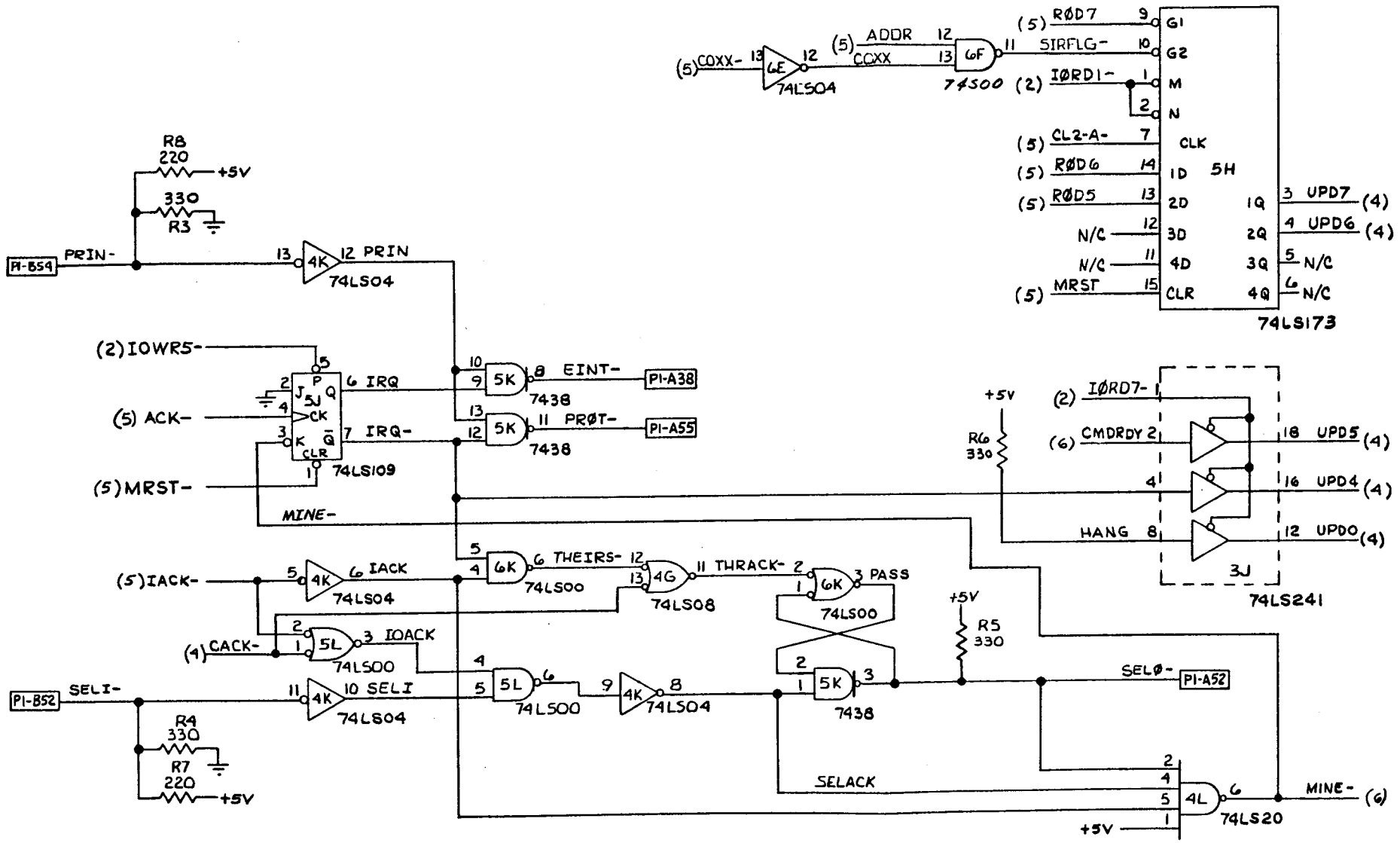
I/O BUS COMMAND & STATUS

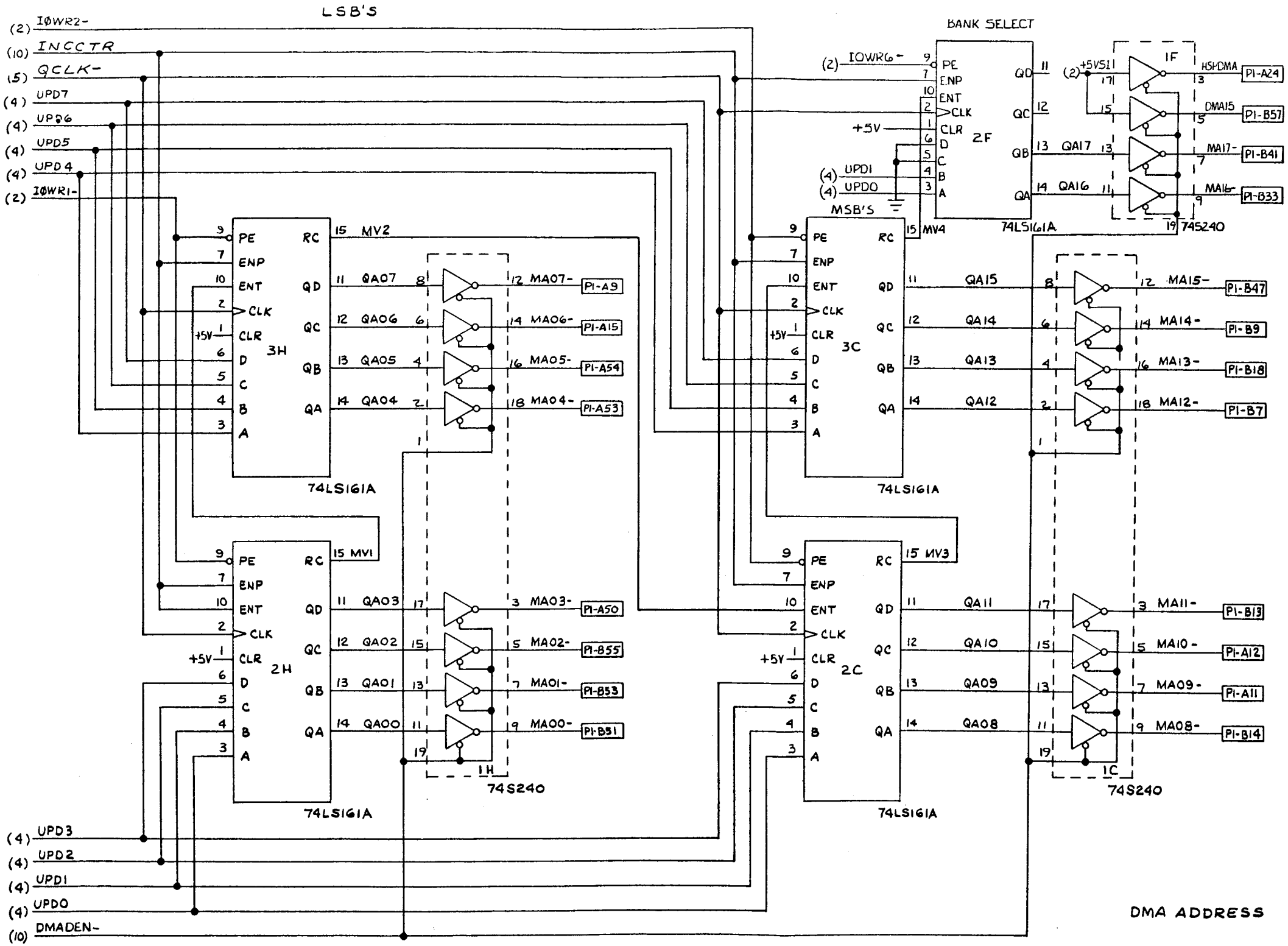
basic / four corporation

SIZE	DWG NO	REV
C	903031	C
	SCALE NONE	SH 6 OF 15

INTERRUPT & SELECT PRIORITY LOGIC

CPU INTERFACE FLAGS TO MPROC



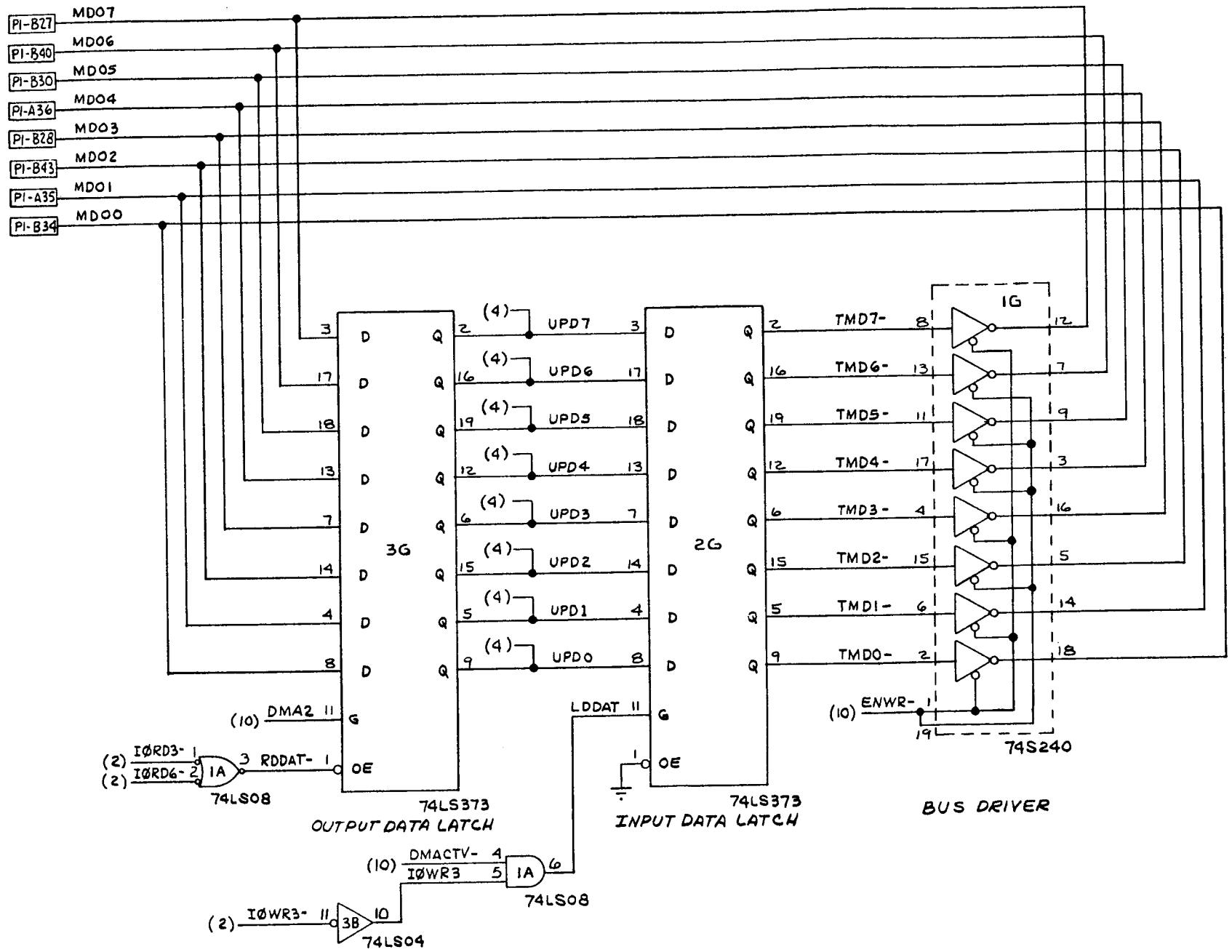


DMA ADDRESS

basic / four corporation

SIZE	DWG NO	REV
C	903031	C

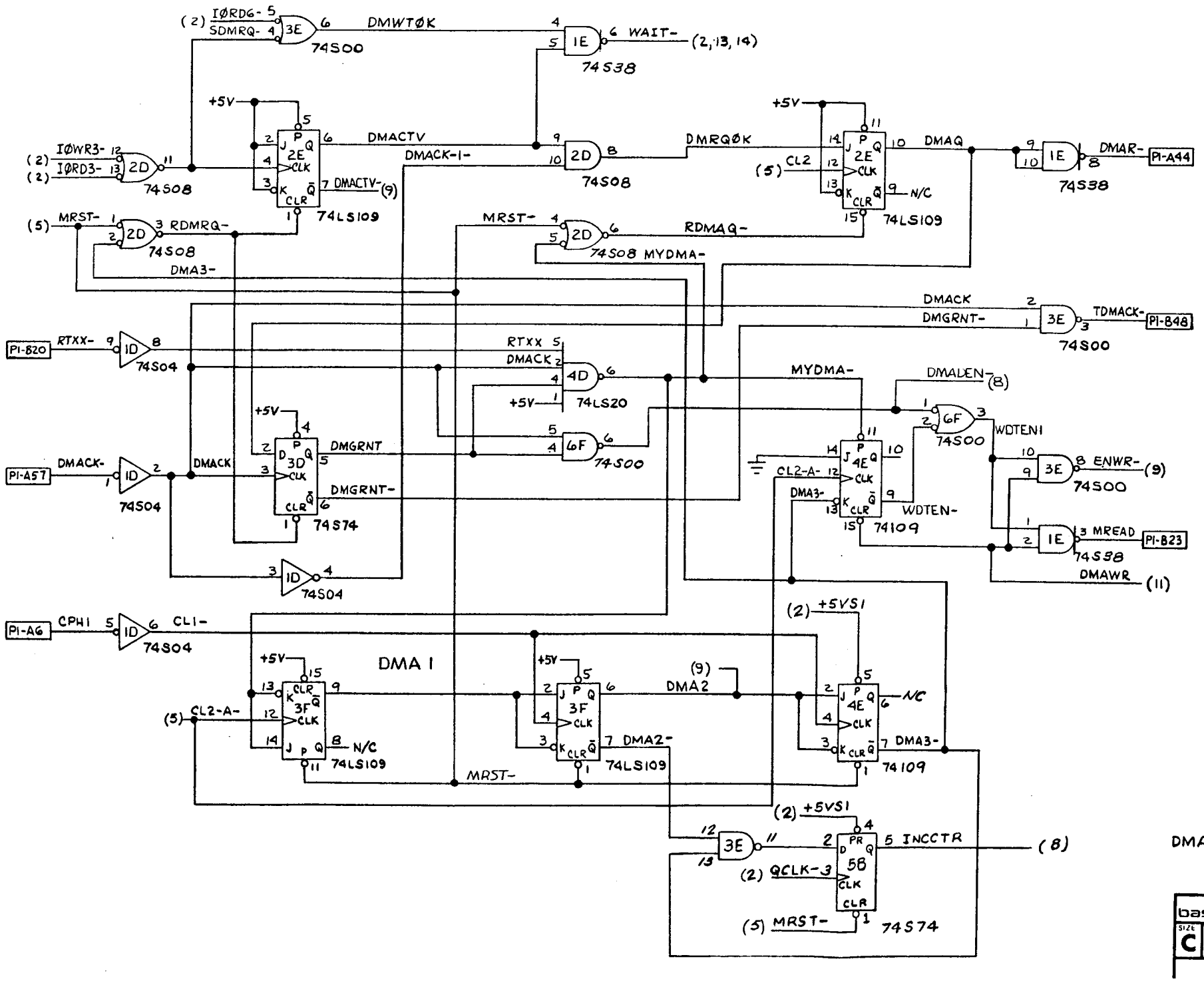
SCALE NONE SH 8 OF 15



DMA DATA

basic / four corporation

SIZE	DWG NO	REV
C	903031	C
	SCALE NONE	SH 9 OF 15



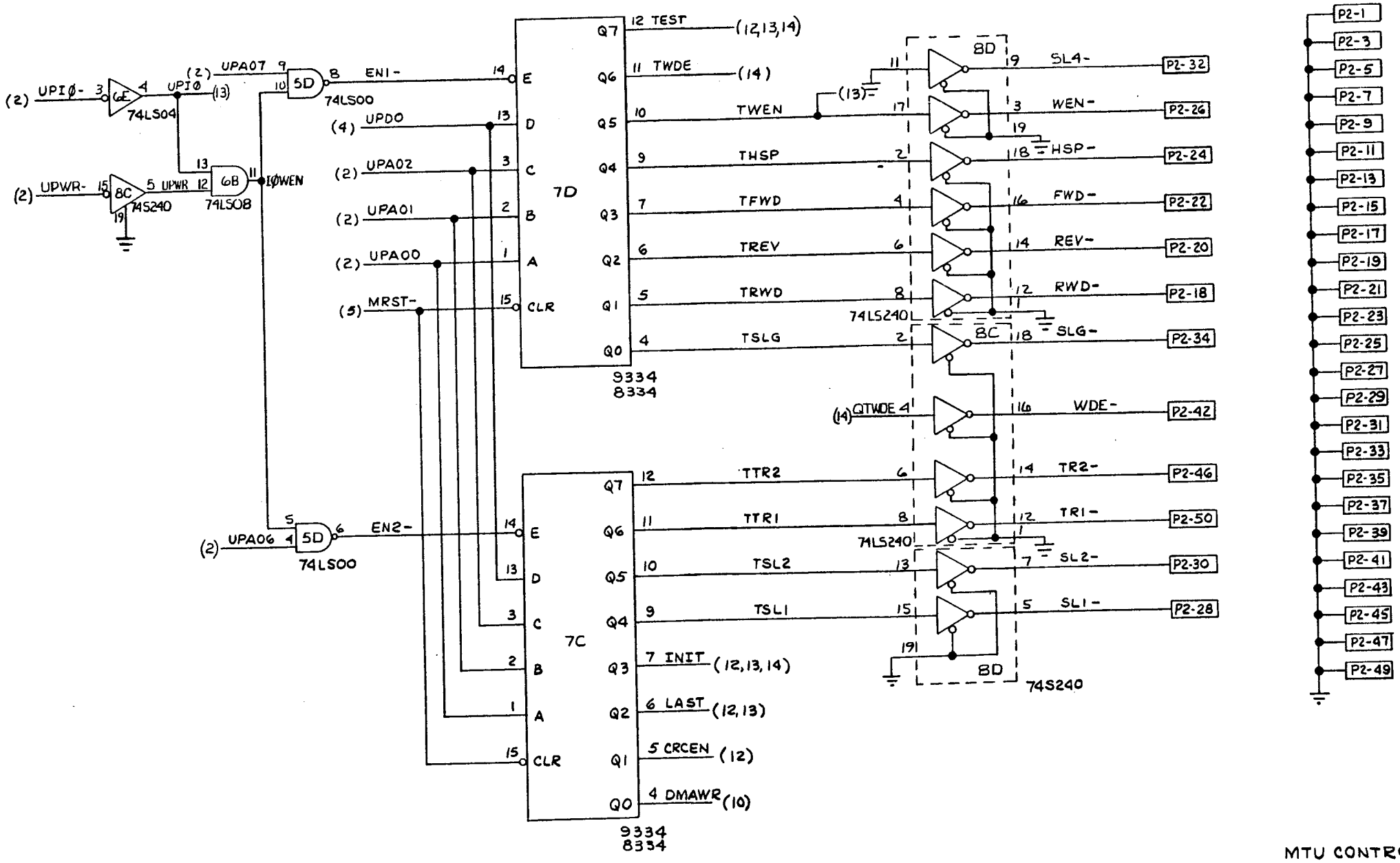
DMA CONTROL & PRIORITY

basic / four corporation

SIZE	DWG NO	REV
C	903031	C

SCALE NONE SH 10 OF 15

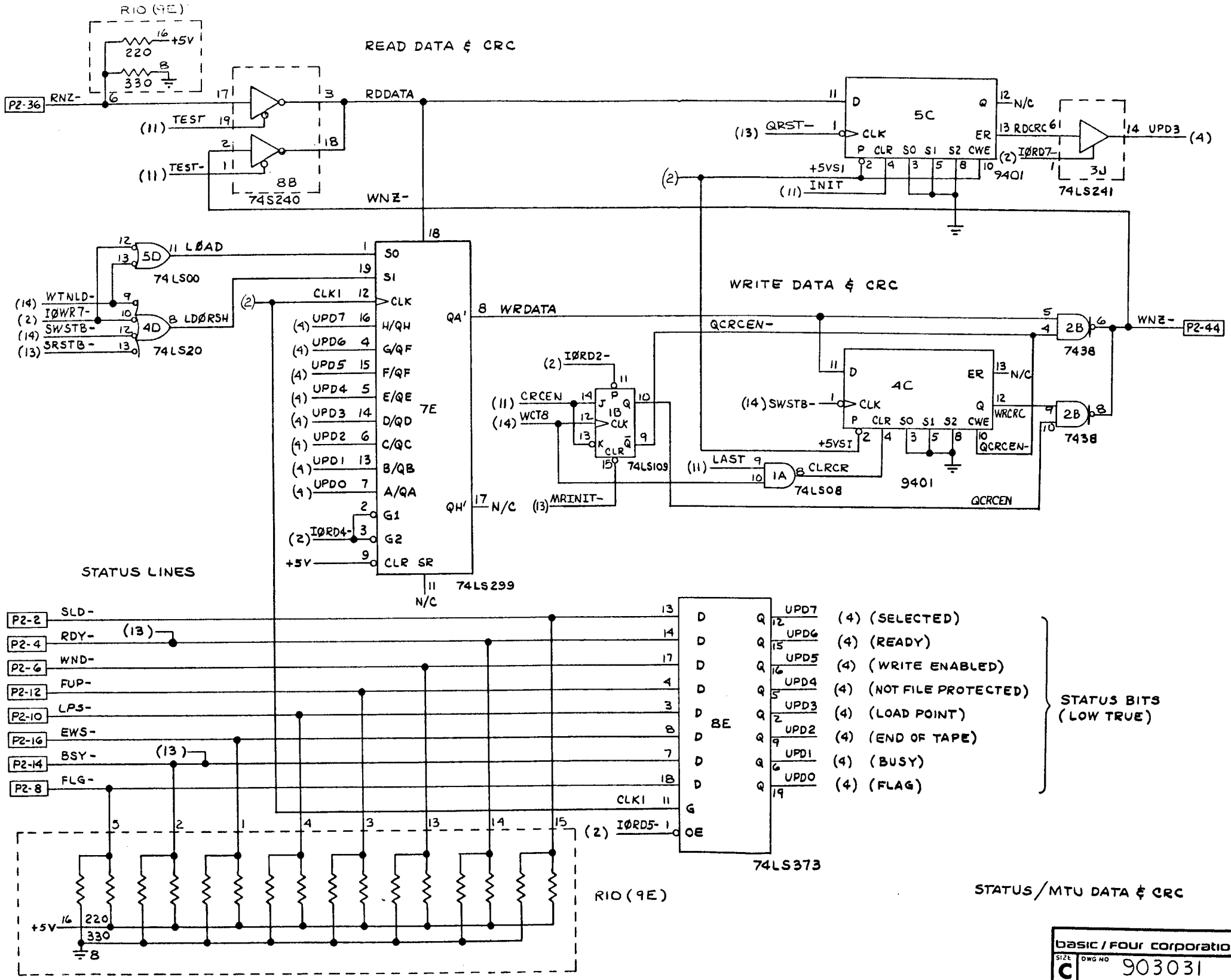
CONTROL LINES



MTU CONTROL

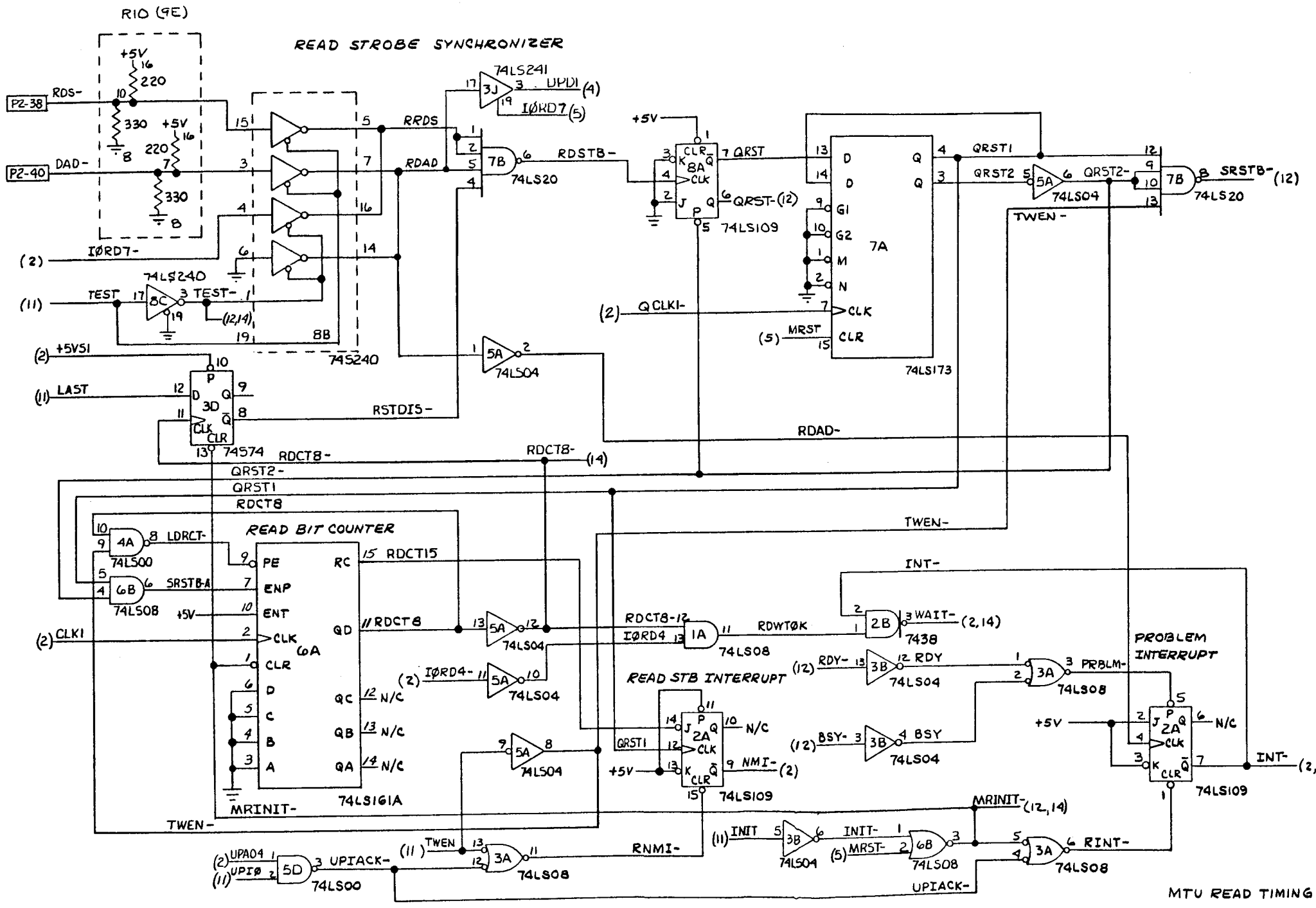
basic / four corporation

SIZE	DWG NO	REV
C	903031	C
	SCALE NONE SH 11 OF 15	



basic / four corporation

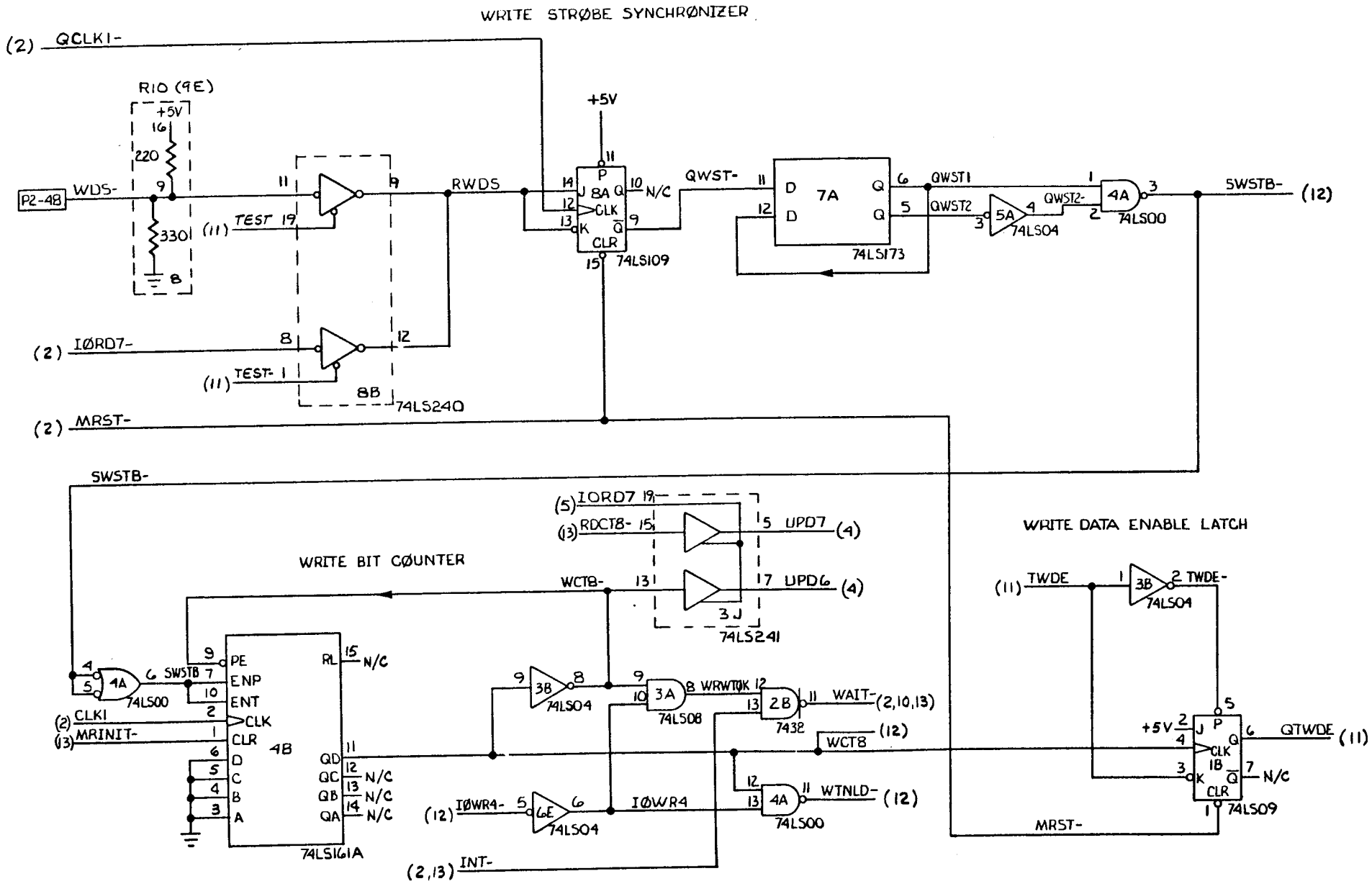
SIZE	DWG NO	REV
C	903031	C
	SCALE NONE	SH 12 OF 15



MTU READ TIMING

basic / four corporation

SIZE	DWG NO	REV
C	903031	C
	SCALE NONE	SH 13 OF 15

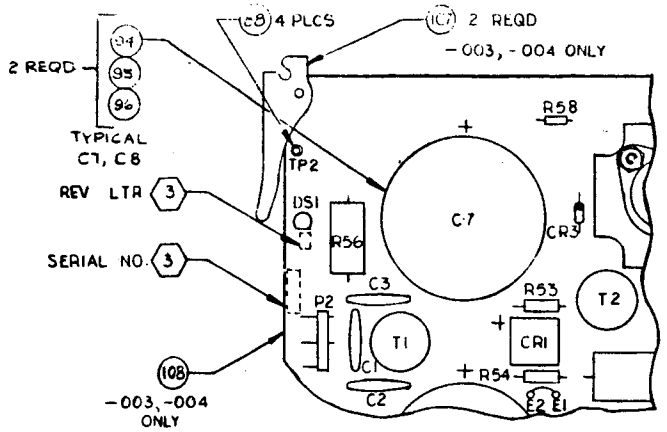


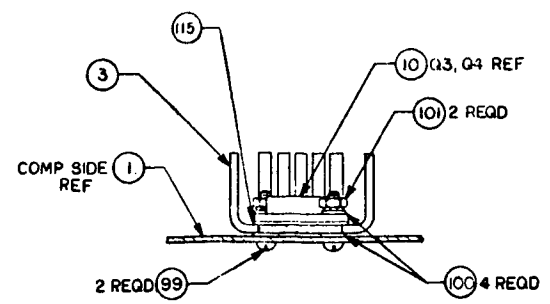
MTU WRITE TIMING

basic / four corporation

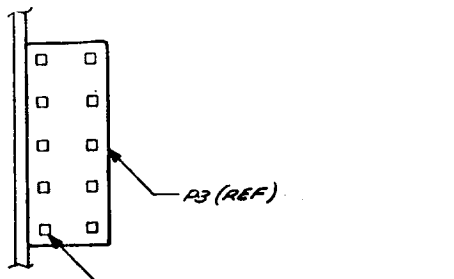
SIZE	DWG NO	REV
C	903031	C

SCALE NONE | SH 14 OF 15





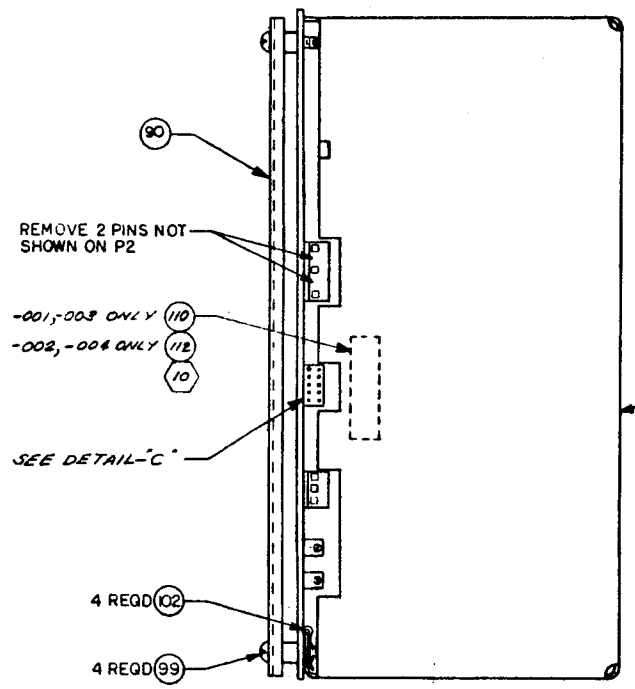
SECTION A-A
SCALE: NONE
TYPICAL Q3, Q4

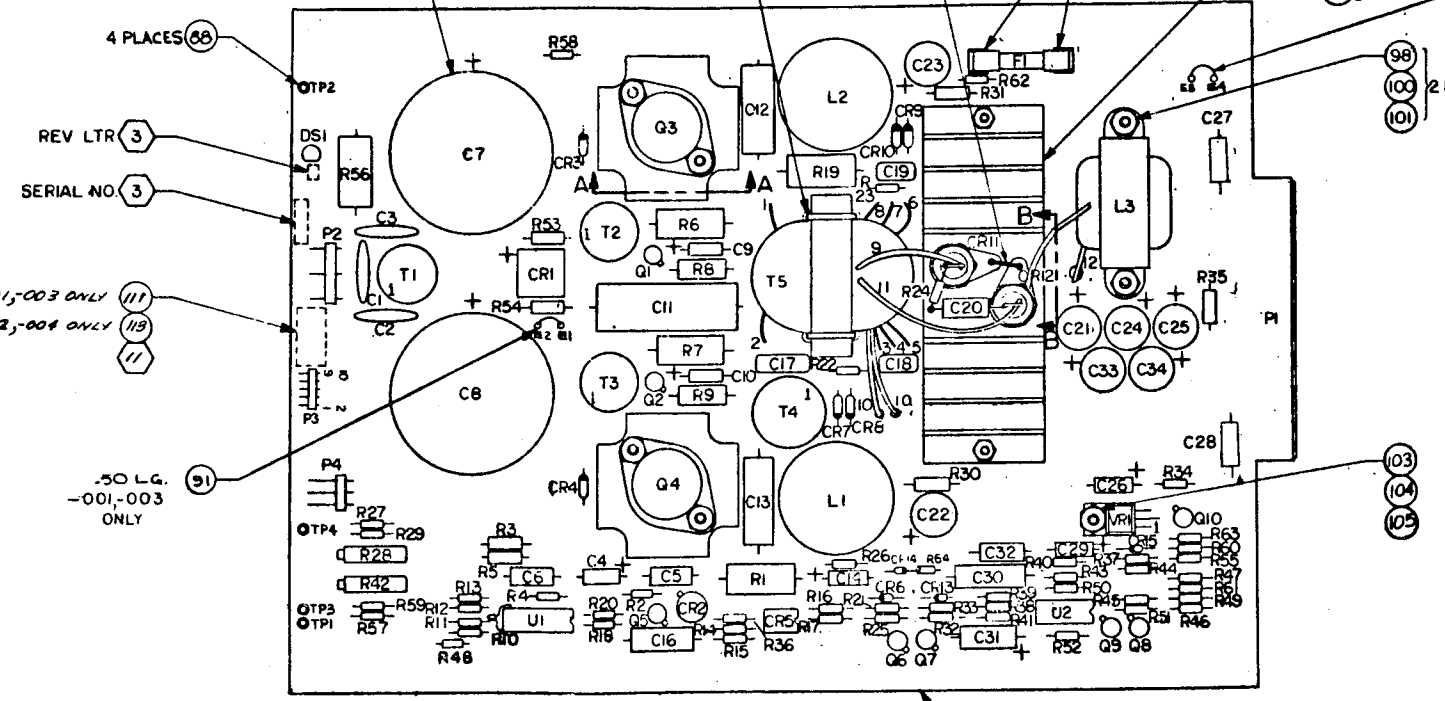


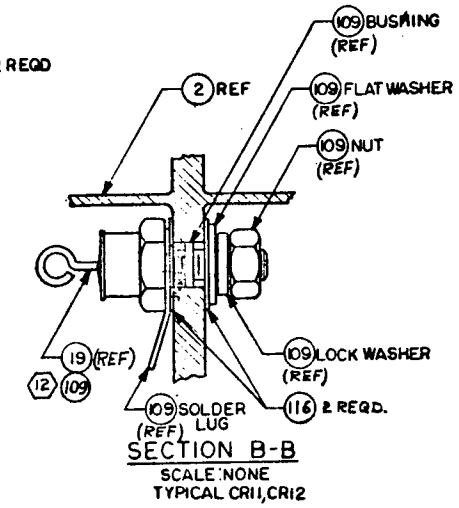
DETAIL-C
SCALE: NONE

REVISION RECORD				
REV	ECN #	DESCRIPTION	INITIAL	DATE
AX		PRE-PRODUCTION RELEASE		
AX2	1975A	INITIAL RELEASE		8/16/77
AX3	2179	SEE ECN		8/16/77
AX4	2206	SEE ECN		10-4-77
AX5	2332	SEE ECN		2-2-78
AX6	2179	SEE ECN		2-2-78
AX7	2355	SEE ECN; NEW PCB 904067(-003,-004 ONLY)		4/19/78
AX8	2352	ADDED DETAIL "C" PER ECN		7/3/78
AX9	2434	SEE ECN		4/30/78
AX10	2487	ADDED REWORK NOTE UPDATED TAB BLOCK		11/6/78
A	2555	PRODUCTION RELEASE INCORPORATED REWORK INTO NEW PCB 904199 (-003 & -004 ASSYS ONLY)		10-19-78
B	2814	ADDED R64 CH6 R40 & R43		1-9-79
C	2866	CHANGED R58		1-9-79
D	2883	CORRECT P/L ERROR		1-9-79

-003 -004







SECTION B-B
SCALE: NONE
TYPICAL CR11, CR12

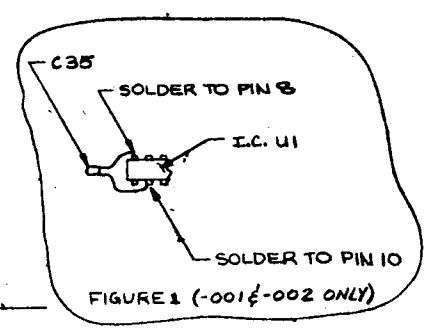


FIGURE 1 (-001 & -002 ONLY)

13. REWORK PER ECN 2484 (-001 & -002 ONLY)
(12) DISCARD MICA WASHERS IN KIT (ITEM 103) AND INSTALL ITEM 116 AS SHOWN
(11) INSTALL LABEL APPROX. WHERE SHOWN, ADJACENT TO P3 AND READABLE WITH COVER ON.
(10) INSTALL LABEL APPROX. WHERE SHOWN (OUTSIDE)
7. REWORK PER ECN 2179. (-001 & -002 ONLY)
6. REWORK -001/-002 ONLY PER ECN 1975A
5 REF. PRODUCT SPECIFICATION NO. 300130.
4 COVERS REMOVED FOR CLARITY ON FRONT VIEW.
(3) MARK DESIGNATION APPROXIMATELY WHERE SHOWN PER BFC SPECIFICATION 800000.
2. REF BOARD DETAIL 904034 FOR -001 & -002; 904149-001 FOR -003 & -004.
1. REF LOGIC DIAGRAM 903039, LATEST REV

NOTES: UNLESS OTHERWISE SPECIFIED

REWORK INSTRUCTIONS (-001, -002 ONLY)
1. LOCATE C35 AS SHOWN IN FIG 1

-001 -002

OUTSTANDING ECN'S
3055A
3170A

REWORK PER ECNS 2814, 2866.

903038-004	D	230V	REMOVED
903038-003	D	115V	—
903038-002	D	230V	REMOVED
903038-001	D	115V	—
PART NO.	MIN ACCEPT REV LEVEL	DESCRIPTION	JUMPER WIRE BETWEEN E1 & E2

TABULATION CHART

SEE PARTS LIST 903038, REV "A"

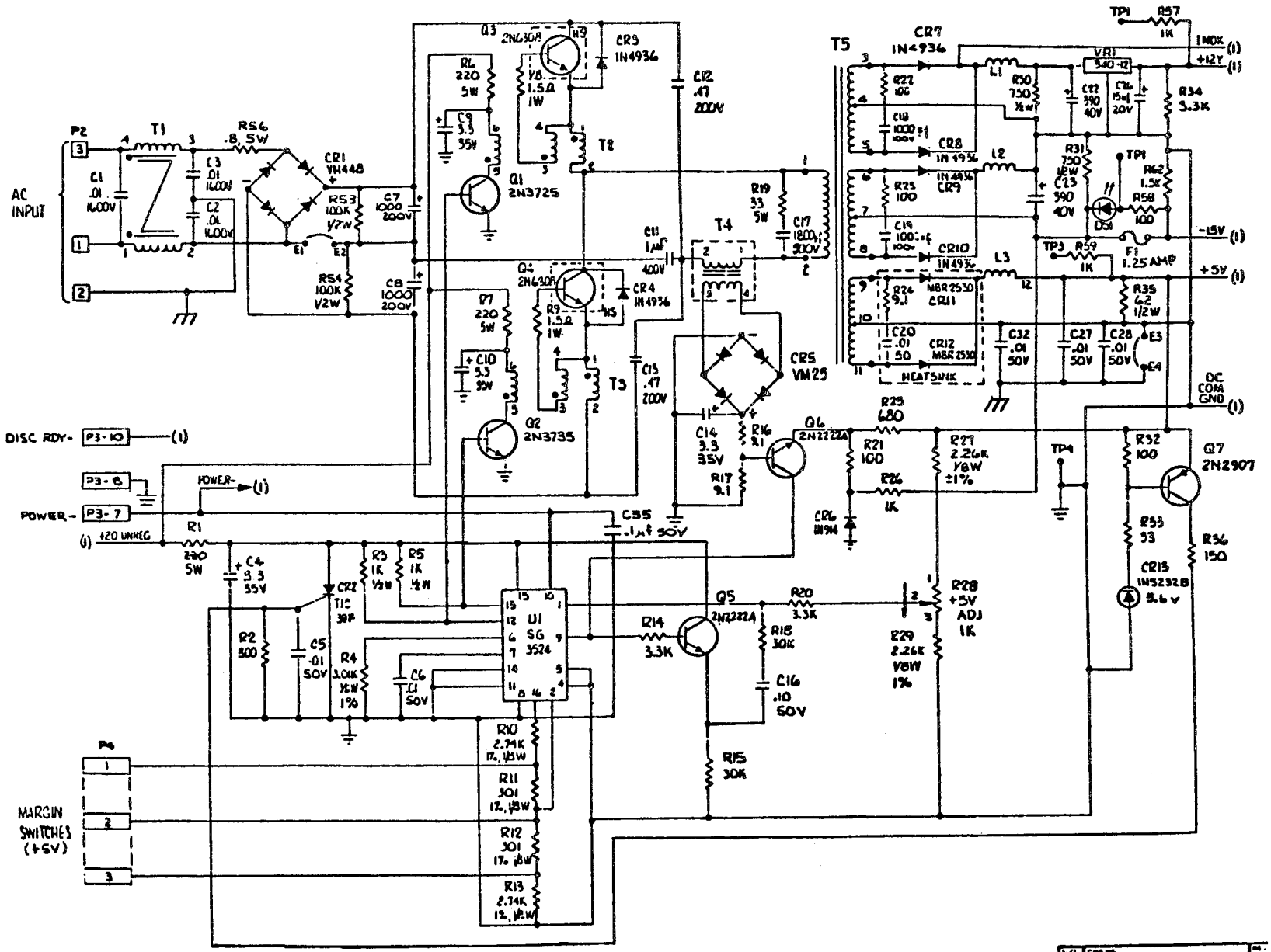
903069	A.0	NEXT ASSY	USED ON

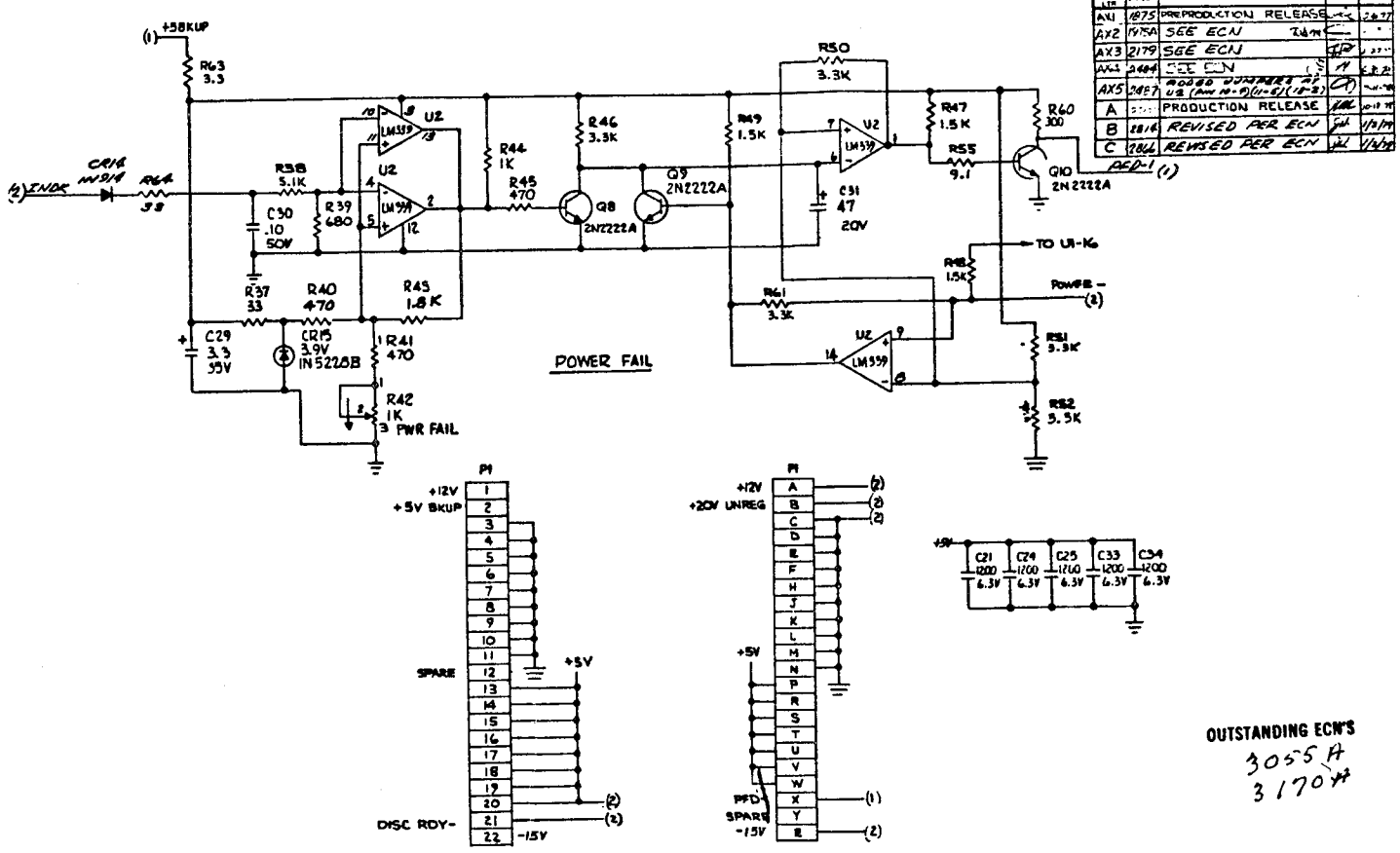
DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
X ± .1
XX ± .03
XXX ± .010
ANGLES ± 1.0°
MACHINED SURFACES √
DO NOT SCALE DRAWING

basic/four corporation
1338 South Claudina Street Anaheim, California 92805

DRAWN		
CHKD		
ENG		
MFG		
APP		

TITLE: PCBA CPU POWER SUPPLY
SIZE D | DWG NO 903038 | REV D
SCALE 1:1 | SHT 1 OF 1





REVISION BLOCK				
REV LTR	ENGR	DESCRIPTION	INITIAL	DATE
AX1	1875	PREPRODUCTION RELEASE		2-8-77
AX2	1975A	SEE ECN		
AX3	2179	SEE ECN		
AX4	2484	SEE ECN		
AX5	2487	ADDED JUMPERS J1-J2 U8 (Ann N-P)(U-6)(L-2)		
A		PRODUCTION RELEASE		
B	2816	REVISED PER ECN		
C	2866	REVISED PER ECN		

OUTSTANDING ECN'S
3055 A
3170 A

2. ALL CAPACITOR VALUES ARE IN MICROFARADS, ±10%.
1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4 W.
NOTES UNLESS OTHERWISE SPECIFIED

REFERENCE DESIGNATION	
LAST USED	NOT USED
C35	C15
U2	
R63	
CR15	
-5	
L3	

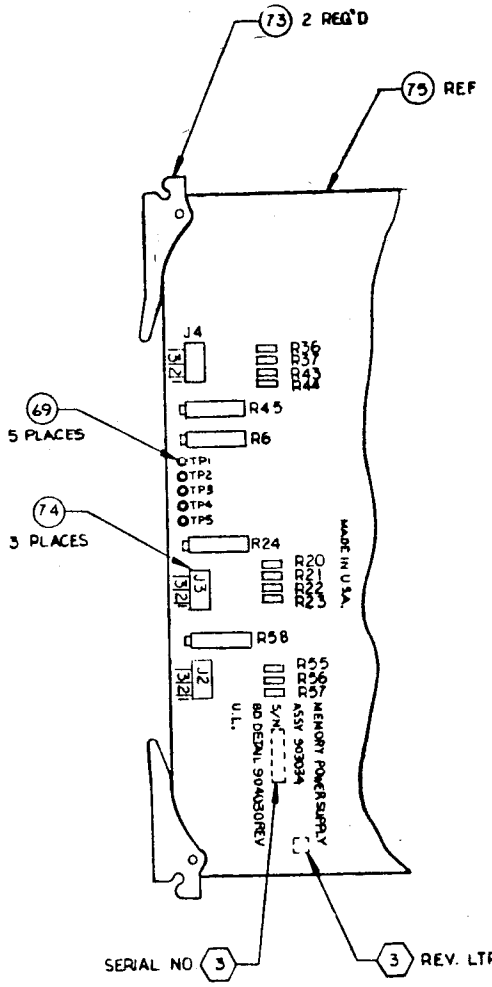
DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
MACHINED SURFACES √
903038 | 300
NEXT ASSY | USED ON
DO NOT SCALE DRAWING

basic/four corporation
1326 South Claudina Street Anaheim California 92805

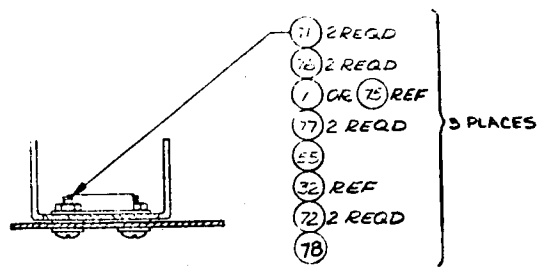
DRAWN	A. GIMENEZ	8-4-77
CHKD		10-5-77
ENG		
MFG		
APP		

TITLE: LD CPU POWER SUPPLY
SIZE C | DWG NO 903039 | REV C
SCALE NONE | SHT 1 OF 2

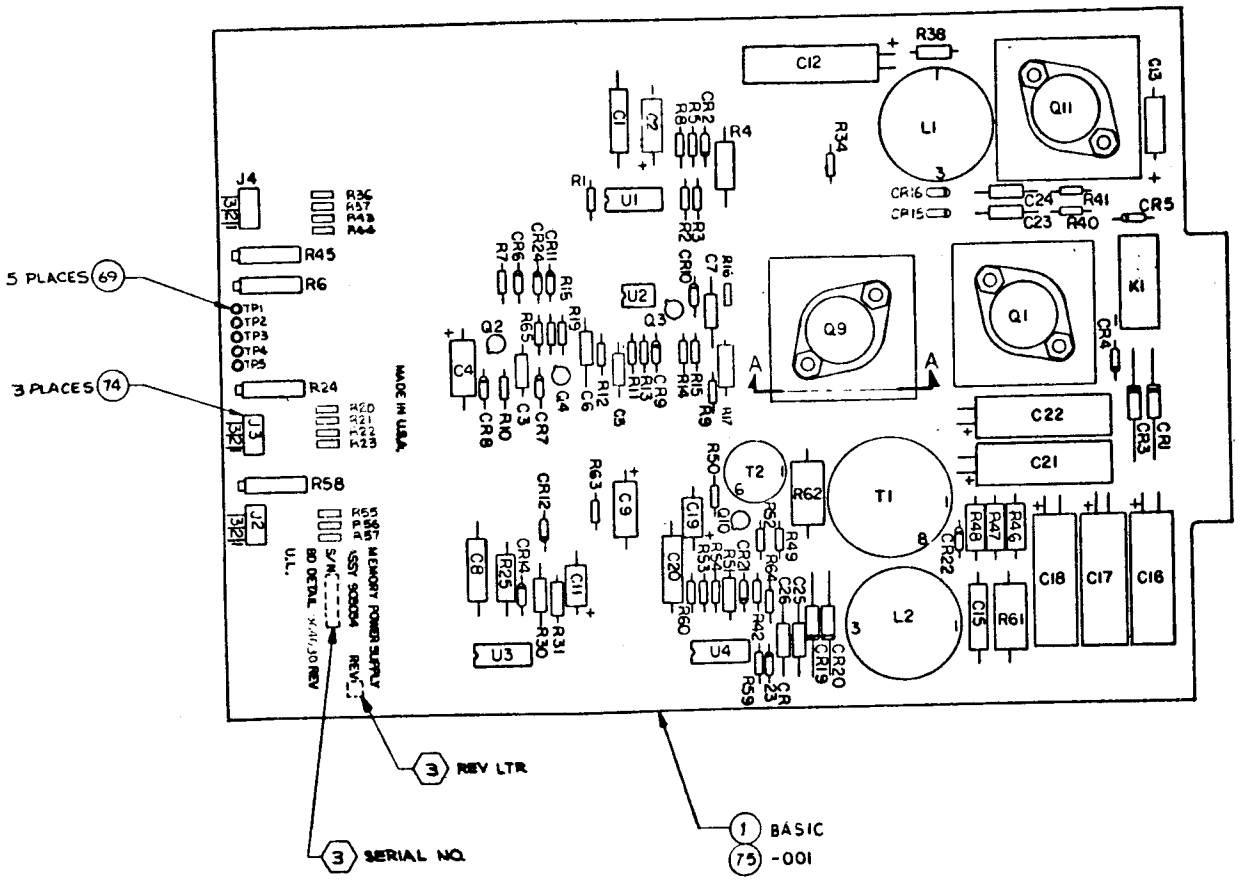
REV LTR	ECN NO	DESCRIPTION	INITIAL	DATE
AX1	[illegible]	[illegible]	[illegible]	[illegible]
AX2	[illegible]	SEE ECN	[illegible]	[illegible]
AX3	[illegible]	SEE ECN	[illegible]	[illegible]
AX4	2065	SEE ECN	[illegible]	[illegible]
AX5	2143	SEE ECN	[illegible]	[illegible]
AX6	2172	SEE ECN	[illegible]	[illegible]
A	2182	PRODUCTION REL	[illegible]	[illegible]
B	2343	REV WAS 904CA6	[illegible]	[illegible]
C	2421	REVISED ITEMS P/L E.C.N.	[illegible]	[illegible]
D	2467	SEE ECN	[illegible]	[illegible]
E	2597	REVISED P/L - ITEM 20 & ITEM 26	[illegible]	[illegible]
F	2708	REVISED P/L - ITEMS 16, 22 & 79	[illegible]	[illegible]



-001



SECTION A-A



OUTSTANDING ECN'S

none

TABULATION BLOCK	
903034 BASIC	WITHOUT INSERTER/ EXTRACTOR
903034-001	WITH INSERTER/ EXTRACTOR

(3) APPLY DESIGNATION APPROX WHERE SHOWN
REF. EEC SPECIFICATION [illegible]

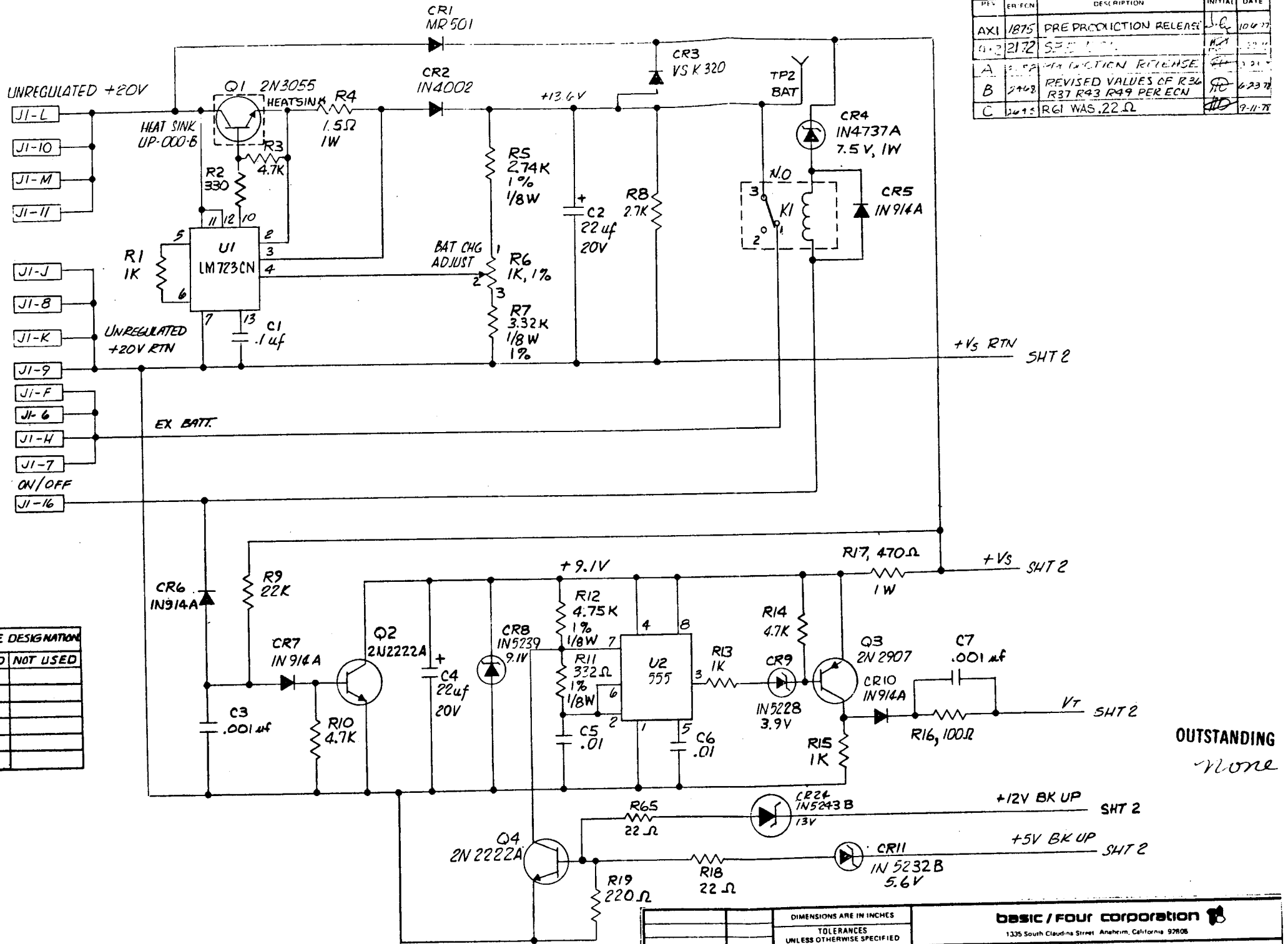
2. REF BD. DETAIL 904030 FOR BASIC & 904C74 FOR -001.
1. REF LOGIC DIAGRAM 903035

NOTES UNLESS OTHERWISE SPECIFIED

FOR PARTS LIST, SEE P/L 903034

		DIMENSIONS ARE IN INCHES	basic/four corporation			
		TOLERANCES UNLESS OTHERWISE SPECIFIED X ± 1 XX ± 03 XXX ± 010 ANGULAR ± 1/2°	DRAWN	R. PERKINS	6/26/77	TITLE PCBA MEMORY POWER SUPPLY
			CHKD			
			ENG			
			MFG			SIZE D DWG NO 903034 REV F
		MACHINED SURFACES √	APP			SCALE 1/1 SH 1 OF 1
NEXT ASSY	USED ON	DO NOT SCALE DRAWING				

REVISION BLOCK				
REV	ER-ECN	DESCRIPTION	INITIAL	DATE
AX1	1875	PRE PRODUCTION RELEASE		10-6-77
A	2172	PRODUCTION RELEASE		3-21-78
B	2468	REVISED VALUES OF R36 R37 R43 R49 PER ECN		6-23-78
C	2695	R61 WAS .22 Ω		9-11-78



REFERENCE DESIGNATION	
LAST USED	NOT USED
R64	
U4	
C26	
CR24	
T2	
L2	

OUTSTANDING

None

1. ALL RESISTOR VALUES ARE IN OHMS, ± 5% 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

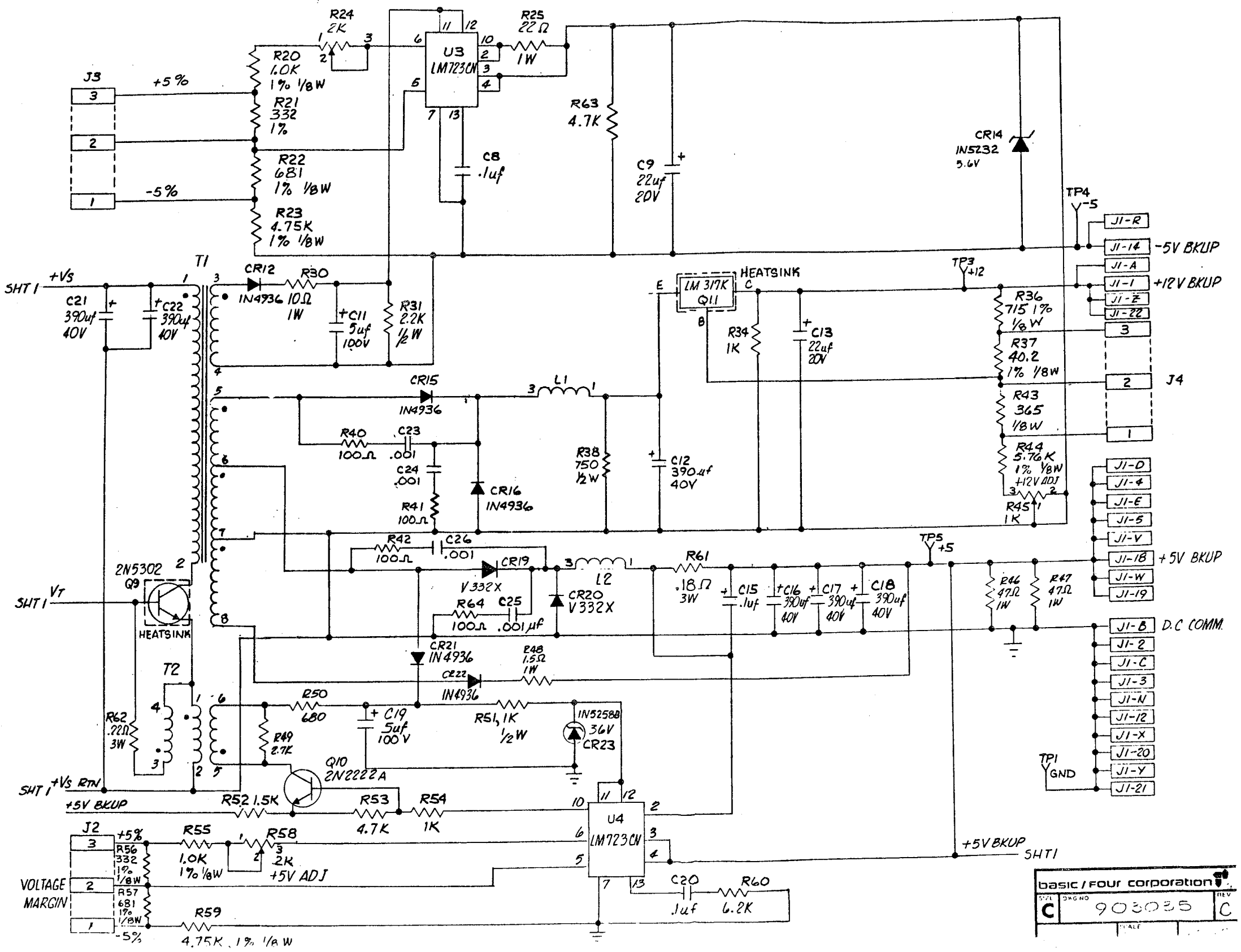
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	MACHINED SURFACES √

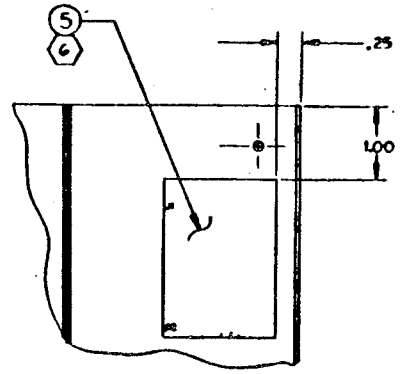
DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
x ± 1
xx ± 03
xxx ± 010
ANGLES ± 1.0°

basic/four corporation
1335 South Claudina Street Anaheim, California 92806

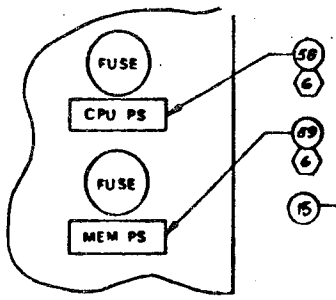
DRAWN		
CHKD		11/9/77
ENG		
MFG		
APP		

TITLE: SCHEM MEMORY POWER SUPPLY
SIZE C | DWG NO 2[illegible]025 | REV C
SHT 2

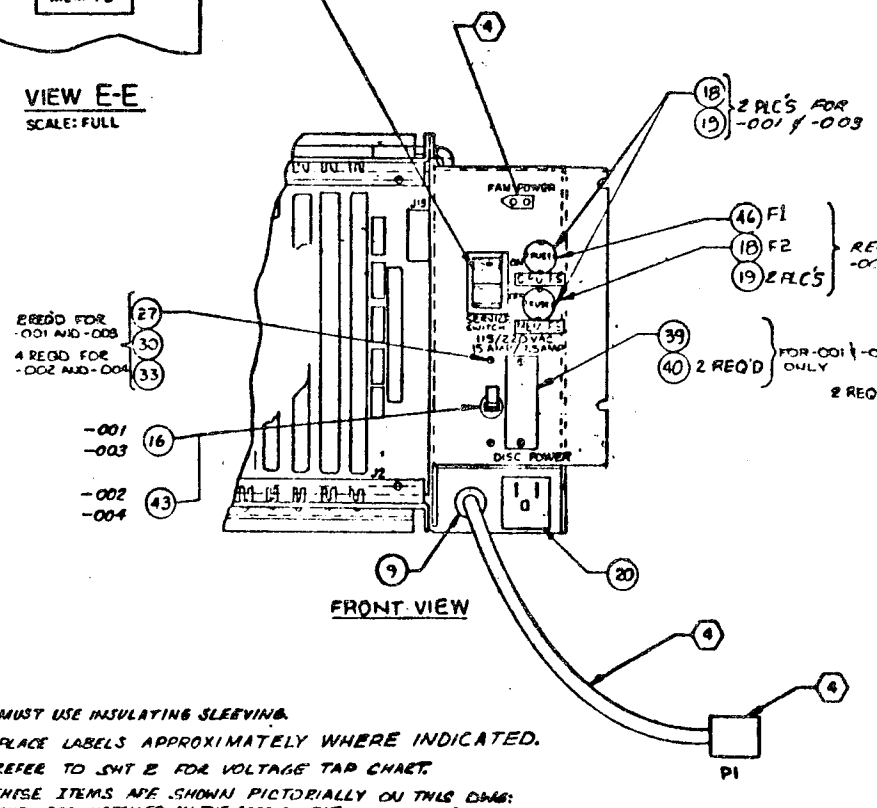

J3
+5%
-5%
R20 1.0K 1% 1/8W
R21 332 1%
R22 681 1% 1/8W
R23 4.75K 1% 1/8W
R24 2K
R25 22Ω 1W
U3 LM723CN
C8 .1uf
R63 4.7K
C9 22uf 20V
CR14 IN5232 5.6V
TP4 -5
J1-R
J1-14 -5V BKUP
J1-A
J1-1 +12V BKUP
J1-Z
J1-22
3
2
1
J4
T1
SHT 1 +Vs
C21 390uf 40V
C22 390uf 40V
CR12 IN4936
R30 10Ω 1W
C11 5uf 100V
R31 2.2K 1/2W
CR15 IN4936
L1
R40 100Ω
C23 .001
C24 .001
R41 100Ω
CR16 IN4936
R38 750 1/2W
C12 390uf 40V
LM 317K Q11
HEATSINK
R34 1K
C13 22uf 20V
TP3 +12
R36 715 1% 1/8W
R37 40.2 1% 1/8W
R43 365 1/8W
R44 5.76K 1% 1/8W +12V ADJ
R45 1K
J1-D
J1-4
J1-E
J1-5
J1-V
J1-18 +5V BKUP
J1-W
J1-19
R42 100Ω
C26 .001
CR19 V332X
CR20 V332X
L2
R61 .18Ω 3W
C15 .1uf
C16 390uf 40V
C17 390uf 40V
C18 390uf 40V
TP5 +5
R46 47Ω 1W
R47 47Ω 1W
J1-B D.C COMM.
J1-2
J1-C
J1-3
J1-N
J1-12
J1-X
J1-20
J1-Y
J1-21
TP1 GND
2N5302 Q9
HEATSINK
SHT 1 VT
T2
R62 .22Ω 3W
R49 2.7K
R50 680
C19 5uf 100V
CR21 IN4936
CR22 IN4936
R48 1.5Ω 1W
R51 1K 1/2W
1N5258B 36V CR23
Q10 2N2222A
SHT 1 +Vs RTN
+5V BKUP
R52 1.5K
R53 4.7K
R54 1K
U4 LM723CN
J2
+5%
R56 332 1% 1/8W
R57 681 1% 1/8W
VOLTAGE MARGIN
-5%
R55 1.0K 1% 1/8W
R58 2K +5V ADJ
R59 4.75K 1% 1/8W
C20 .1uf
R60 6.2K
+5V BKUP SHT 1
basic/four corporation
SIZE C
DWG NO 903035
REV C
SCALE



SECTION A-A
SCALE : NONE



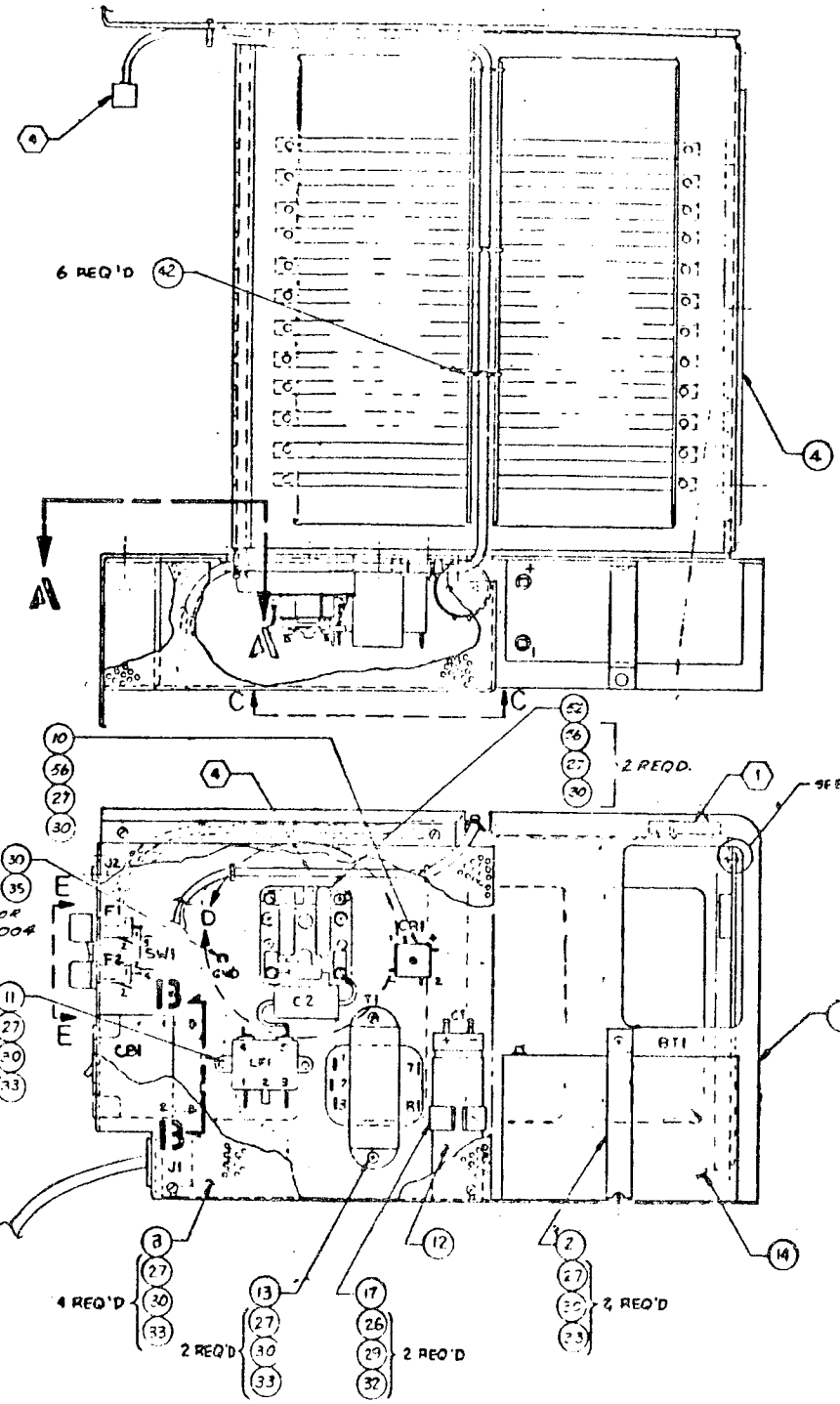
VIEW E-E
SCALE: FULL

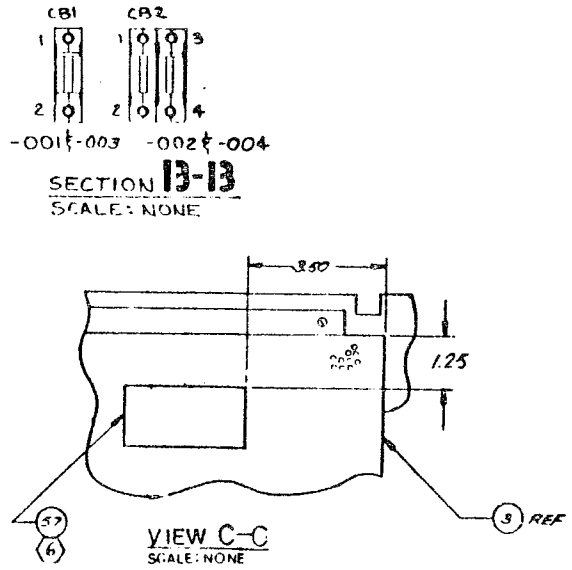


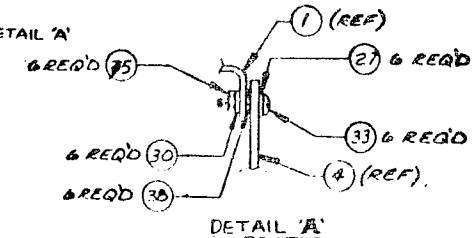
(7) MUST USE INSULATING SLEEVING.
(6) PLACE LABELS APPROXIMATELY WHERE INDICATED.
(5) REFER TO SHT 2 FOR VOLTAGE TAP CHART.
(4) THESE ITEMS ARE SHOWN PICTORIALLY ON THIS DWG: AND ARE INSTALLED ON THE 902710 LEVEL.

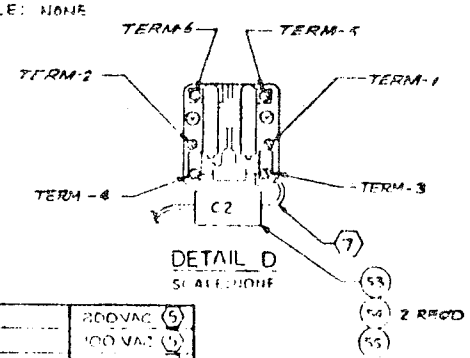
1. SEE APPLICABLE P/L E/F NO. 902670.
2. FOR WIRE LIST SEE B/F PART NO. 902710.
3. MARK IDENTIFICATION PER SPECIFICATION B00000 WITH APPLICABLE PART NO. AND REV. LTR, APPROX. WHERE SHOWN.

NOTES UNLESS OTHERWISE SPECIFIED







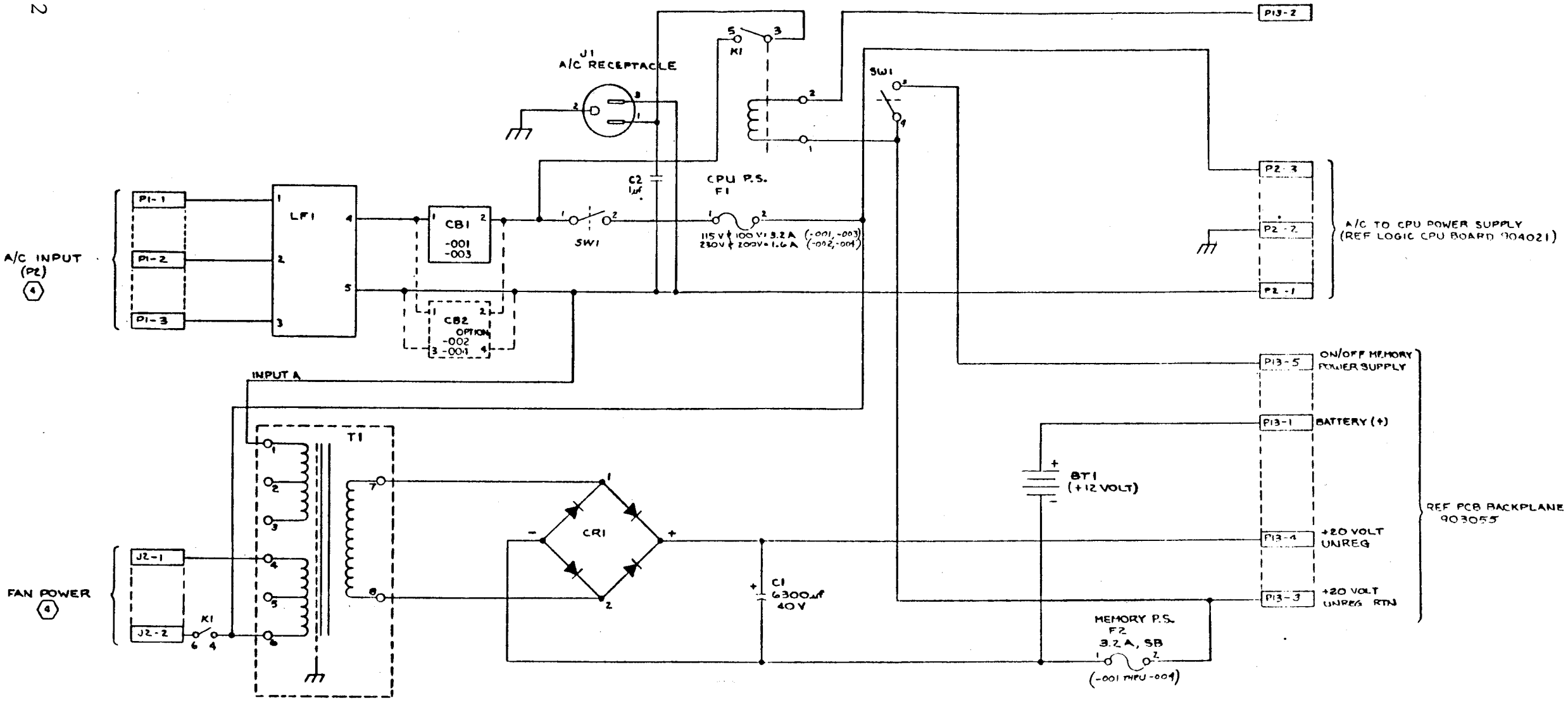


PART NO	MINIMUM ASSY REV LEVEL	DESCRIPTION
TABULATION START		

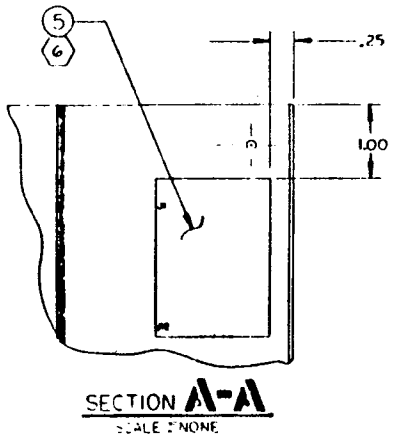
basic/four corporation

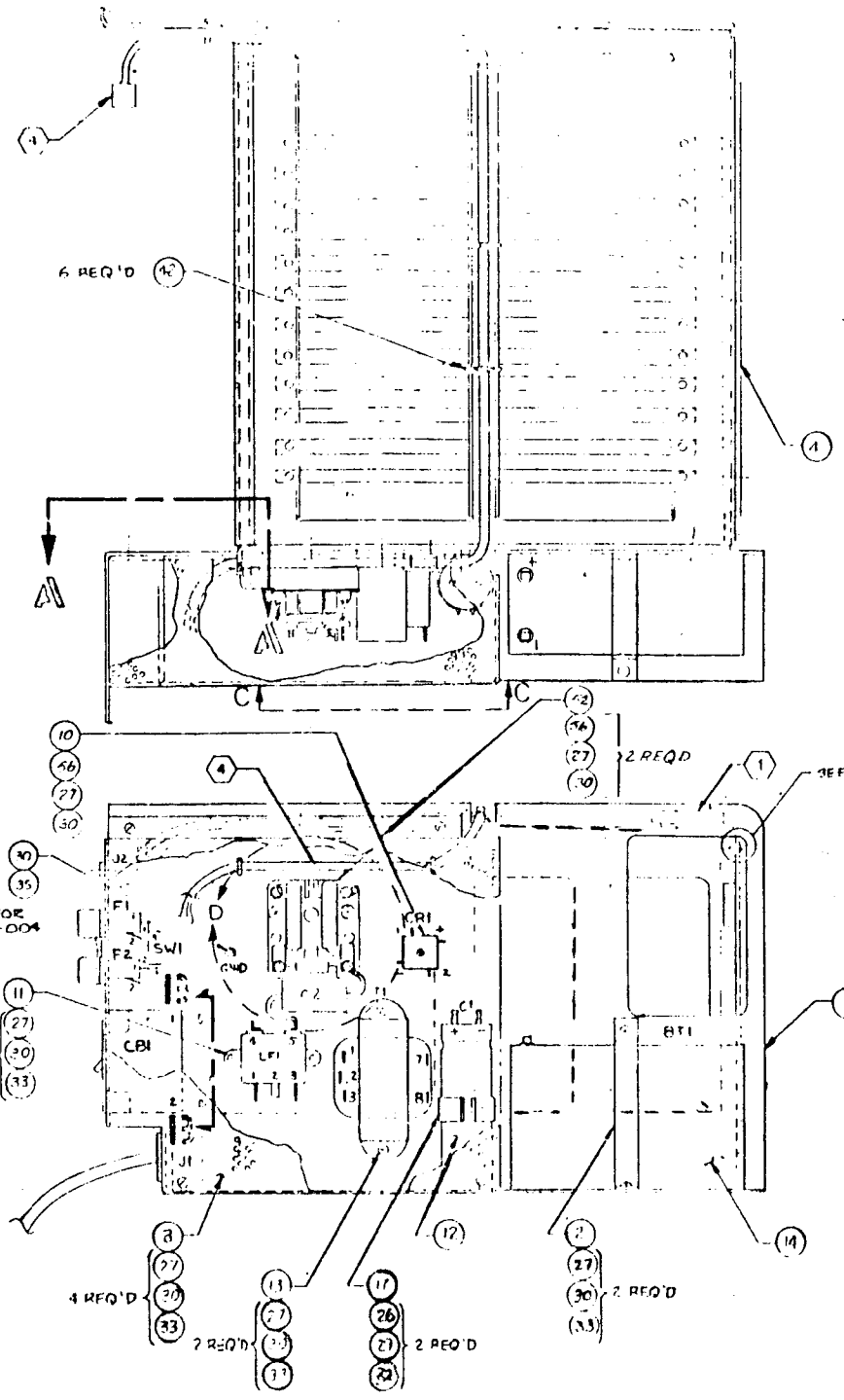
CHASSIS ASSY CPU

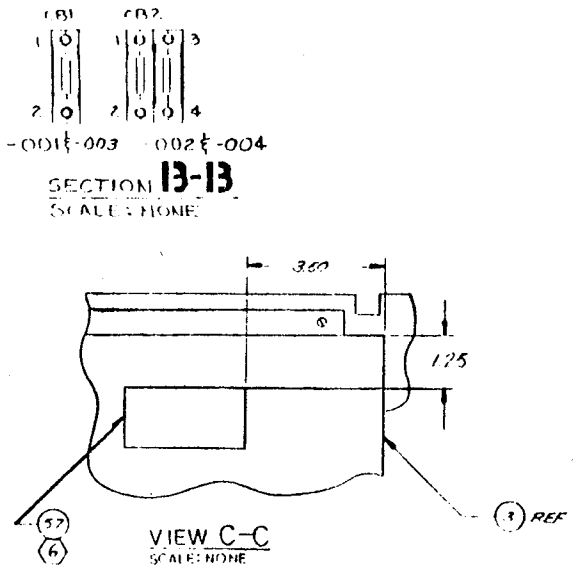
902670 B

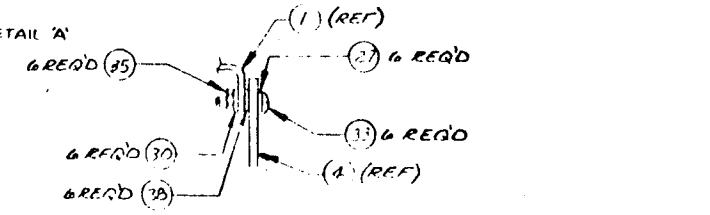


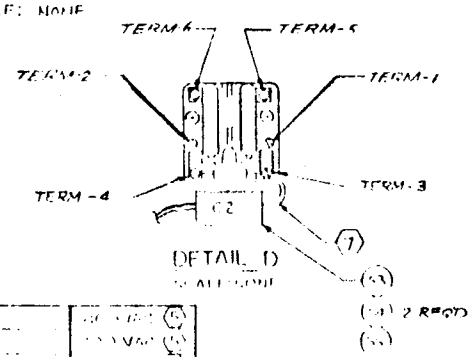
	VOLTAGE TAP CHART (T1)			
	-001 (115 VAC)	-002 (230 VAC)	-003 (100 VAC)	-004 (200 VAC)
INPUT	A TO T1-1	A TO T1-1	A TO T1-2	A TO T1-2
JUMPER	T1-1 TO T1-4	T1-3 TO T1-4	T1-2 TO T1-5	T1-3 TO T1-5
JUMPER	T1-3 TO T1-6		T1-3 TO T1-6	

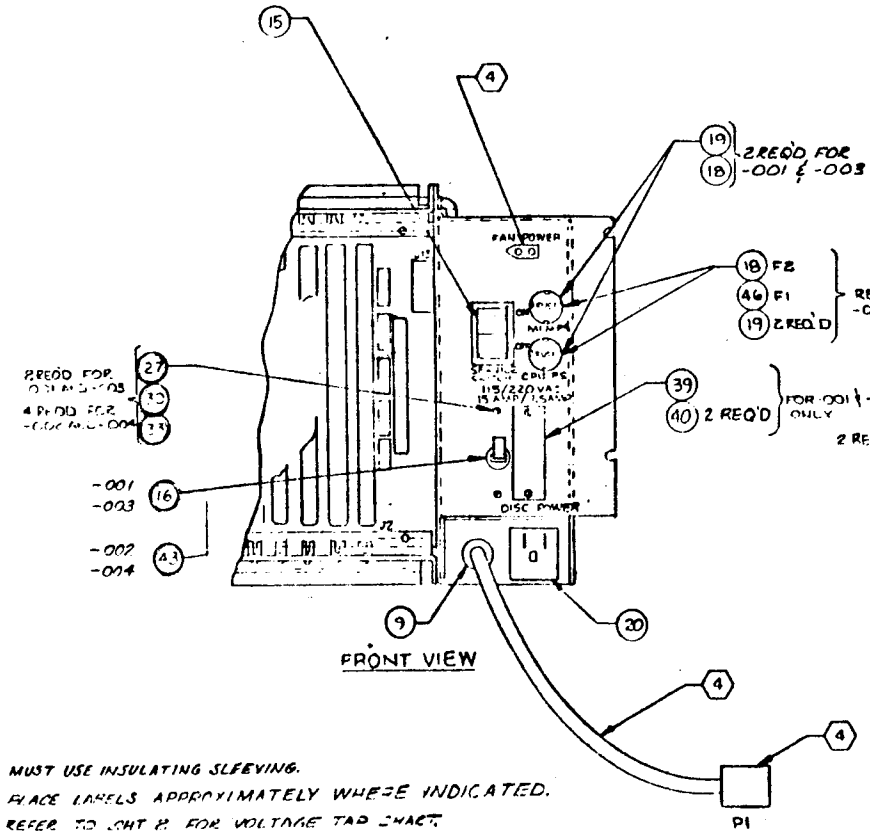












) MUST USE INSULATING SLEEVING.

) PLACE LABELS APPROXIMATELY WHERE INDICATED.

) REFER TO CHT 2 FOR VOLTAGE TAP CHART.

THESE ITEMS ARE SHOWN PICTORIALLY ON THIS DWG AND ARE INSTALLED ON THE 202110 LEVEL.

SEE APPLICABLE P/L & F NO. [illegible]2620.

FOR WIRE LIST, SEE B.F PART NO. [illegible] 110.

) OTHER IDENTIFICATION (I.D. STENCILING) ENGRAVED WITH APPLICABLE PART NO. AND REV. LTR. AS PER DR. WHERE SHOWN.

[illegible] UNLESS OTHERWISE SPECIFIED

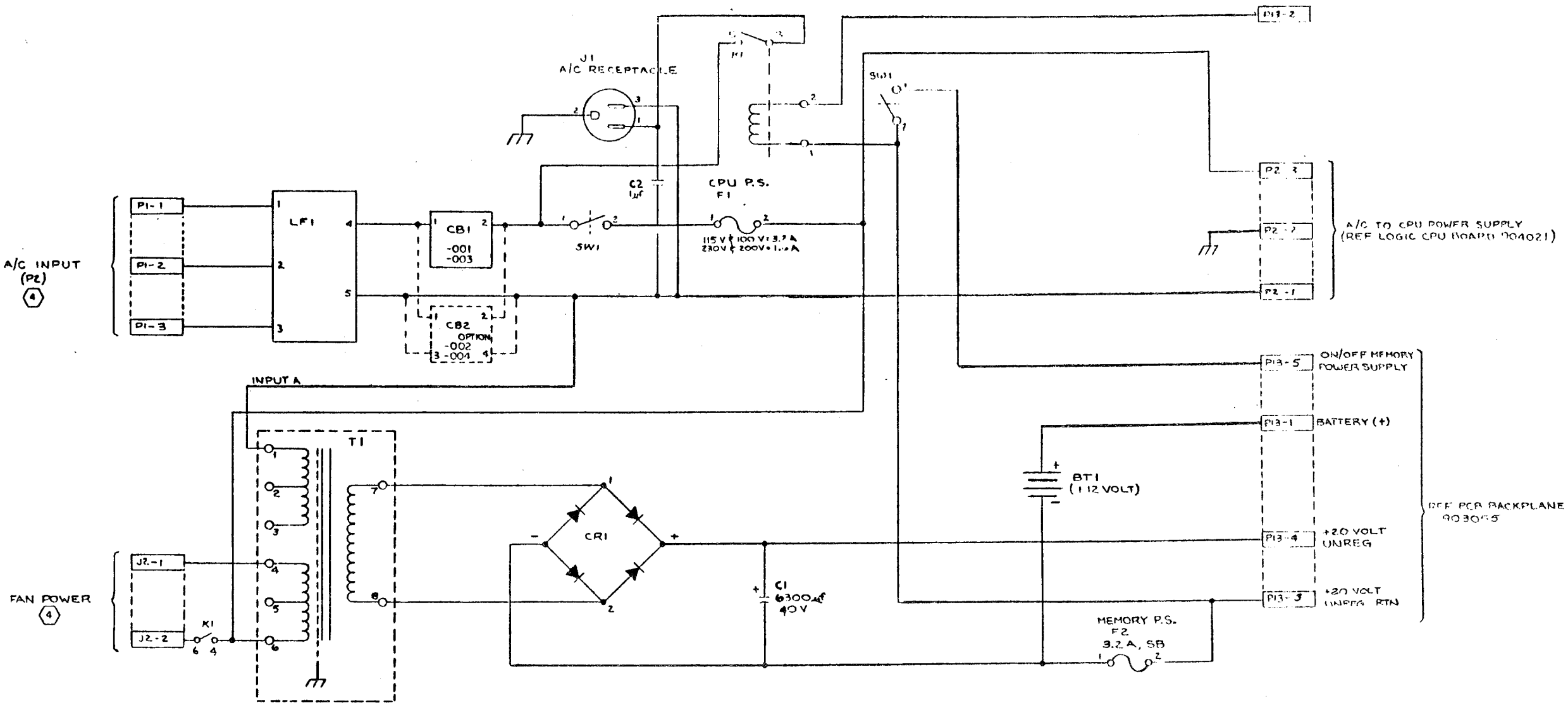
[illegible]	[illegible]	[illegible]
PART #	[illegible]	[illegible]

basic/four corporation

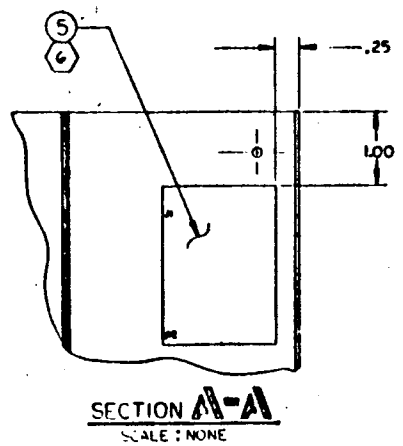
CHASSIS ASSY CPU

202110

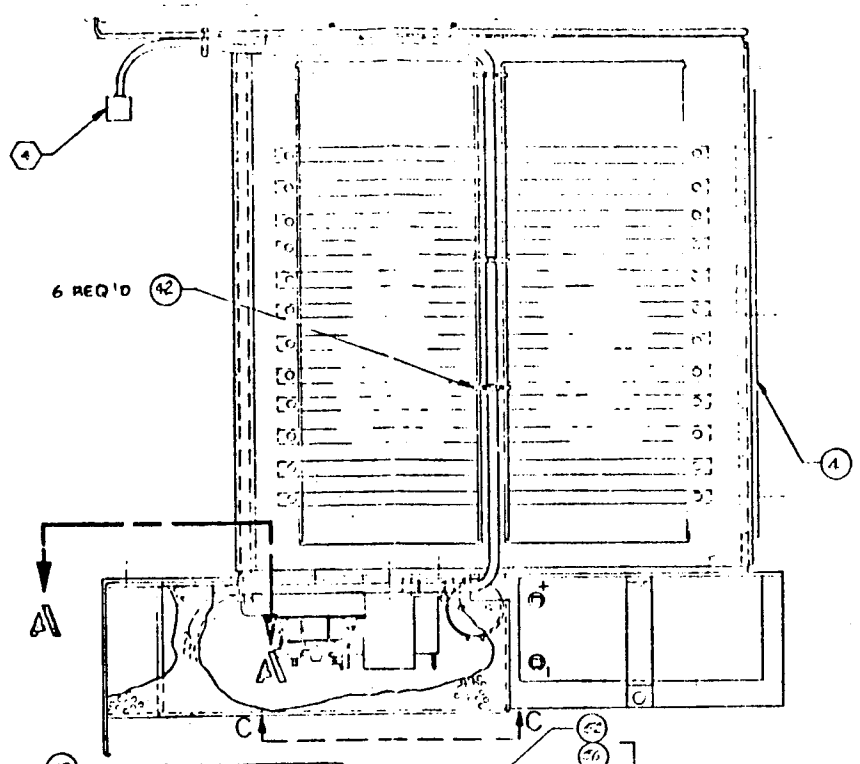
A

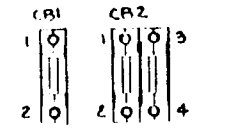


VOLTAGE TAP CHART (T1)				
	-001 (115 VAC)	-002 (230 VAC)	-003 (100 VAC)	-004 (200 VAC)
INPUT	A TO T1-1	A TO T1-1	A TO T1-2	A TO T1-2
JUMPER	T1-1 TO T1-4	T1-3 TO T1-4	T1-2 TO T1-5	T1-3 TO T1-5
JUMPER	T1-3 TO T1-6		T1-3 TO T1-6	

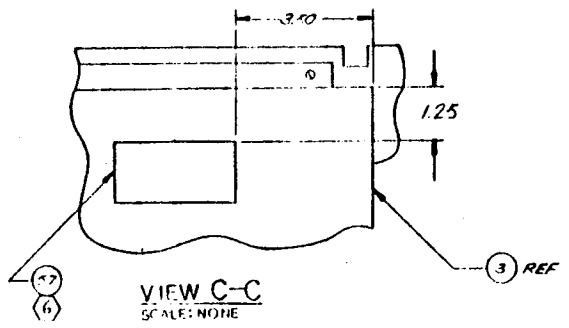


SECTION A-A
SCALE : NONE

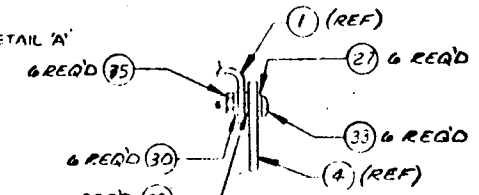




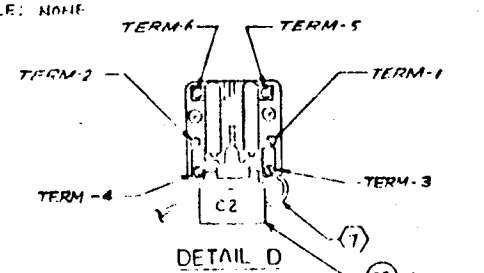
SECTION D-D
SCALE: NONE



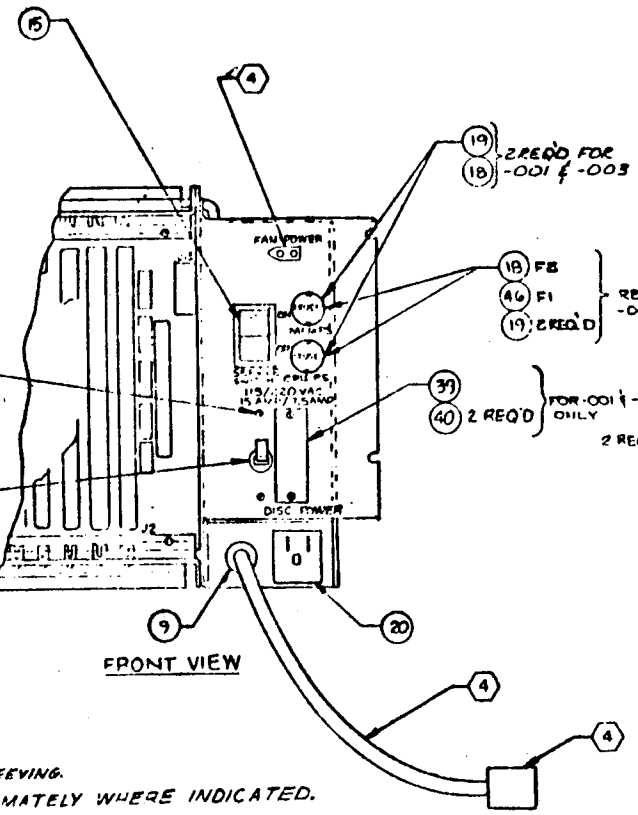
VIEW C-C
SCALE: NONE



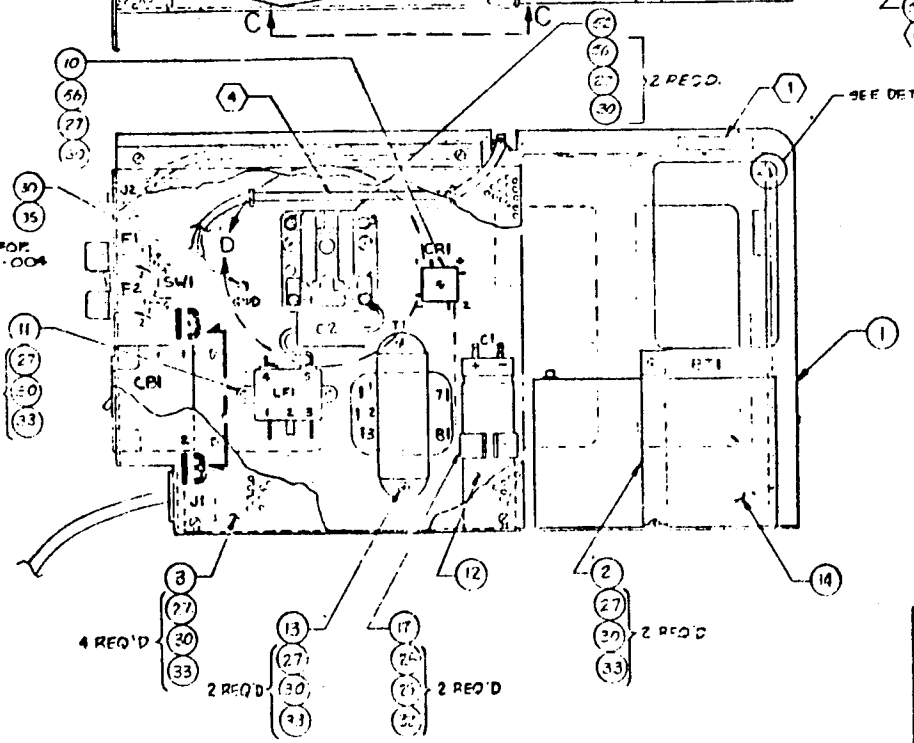
DETAIL 'A'
SCALE: NONE



DETAIL D
SCALE: NONE



FRONT VIEW



- MUST USE INSULATING SLEEVING.
- PLACE LABELS APPROXIMATELY WHERE INDICATED.
- REFER TO SHT 2 FOR VOLTAGE TAP CHART.
- THESE ITEMS ARE SHOWN PICTORIALLY ON THIS DWG AND ARE INSTALLED ON THE 902110 LEVEL.
- PER APPLICABLE P/L S/F NO. 902670.
- FOR WIRE LIST SEE S F PART NO. 902110.
- WIRE, INSULATION, SOLDER, SPECIFICATION 000000 WITH APPLICABLE PART NO. AS REF. ITEM 000 XX. WHERE SHOWN.

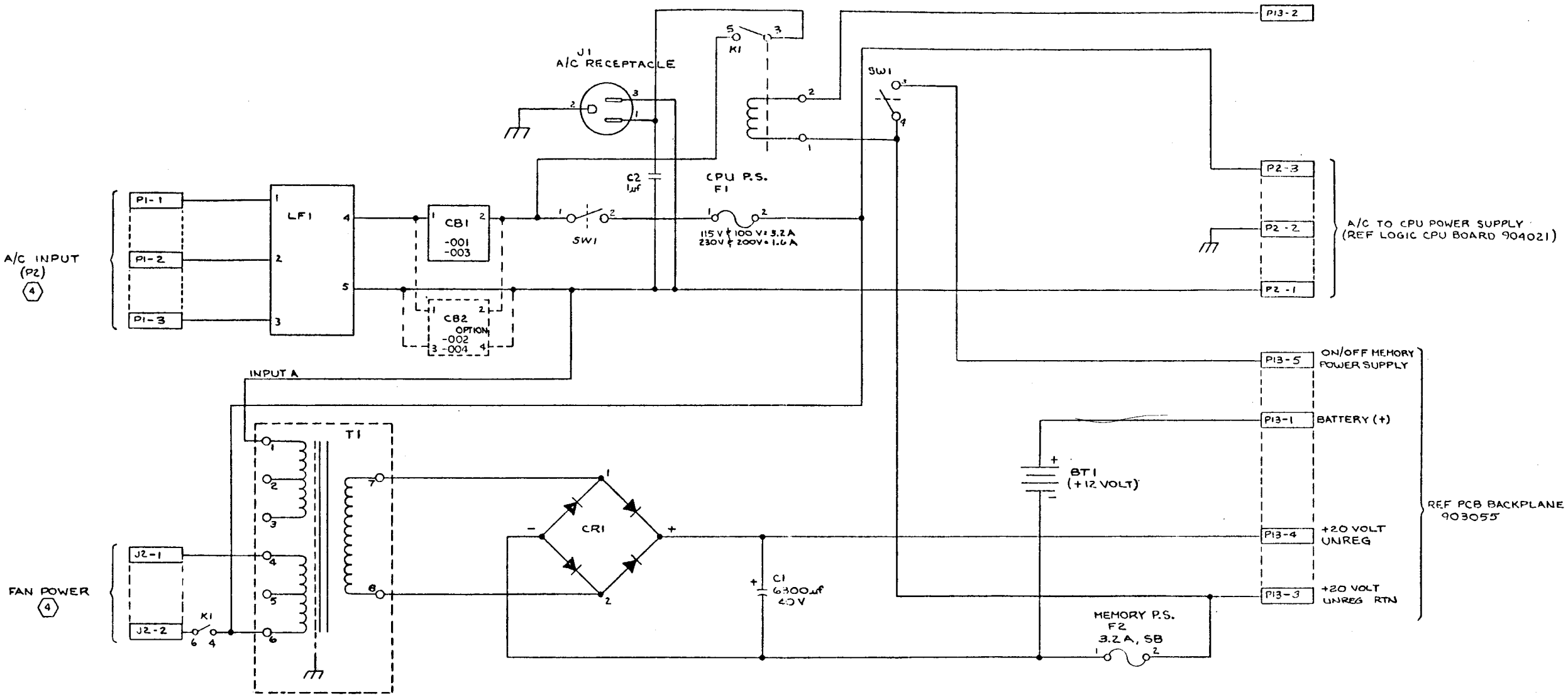
UNLESS OTHERWISE SPECIFIED

PART NO.	QTY	DESCRIPTION

basic/four corporation

CHASSIS ASSY CPU

902670 AX5



	VOLTAGE TAP CHART (T1)			
	-001 (115 VAC)	-002 (230 VAC)	-003 (100 VAC)	-004 (200 VAC)
INPUT	A TO T1-1	A TO T1-1	A TO T1-2	A TO T1-2
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JUMPER	T1-3 TO T1-6		T1-3 TO T1-6	